Digitization of Museum Collections
A Case Study for Bibliotheca Alexandrina Antiquities Museum

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The Bibliotheca Alexandrina Antiquities Museum (BAAM) has been involved in many digitization-related projects. Part of them were external projects where the museum played a secondary part, while in others the BAAM team was a main player. This paper analyses some of these projects and discusses the lessons learnt from each of them. It also highlights the role of museum professionals in formulating clear objectives for digitization, and the subsequent strategies formulated to achieve them. Finally, it presents some of the digitization advantages, opportunities, difficulties, and challenges based on the BAAM experiences.

Bibliotheca Alexandrina Antiquities Museum (BAAM)

The BAAM was established in 2002 inside the building of the New Library of Alexandria (Bibliotheca Alexandrina) to house the collection of artefacts discovered between 1993 and 1996 at the construction site of the Library.[1] In addition to the collection discovered *in situ* (111 objects), artefacts were also acquired from other Egyptian museums and archaeological storerooms. The museum's permanent collection eventually consists of 1.322 artefacts (in 2021) covering the history of Egypt from the ancient Egyptian Period (c. 3100 BC) to the early part of the twentieth century.

1 Abbreviations used in this article include: Bibliotheca Alexandrina (BA); Bibliotheca Alexandrina Antiquities Museum (BAAM); Centre for Documentation of Cultural and Natural Heritage (CultNat); Egyptian Museum, Cairo (EMC); Graeco-Roman Museum, Alexandria (GRM); Information and Communication Technology Sector, Bibliotheca Alexandrina (BA ICT).

Earliest Experiences and Partnerships in Digitization

The Eternal Egypt website and the Digital Guide

In 2004, the BAAM was part of a leading project managed by the Centre for Documentation of Cultural and Natural Heritage (CultNat)[2] in collaboration with the then Supreme Council of Antiquities[3] and IBM Corporation.[4] The project, entitled *Eternal Egypt*, consisted of a website[5] made available in five languages[6] displaying more than 2.000 artefacts from eight museums in Egypt. It offered, as well, tours for a selection of historical sites. The BAAM contribution consisted of providing data for a selection of 220 artefacts from its collection. The website used some of the then latest interactive technologies including animations and three-dimensional models. In 2005, the same project developed the *Digital Guide*, a solution for on-site tours at the BAAM. It consisted of a handheld digital audio and visual device. The BAAM was the second to use this solution in Egypt after the Egyptian Museum in Cairo (EMC). It included thematic and chronological tours, as well as explanatory animations. It was available in Arabic, English and French.

Discussion

Eternal Egypt website was among the earliest well-praised digital initiatives in Egypt and it even received an international prize (Bibliotheca Alexandrina 2006). It was the first website, nationwide, to properly publish a large number of archaeological collections online in such a neat and organized manner.

As museum professionals at the BAAM, this was our first experience with digitization. We got to know, through our work with CultNat, the basics of collection digitization. Still, our role was limited to simple data provision for the museum collection (brief object designation, material, provenance, material, dimensions, etc.). Even detailed description of the artefacts was assigned to archaeologists and art historians, many of whom were not from the museum sphere. This resulted, in a few instances, in a very descriptive text of what the website user could already see in the accompanying artefact image. This type of detailed description would be,

2 CultNat is one of the departments of Bibliotheca Alexandrina. It is located at the Smart Village in Cairo.

3 Currently the Ministry of Tourism and Antiquities (as of 2019).

4 IBM was contracted to develop the software needed for both *Eternal Egypt* website and the *Digital Guide*.

5 *Eternal Egypt* is available at http://www.eternalegypt.org.

6 The website languages are Arabic, English, French, Italian and Spanish.

perhaps, more appropriate for a scientific publication rather than an artefact highlight for an average online user. Consequently, this raised some questions about the content planning and whether the website target audience was clearly defined.

As for the hand-held device, the *Digital Guide*, users generally provided positive feedback. For many, it was a new and a different type of museum visit experience. Some visitors also expressed that it made them masters of their own visit; they only listened and went through media about objects they were interested in, or picked a thematic tour of their preference, which was more convenient for them than an ordinary visit led by a *real* guide. Some added, however, that in case of inquiries, they had to get back to the guides in the museum, and indicated that both *digital* and *ordinary* guides may complement each other in some instances.

On the other hand, we still had, as in the case of the website of *Eternal Egypt*, similar issues with the presentation of the content. The *Digital Guide* was operating in a different environment; i.e. inside the museum and not on a PC screen. This required a different presentation for the content. For example, in some of the thematic tours, each object included in the tour was still displayed apart when clicked, whereas one would expect, instead, that a tour (for instance about Egyptian afterlife beliefs) would take the handheld device user on a journey about the theme directing him/her among the displayed artefacts (coffins, mummies, amulets, etc.) while making some connections between them.

Another remark we got was about the narration voice. As the project was mainly run by colleagues who come from the IT sphere, they were, in many instances, keen on utilizing some of the then latest technologies. At that time (2005) the text-to-speech technology was favoured, which generated human-like audio from written text. Although the English and French narrations were somehow acceptable, there were some obvious issues with the Arabic version. When asked, many visitors indicated they would have preferred a real human voice instead. This was a comment that we frequently got for the three available languages.

A drawback of projects entirely run and funded by other parties is that by the time the project ends it becomes somehow difficult to run major upgrades for the hardware and software, as well as the content. The *Digital Guide* remained operational for some good seven years, which is quite a long period for this kind of technology. Hardware issues were maintained by the information and communication technology sector[7] of the Library (BA ICT). On the other hand, there were no updates on the content after the project was delivered to us. As there were no additional funds to upgrade the software and hardware or to rework the content, the service eventually stopped in 2013 after the technology was judged obsolete.

7 The Information and Communication Technology Sector of the BA is the one responsible for developing and maintaining digital solutions for all BA departments.

Finally, one should point out the importance of the inclusion of all concerned parties in the planning phase of any digitization related project. Before letting technical professionals take over, important decisions must be taken as to what to digitize, for which end and how the digitized material would help achieve the project objectives and, consequently, the museum mission. In the case of the website of *Eternal Egypt* and the *Digital Guide*, the project's main objective was clearly to provide access to archaeological heritage to as many people as possible. This highlights the significant role of museum professionals in the planning process, as they have the needed expertise in collection interpretation, in conveying information to visitors and in culturally mediating between displayed objects and visitors. Unfortunately, the BAAM team was not included in the planning phase, and consequently, it was too late to make any modifications on the content or the way it was presented. One should also note that technological gadgets and the accompanying digitized material should only be selected based on the needs of this interdisciplinary planning, and as a customized medium to convey the project objectives to online users or museum visitors. Advanced technology without a good content tailored for the chosen audience would be a waste of funds and resources.

Digitization Projects at the BAAM

The BAAM Digitization Objectives and Deliverables

Objectives

Before we began our own first digitization projects at the BAAM, we needed to set clear and defined objectives. These were intended to serve as guidelines for the planning process, as well as for the choice of the most appropriate tools needed to fulfill our goals. We agreed on the following objectives:

- Digitization projects should serve curatorial work, conservation and collection management.
- Digitization projects should help in making the museum collections more accessible to the general public.
- Digitization projects should help in raising awareness about national heritage.

Deliverables to achieve objectives

- A comprehensive database for the museum collections.
- A website dedicated to the BAAM where users could access the entire museum collections online.

Collection Database

Available Data

To create a comprehensive database, we needed to include all the fields required for a proper documentation of archaeological artefacts. We started by assessing the data we had. It was divided into photographic material and written/printed data.

The photographic material included 35 mm slides and negatives. We also had printed photos developed from these negatives. However, the decision was taken to digitize the source slides and negatives to get the highest possible quality, and to avoid as well any colour changes that might had occurred during the developing process based on the type of the printing equipment. The scanning resolution was set to enable us to make A3 prints at 300 dpi from the digitized files.[8] The photographic material included, in addition, digital photos that were taken for certain objects starting from 2004. Specific metadata fields for the photographs (photographer, copyright, original medium, etc.) were prepared at that point.

As for the written data available for the museum artefacts, we had many sources, such as the official register book,[9] acquisition documents, few excavation reports and publications about specific collections or artefacts.

Parties Involved

In order to fulfill our first objective, i.e. *Digitization projects should serve curatorial work, conservation and collection management*, we were keen to engage the curators in charge of the museum collections at the very early stages of planning, to be able to come up with the best representative data fields needed for cataloguing and managing the collection artefacts.

Then came the role of the documentation team who prepared the preliminary structure of the database based on the curators' demands. The team also acted as the link between curators and the BA ICT specialists. The team members were also responsible for doing some online research to assess some of the existing online museum databases to be able to come up with the most suitable structure which fits the BAAM collections.

8 We are indebted to Rami Rouchdi and his expert team at the Digitization Operations Section (BA ICT Sector) for accomplishing the scanning and processing of the BAAM slides and negatives.

9 The official register book, also referred to as the *museum ledger*, is where museum artefacts are recorded. All the information for the different fields (inventory, description, provenance, dimensions, notes, etc.) is handwritten. A small printed photograph is also glued opposite to the record. Even with advent and use of databases, the register book is still the legally recognized document which is referred to in most of the official paperwork.

The IT specialists of the Bibliotheca Alexandria[10] eventually developed the database with the most appropriate field types depending on the type of data which is to be entered.

Use and Re-use of Cataloguing Data

The use and re-use of cataloguing data is most prominently demonstrated in online collection databases. The ability to search for object information outside the confines of the holding institution has revolutionized research and the very notion of public access to collections (Szrajber 2014: 5). The structure and development of the museum database were, accordingly, set to fit the requirements needed for online access. Any addition/modification of records had to be directly reflected on the online catalogue accessed by the public. Furthermore, the database was the nucleus for another project aiming to create a virtual version of the BAAM.

Database Design

In the pre-design phase, we went through some online collection databases.[11] The aim was to get a general idea about how such catalogues work and to know more about their structures. This was, indeed, an important step which helped us a lot while designing a customized database for the BAAM. We were also interested in assessing the ease of access to the information; this was done by testing the efficiency of the search types (i.e. simple and advanced searches) used in these databases. And this is, in fact, where we encountered a few frustrating experiences. There were instances where we had trouble finding very specific objects we already knew they existed in these databases. We were either not getting the result we were looking for, or getting too many results that took a great deal of time to go through. This is where we realized that the structure of the database, as well as the form of the data entered both played a major role in the efficiency of the search systems. This was considered during the different steps of the database design that we will present here in some detail.

Artefact Classification and Terminology

A polyhierarchical thesaurus for archaeological terminologies was used to classify the museum artefacts. It was prepared in the form of dropdown menus. As the online database was planned to be made available in Arabic, English and French, the thesauri had also to be available in these languages. We referred to some existing

10 We are truly thankful to Nahed Bahaa and her team from the Institutional Repositories and Integrated Library Systems department (BA ICT Sector) for developing the BAAM database.

11 The assessment was done in 2006 for the database of the British Museum, Base Atlas of the Louvre Museum, The Petrie Museum database and the Metropolitan Museum of Art database.

thesauri, such as, among others, the English thesaurus graciously provided to us by the Petrie Museum of Egyptian Archaeology[12] and the Multilingual Egyptological Thesaurus on the Global Egyptian Museum website.[13] We consulted, as well, printed museums catalogues and art books for the precise translations of some terms. This was helpful especially during the French terminology jargon translation. We eventually came up with a customized thesaurus for the BAAM collections, with the possibility for curators and documentation specialists to add new categories when needed (in case of new acquisitions and temporary collections). A somehow challenging task was the preparation of the Arabic version of the thesaurus. This was due to the noticeable lack of standardization of terminology in Arabic literature dealing with archaeology. Some terms were even, in some instances, a simple transliteration of foreign ones. As a result, we tried to prepare the Arabic jargon that was commonly used and accepted by curators, researchers and archaeologists. Due to the nature of the Arabic language, we also added some fields for synonyms; these included the different commonly used and colloquial equivalents that sometimes varied based on the spoken dialect, as well as different plural forms that could exist for the same term, which is a frequent case in Arabic. Such data was useful to yield better results for the free-text simple search on the online catalogue, where users might not be acquainted with specialized jargon, but may use terms they are familiar with. On the other hand, as Modern Standard Arabic is the literary language used and accepted in academia, print and mass-media, these colloquial terms were just a hidden search-aiding tool, and, thus, were not shown to users on the online catalogue. A small number of similar occurrences existed for some English terms of Latin and Greek origin. This included the different spellings of the same word (like *stela* and *stele*; *oenochoe* and *oinochoe*) and its different plural forms (*stelas* or *stelae*; *oenochoae*, *oenochoes, oinochoai* or *oinochoes*). The same applied for terms derived/transliterated from the ancient Egyptian language (like *shabti*, *shawabti* and *ushabti* used all to refer to a type of funerary statuettes placed in tombs).

A clear advantage for the artefacts classification system is that it made curators better informed about the museum collections. The classification process required, in many instances, some research beforehand to come up with the most accurate terms to describe the artefacts. Analogues for the BA museum objects, either

12 We are indebted to Stephan Quirke who sent us the English artefacts category thesaurus of the Petrie Museum of Archaeology database, which was the backbone for the BAAM English category thesaurus.

13 This thesaurus was compiled at the Centre for Computer-aided Egyptological Research (CCER) in the Netherlands by Prof. Dirk van der Plas. The ICOM International Committee for Egyptology (CIPEG) concluded this thesaurus as the standard for electronic databases in 1996. As of 2005, the Global Egyptian Museum website (*http://www.globalegyptianmuseum.org/advanced.aspx*) has been hosted by CultNat.

in printed catalogues or online databases of other museums, also helped correct inaccuracies which existed in the description of some of our artefacts.

Dropdown Menus and Free-text Fields

To end up with a well-structured and unified data entry system that would, in turn, result in an efficient advanced search system on the online catalogue, we generalized the use of dropdown menus for all the fields which would support this function. Users are now able to filter their search either by collection, category (object classification), material, archaeological provenance, dating, and, of course, by using a combination of these fields. We were also keen on providing the possibility to search by the different registration numbers an object may have in addition to its current Bibliotheca Alexandrina Antiquities Museum serial number. The reason for this is that the BAAM is only a nineteen-year-old museum (in 2021), with collections that were acquired from different and much older museums or archaeological storerooms. Before the museum was inaugurated in 2002, any artefact from the current BAAM collection, when published, bore the inventory number of its original exhibition/storage place. Here, we should point out that certain institutions had different and sometimes even complex numbering systems. This applies, for instance, to the artefacts acquired from the Egyptian Museum Cairo (EMC), where the same object could have, among other numbers, an entry journal number (JE), a number used for the *Catalogue Général* publications (CG), and a temporary register number (TR).[14] Furthermore, special publishing numbers are given to specific collections most importantly papyri, such as *P.Oxy.* numbers for *Oxyrhynchus Papyri*, *P.Fay.* for *Fayoum Papyri*, *PSI* for *Papiri greci e latini*.[15] Hence, it was important to add all available numbers preceded by their corresponding prefix. For this, a separate dropdown menu field was created for the numbers' prefixes. The prefix was first chosen from this menu, then the number was added in a free text field right beside it. This made the users search for these specific collections on the online catalogue far easier.

As for free-text entries, they were reserved for fields where no lists of choices were possible, such as the designation of the artefact (i.e. the title given to the object as it will appear on the online catalogue), notes on the discovery circumstances,

14 For more about the EMC numbering systems, see: Bothmer 1974: 111–122; Rashed/Badr-El-Din 2018: 41–63.

15 For some more examples about Papyri numbers in the Egyptian Museum, see: *The Photographic Archive of Papyri in the Cairo Museum* on *http://ipap.csad.ox.ac.uk/Intro.html*. The archive is among the earliest and successful examples for the digitization of the Cairo Museum papyri. The project was undertaken by the Centre for the Study of Ancient Documents (CSAD, Oxford University) which made the digitized collections more readily available online to the scholarly community. Although the site has now (2021) some broken links, there are no issues in browsing the catalogue of artefacts.

notes on the acquisition, detailed description of the object, etc. Some attention was given in particular to the content of the free-text field *designation*, which was created specifically for the online catalogue to ease the simple search process. We made sure this field contained data that is as informative as possible. For example, instead of just writing 'Head of a woman' as the title of an object,[16] we used 'Head of a woman wearing a *Kekryphalos* (hairnet)'. In this example, the hairnet was the most distinctive feature of the artefact. Thus, if a user is interested in the study of ancient hairnets, and he/she only types 'head' or 'head of a woman', his/her search will yield too many unwanted results. If he/she types 'hairnet' and this phrase is not included in the designation, no result will come out. In our case, by typing 'hairnet' or 'Kekryphalos' (if the user is familiar with archaeological jargon), the simple search results will be quite narrowed. A second reason for creating such informative (and sometimes long) titles for the objects is due to the fact that it was not possible to make a detailed description for each and every artefact. This would have required more labor, time, and funds to provide the needed material in the three aforementioned languages. In addition, the only available detailed description was the Arabic description in the official register book. We thought, however, that because this text was mainly prepared for internal curatorial work, it would not be quite suitable for online users. As the collections were acquired from different provenances, there was an obvious lack of consistency in the way the description was formulated. Hence, a descriptive title, written in a unified manner, was deemed as the most practical solution for the database.

Data Verification

After the development of the database by the BA ICT specialists, and the data entry by the museum curators and documentation specialists, the content was revised by two members of the documentation team. The database was then published on a temporary server, where the access was granted to all curators for a second check of both the data and the overall structure of the database.

Launching the Online Collection Catalogue

The catalogue was planned to be published online as part of a newly designed website for the museum. The catalogue included database fields that targeted both online average users and researchers. The website, that will be presented later in this paper, was launched in August 2010.

16 This is the case of artefact number BAAM 0292.

Second Revision through Comparison with the Source Data

In 2019, it was decided to add the bibliography for the published museum artefacts to the database.[17] Interestingly, the publications for some artefacts were occasionally handwritten in the old register books of the original museum where our collections were acquired. Such occurrences existed in the books of EMC and those of the Graeco-Roman Museum of Alexandria (GRM). It was a good chance, while searching for any available publication data in these two sources, to revise for the second time as well all the data for each artefact acquired from these two museums – this time directly from the source. The original official register books of both museums were handwritten mainly in French and English. The information we possessed earlier about the objects acquired from these two museums was basically a summarized translation into Arabic for the data in these original register books. During the review process, we spotted some translation inaccuracies mainly in the data translated from the original French text. The needed corrections were, consequently, made in the database. Additional information, when available, was also recorded. This included other registration numbers, information about the expeditions in charge of excavations, year/season of excavations, discovery date, identity of donors, etc. This data was sometimes omitted in the official acquisition documents dating back to the period between 2000 and 2002. The reason for the omission could have been that the information about the same artefact is sometimes scattered among different register books (in the case of the EMC, for example, the same object could have records in the *Journal d'Entrée*, the *Temporary Register* and the *Special Register*[18] at the same time).

Making Use of Digitization Projects of Peer Institutions

The good news is that the two above mentioned museums had their register books digitized. This has made our revision work much easier. The then Supreme Council of Antiquities worked in collaboration with the American Research Center in Egypt (ARCE) from 2005 to 2011 to build a new collections management database at the EMC, and to create as well the first ever registration and collections management department in Egypt (Kamrin 2015: 431). The project has created a local intranet portal, accessible only to museum staff and scholars (who can only access it locally at the EMC).[19] The great advantage about this database is that it publishes all the

17 The efforts of Rehab Ali and Mirette Magdy are so much appreciated in this area.

18 The Special Register *(SR)* is a ledger with a separate numbering system. Its main goal is the distribution of artefacts to particular curators, who have responsibility over specific collections (Rashed/Badr el-Din 2018: 43–44).

19 A fully operational internet site which will provide selected information and images was also developed, but the website was not yet launched due to some technical difficulties (Kamrin 2015: 435).

object and collections management information in the database, along with the images and the scanned facsimiles of the entire museum's handwritten register books. This allowed us to check all available information for the artefacts of the BAAM in all register books (JE, TR, SR) once we opened a single artefact record, as the corresponding digitized pages of these register books were directly attached to the database record.

The situation was different for the GRM. Unlike the EMC, the currently available database for the GRM, which is used for curatorial work, does not include a digitized copy for the museum handwritten register books. Luckily, the GRM had recorded these books on microfilms which were, in a later stage, digitized. We were fortunate enough to get access to the microfilms' digital copy. The search for specific records took, however, some time, due to the absence of a clear identification system for the ledgers' scanned pages.[20] We eventually managed to keep a copy of the scanned pages corresponding to the artefacts from the BAAM collection on our database for the use of the BAAM curators.[21]

Digitization of the BAAM Register Book and Other Acquisition Documents

In 2019, after around seventeen years of continuous use, the official register book of the BAAM showed signs of wear and tear. A digital copy was urgently needed. The physical book had to be restored to avoid any further potential damage during scanning. This process took place at the restoration lab of the Manuscript Museum.[22] Once the ledger was restored, it was passed to the BA Digitization Operations Section, where it was scanned. A high-quality version was created for archiving purposes. Another optimized digital PDF file was made for easy on-screen viewing and small-scale printing purposes. This digital copy was saved on one of the BA servers and was made accessible to all curators. In addition, all original acquisition documents were digitized. These documents contain important information about

20 The digitized microfilms are arranged in numbered folders. Each folder contains JPEG or TIFF files, each of which represents a page of the register book. The photo files are named in a four-digit sequence starting from 0001. No further information is available in the file name to indicate which handwritten records appear on which page. The only indication is a cover page photo at the beginning of the microfilm indicating the identification number of the microfilm, the register book number, and the first and the last inventory numbers in this book.

21 At the time this paper was written, a centralized database for the museums in Egypt was being developed, which sounds, according to some curators from the Ministry of Tourism and Antiquities, really promising for collection management in Egyptian museums.

22 The Manuscript Museum is one of three museums at the BA, the second is the Antiquities Museum (BAAM), and the third is the Sadat Museum. We thank Hossam el-Deeb and his team at the Preservation and Environmental Monitoring Section of the BA Manuscript Museum for their impeccable restoration work.

the museum collections acquisition, including the acquisition date, the details of transport, artefacts description, their inventories, original curators, the acquisition committee, etc. The digital version was also stored on the same server of the register book after it was properly indexed.[23] It is planned to add all these documents to the database, after the needed fields are created.

Discussion

The creation of a new museum database accessible to both the BAAM curators and the general public was an essential step to fulfill two of the museum digitization objectives, which aimed to serve efficiently curatorial work and collection management, as well as to make the museum collections (both displayed and stored) better accessible to researchers and the general public.

It is important to note that the involvement of curators in the database planning, as well as the data entry, had many advantages for the curatorial work of the BAAM. Many fields were added to meet the needs of curatorial work. The whole process was, in addition, a kind of a detailed revision and a better classification for the existing data about the museum collections. The data of some records was, accordingly, updated based on the information in the register books of the museums of origin and new information was also added based on thorough research. Curators and documentation specialists with multilingual skills, especially French speakers, were essential during the revision of the data and its comparison with the original register books from the EMC and the GRM.

The evaluation of the existing artefacts' photographic material on the database was another important task. New photographic material is, accordingly, constantly added to the database records. It includes new shots taken either for artefacts lacking photos, or to supplant old poor-quality photos, or to replace photos which are not quite representative of the objects (better angles, focus on some details, etc.). New responsibilities were, thus, assigned to the documentation team specialists. These include, in addition to regular objects photography, detailed photographic documentation for the artefacts restoration/conservation process, and special types of photography such as Reflectance Transformation Imaging (RTI)[24] for some types of artefacts. Interestingly, the new skills and expertise the BAAM professionals gained in this respect were appreciated by colleagues in other peer institutions in Egypt. As a result, photographic documentation workshops were organized by

23 As many of these documents were handwritten, no optical character recognition (OCR) was possible. Therefore, the content of each document had to be analyzed and indexed according to the new BAAM numbering system. We thank Miral Taha, chief curator at the BAAM, for her meticulous work in this area, as well as for her relentless efforts in the BAAM database design and data entry.

24 For more about RTI photography, see: http://culturalheritageimaging.org/Technologies/RTI/.

the BAAM. The attendees of these events included museum professionals and archaeological sites inspectors. So, one could say that working in digitization related projects not only led to the development of the BAAM professionals' skills, but also contributed to the capacity building of other museum and site management professionals in certain respects.

It is important to note that once the database became operational, almost all the data about the museum artefacts (including new and updated data) was, at last, stored in one place. This was quite an improvement, as all curators were granted a faster and more efficient access to the entire museum collection records. Before that, the collection data was somehow scattered among curators. Each kept the data about the collection he/she was responsible for apart in his/her own collection register book,[25] and using sometimes his/her own way to archive any relevant documents.

Finally, having such a comprehensive database was of great use in other projects later on. An example for this was the use of selected fields of the database in the Virtual Museum project, which we are currently working on.

The BAAM Website

Before the launching of its new website in 2010, the BAAM was only represented online through a link on the main website of Bibliotheca Alexandrina. The link provided only brief information to assist people in planning their visit to the museum (admission, general description of the BAAM collections, etc.). To achieve the BAAM's second and third objectives for digitization, which aim to make the museum collections more accessible and help raising awareness about the archaeological heritage of Egypt, a new website was developed.[26]

Target Audience

In line with the above digitization objectives, the website was to address at the same time a non-specialized audience and researchers. The sections to prepare for each of the two categories were defined. Special attention was given to the content and its presentation to meet the needs of both categories.

25 In addition to the BAAM *General Register Book*, each curator at the BAAM has also his/her own handwritten register book which only includes the collection in his/her custody.

26 BAAM website: *http://www.antiquities.bibalex.org*. We truly thank Hani Sawires, head of the Web Graphics and Content Design Section (BA ICT Sector), and his talented team for the design of the museum website.

Website Languages

Language can be a barrier to access. A cultural website must aim to go beyond its national and linguistic boundaries and to serve the widest possible number of people (MINERVA 2005: 46). This, indeed, goes in line with the message of Bibliotheca Alexandrina as the window of the world on Egypt.[27] For this, the BAAM's new website was designed to be made available in three languages: Arabic, English and French. It is important to note that the use of two foreign languages was not restricted to foreign users; we received, in fact, positive feedback from Egyptians who benefited as well from the English and French pages. These included students of archaeology, history, as well as students receiving training to become tour guides with foreign groups.

Adopted Quality Principles

During the planning and operation phases we implemented, as much as possible, the quality principles for cultural websites of the Ministerial Network for Valorizing Activities in Digitization (MINERVA project).[28] The ten MINERVA principles were aimed at cultural websites developed by museums, libraries, archives, and other cultural institutions. According to the MINERVA principles, a good cultural website must be (1) transparent, (2) effective, (3) maintained, (4) accessible, (5) user-centered, (6) responsive, (7) multilingual, (8) interoperable, and (10) preserved.[29]

The BAAM Collection Interpretation

The biggest section of the website was dedicated to the museum collection. The BAAM collection is divided among nine departments: (1) Ancient Egyptian Antiquities, (2) In the Afterlife, (3) Graeco-Roman Antiquities, (4) Byzantine Antiquities, (5) Islamic Antiquities, (6) Antiquities of the Bibliotheca Alexandrina site, (7) Submerged Antiquities, (8) Nelson Island collection and (9) Temporary collections.

A successful collection interpretation and presentation is intended to heighten public awareness and enhance understanding about heritage (ICOMOS 2008: 4). It should also provoke visitors' curiosity and interest in what may be an unfamiliar

27 For more about Bibliotheca Alexandrina's vision and mission, see: *https://www.bibalex.org/en/Page/About*.

28 MINERVA was a network of Member States' Ministries to discuss, correlate and harmonize activities carried out in digitization of cultural and scientific content for creating an agreed European common platform, recommendations and guidelines about digitization, metadata, long-term accessibility and preservation (see: *https://www.minervaeurope.org/whatis.htm*). A second project, MEDCULT, was based on the results achieved by the MINERVA project. The aim of MEDCULT was to improve the quality of cultural and educational websites in the Mediterranean countries (see: *https://www.medcult.org/about.html*). CultNat was the Egyptian partner in this second project.

29 For more details about the MINERVA quality principles, see: MINERVA 2005.

topic or theme (Interpret Europe n.d.). Keeping this in mind, together with the reservations we had on the content of comparable websites,[30] we decided that both collection interpretation and presentation on the new website should be assigned to the BAAM curators. The reason for this choice is that one of the main tasks of curators, at the time the website was being planned, was delivering guided tours. These included, among others, school, tourist groups and VIP official visits. Acting as museum interpreters, the BAAM curators were deemed to have the know-how needed to relate the museum collections to visitors' own knowledge, experience and background. They were, accordingly, the best candidates to work on the content directed to an ordinary non-specialized online audience.[31]

Each collection was first briefly presented. Then followed a historical preview in case of departments classified chronologically (departments 1, 3, 4 and 5), or a collection specific introduction for the collections grouped thematically (departments 2, 6, 7, 8 and 9). Highlights were selected for each of the museum departments. The artefact highlight begins with a description of the object. To this are added some themes related to the artefact presented in the form of titled short paragraphs, so that the reader could move quickly to his/her theme(s) of interest. Explanatory links were added in case of specialized jargon. To avoid moving between pages, the link text appears on the same page of the highlight inside a small balloon that the user closes after reading. A total of eighty-six highlights were prepared, which represent 6.5 percent of the total number of the BAAM collection artefacts.[32] The highlights were reviewed by specialized moderators from the academic sphere to guarantee that the presented information is accurate and up to date.

The Collection Online Catalogue[33]

The collection catalogue[34] is an integral part of the BAAM website. It includes three types of search:

- *Simple search:* The user can type keywords in a free-text field to search on the database.

30 An example is the content issue described earlier for some of the artefacts on the website of *Eternal Egypt*.

31 Beside curators, the museum guides made an important and valuable contribution to the content. Unlike curators, guides are not responsible for archaeological collections.

32 For the preparation of the content, we deeply thank Bassem Nabil, Dawlat Selim, Esraa Moussa, Miral Taha, Mirette Magdy, Mona Dabbas, Nevine Roushdy, Omayma Elzanaty, Ramy Rifaat, Rehab Ali and Rehab Elhag.

33 See: http://antiquities.bibalex.org/collection/MuseumDatabase.aspx

34 Or *Museum Database*, as it is called on the website.

- *Advanced search:* The search is performed mainly by dropdown menus, where users can filter results by collection, category, material, archaeological provenance, dating, or a combination of these fields. Searching by the BAAM inventory is possible through a free-text field. Search by other inventories is also available, with the possibility to narrow results by choosing the inventory prefix (CG, JE, P.Oxy., etc.).
- *Search by Hall:* Using an interactive plan of the museum, online visitors can click on the hall of their choice and browse the content of all showcases in the chosen hall, as well as the objects on display outside the showcases.

Once users click on the search result they are interested in, they are directed to the artefact page where they find all relevant information.

Expert Feedback

In some occurrences, we were contacted by researchers who had remarks on the content of some records of the database. Some even provided us with clarifications or more accurate data for these records. Such comments were so much appreciated and considered, and were, when verified, used to update the existing records. This indirect engagement of the academic community, although not quite regular, was an additional and useful tool for the collection records update; an advantage which would have not existed had the database not been accessible online.

Discussion

The BAAM was the first in Egypt to launch a website where online users can access the entire collection of a museum. The well-structured database and the efficient search system resulted in an easier access to the museum artefacts, which was one of the BAAM major objectives of digitization. The multilingualism of the website also helped widen the access to the online catalogue and the other pages of the website. The public included native and non-native speakers, as in the case of Egyptian students studying Egyptology who indicated that the availability of the collection highlights and the artefacts classification thesaurus in three different languages was a good asset for their studies.

The collection interpretation targeting different types of audience was also necessary to fulfill another digitization objective of the BAAM, which is to increase the awareness about Egyptian heritage. The choice of collection interpreters (in our case curators and guides) was a key factor in providing material that suits the target audience.

With the availability of such content online, terms of use for photographic material and publishing regulations needed to be issued to ensure that copyright is respected, and to keep track of any new publications about the museum collections.

The expert feedback and comments received from scholars on the information about some artefacts was an example of the contribution of the scientific community that help update the content of some artefacts' records.

Fig. 1: (Left) Mohammed Elfarargy from the BA ICT Sector scanning one of the temporary artefacts of the BAAM collection using the Artec Eva handheld scanner; (right) the final 3D model.

The BA Virtual Museum

In line with the BAAM digitization objectives, it was decided to create 3D models for a selection of the museum artefacts. The models were planned to be used by curators as they represent a high-resolution 3D archive of the objects surface topography with a high measurement accuracy. Models would also constitute an efficient and safe tool for both conservation and research with no impact on the real object. 3D data was also deemed a useful means to create educational material that could reach a wider public, offering, as well, a different visit experience.

The Virtual Museum project was, accordingly, developed in collaboration with the BA ICT Sector, to digitize and exhibit around 700 objects of the museum collections. The project aimed at recreating the real space of the museum as it exists in reality, including all showcases and artefacts. The objects were 3D scanned using Artec Eva handheld scanner **(Fig. 1)**, 3DS Max was used for modeling the museum space, and Unity 4 game engine was used to program the logic of the application (Elfarargy/Rizq 2018: 175). The basic information fields and existing photographic material for the museum artefacts records were imported from the museum main database.

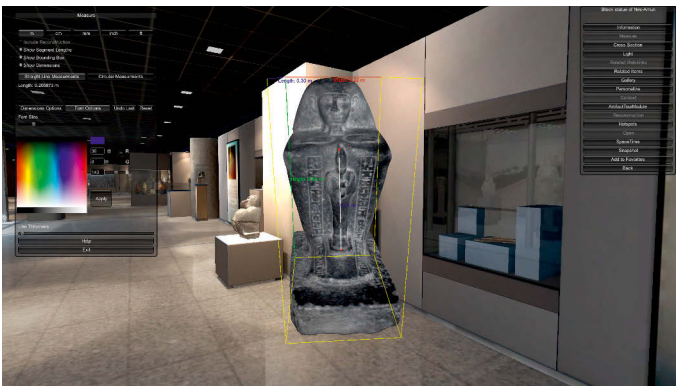
Target Audience

The application had tools that serve users of a wide spectrum of expertise ranging from casual audience to experienced researchers.

Ordinary users can virtually circulate inside the museum halls, choose a 3D model of an exhibited artefact **(Fig. 2)**, inspect it from all angles, read available information about it, and, for some selected objects, take a detailed tour that elaborates on relevant archaeological, artistic, or historical details. A reconstruction was also made available for some objects to further explain their exact use or significance. *Hotspots* were added to some models, so that, when clicked, users could understand more about the details of the artefact (e.g. the type of crown presented, the insignia a king is holding and its signification, etc.).

As for expert researchers, they can make side-by-side 3D models' comparison for the artefacts they are studying, take exact measurements with a variety of measuring tools, inspect the objects' details more thoroughly, and even change the light angle falling on the object to discern some details that might be difficult to see in conventional images.

Fig. 2: The application allows users to navigate inside the Virtual Museum model. They can inspect the 3D models of the displayed artefacts from all sides, take measurements, make cross-sections, change the angle of the light falling on the object for a better view of the chosen angles. Tours providing insights into the context of some artefacts can also be played by users



Project Team

The BA ICT software developers and 3D designers were responsible for the tedious task of artefacts scanning, models processing, as well as the development of the application and the design of the Virtual Museum model.[35] As for the museum curators and guides, they were in charge of the preparation of the tours content for a selection of artefacts. This included all explanatory text and photographic material needed for a better interpretation of the artefacts and their original context. The BAAM team also tested the application, made some comments about the preliminary design, and offered suggestions that would make the interface more user-friendly.[36]

Discussion

The BA Virtual Museum provides a new and different experience to explore the BAAM. It allows users to virtually inspect artefacts in an enhanced manner that goes beyond a conventional visit. The application has even given users the chance to see some details they previously had no access to due to display limitations **(Fig. 3)**.

The application has many advantages for the artefacts' interpretation and presentation. The interactive tours prepared for a selection of artefacts help visitors in understanding the context of these objects in more interesting ways. The clickable *hotspots* are another easy tool to display brief information about certain features for the chosen artefact. The latter option suits young people, as well as those who do not wish to spend too much time in front of the same artefact.

Fig. 3: An example where users can open a coffin and inspect it from the inside. They can also admire the beautifully decorated rear side by simply rotating the model on-screen. In a real-life situation, this would not be possible, as the coffin is lying on its back in the showcase.

35 We are truly thankful to the team of the International School of Science Unit (BA ICT Sector) headed by Mohammed Elfarargy for handling this enormous task.

36 We are indebted to Amr Tayssier, Miral Taha, Ramy Rifaat and Rehab Ali for their professionalism in accomplishing these tasks.

Three dimensional models contribute, as well, to preventive conservation by allowing a digital, non-invasive means of studying and interacting with artefacts. With their high accuracy and resolution,[37] the produced coloured models constitute an excellent study and examination tool for both researchers and conservators/restorers. Measurements can be easily and accurately taken on the application. Cross sections can be made in any of the three main axes (X, Y, Z) in both positive and negative directions and at any depth (ibid.: 177).

Furthermore, both 3D museum space and artefacts models constitute a useful tool in exhibition planning and display rearrangements. Better decisions could be taken based on on-screen virtual display/rearrangement of objects in the space intended for exhibition. This gives designers and curators a chance to better visualize what an exhibition will look like, and easily make, if needed, any necessary changes for the sake of scenography, aesthetics, or the safety of the artefacts.

On the other hand, developing virtual museums is a costly process considering that it needs a team of talented software developers, 3D designers and other software/hardware tools (ibid.: 175). Funding issues, in our case, resulted in the delay of the project launching due to the lack of some essential equipment. Now that we have the needed hardware, many new arrangements and reconsiderations must be planned with the BA ICT developers and designers to guarantee that the application goes, as much as possible, in line with the current technology standards. To this is added the availability of our ICT partners, as they are already involved in other projects.

Conclusion

The projects presented in this paper helped the BAAM professionals in developing some guidelines on how to properly plan and implement digitization-related projects. The BAAM started with a minimal role in the *Eternal Egypt* website and the *Digital Guide* projects. The assessment of the users' experience, as well as of the content provided in these two projects, was crucial for the BAAM team to set up clear objectives and deliverables for its own future digitization plans. In doing so, the BAAM successfully created a strong database for its entire artefacts collection and made it available through an online database. Another ambitious project by the

37 Based on the information available on the Artec official website, this scanner could reach 0.1 mm and 0.2 mm for point accuracy and resolution respectively (Artec 3D n.d.). Although the 3D models produced for the BAAM artefacts were highly accurate, they did not reach the maximum precision values indicated by Artec (M. Elfarargy 2021, personal communication, 4 January).

BAAM, the BA Virtual Museum, is also underway, even though it has encountered some funding issues.

The digitization of museum collections not only offers opportunities for a better collection management on institutional level, but it also has the potential to increase access to heritage on a global level. The increased access to the BAAM collection resulted, in some instances, in establishing links and exchanging knowledge with the academic community worldwide, which was reflected positively on the content of the BAAM online catalogue. The availability of the BAAM website and database content in three languages also served as an educational tool for students of Egyptology, history, as well as students receiving training to become tour guides with foreign groups.

Digital technologies are, however, nothing but tools used to achieve the objectives set by museum professionals for a certain digitization project. Interdisciplinarity in such projects is, accordingly, essential to enable museum professionals choose the most efficient digital solutions to reach the project goals. A lot of care should be taken of the content of any project deliverables, be it for a website, a virtual museum, or some other digital output. Collection interpretation needs to be assigned to qualified staff with the needed expertise, and the target audience should be clearly defined before working on the content.

Training and exchange of experiences in the field of digitization on national and, when feasible, international levels is required to keep up with the fast-moving pace of digital solutions and the opportunities they offer to museum professionals.

Copyright concerns and digital content reproduction must be addressed by museums publishing online catalogues for their collections. Rules should be set in a way that does not intimidate online users, and, at the same time, in a manner that acknowledges the museum rights and help keep track of the media where its collections are published.

Some digitization projects, such as the BA Virtual Museum, are costly in terms of development, software, and hardware. Funding delays may cause a project to stop. Although the needed funds may become available after a while, such delays, with today's rapid technological changes, could sometimes result in the obsolescence of the previously developed applications. Accordingly, realistic funding strategies should be insured at the beginning of such demanding projects. Cooperation with institutions having developed similar digital solutions, rather than starting from scratch, could be an effective means to cut costs. In addition, resorting to open-source software, or to applications which provide a set of tools that can be used by non-developers is another way to work easier, faster and on a much lower budget.

Finally, the evaluation of the digitization projects' deliverables is an essential step. It should include the analysis of both the target audience feedback, as well as

the museum professionals who deal with the developed solution for their curatorial or conservation work.

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