

International Journal of Computer Science and Mobile Computing



A Monthly Journal of Computer Science and Information Technology

ISSN 2320-088X

IMPACT FACTOR: 6.017

IJCSMC, Vol. 7, Issue. 11, November 2018, pg.46 – 51

IMPACT OF TECHNOLOGY ON TRADITIONAL MUSEUM COLLECTION STORAGE AND MANAGEMENT

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Abstract: Technology is defined as a discipline that deals with the art or science of applying scientific knowledge to practical problems. Technology, since its invention has played very important roles in the field of humanities. Traditional method of storing museum collections in time past involved following accepted customs in ensuring that the museum collections were preserved from generation to generation. But, the traditional method exposes the museum collections to much vulnerability that threatens the conservation agenda of any museum. This means that museum collection storage involves more than a physical facility. It reflects the museum's roles and programmes in exhibition, education and research. The storage and conservation of many museum collections have received inadequate attention in the past, and in most cases are still receiving inadequate attention. In fact, probably more harm has been done to museum collections through improper storage than by any other means. It is crucial for the future of all museums, as the custodians of a substantial part of mankind's natural and cultural heritage, that steps be taken to improve storage practices and facilities. The culture of a community is an original creation, which manifests itself in every dimension of life – the everyday activities and the periodic events, involving the use of ordinary objects as well as the most sophisticated productions. Some museum collections are perishable resources that are not renewable and are at constant risk of permanent loss. Museums, libraries, galleries, and archives have traditionally been regarded as the guardians and gatekeepers of a nation's culture and have taken on the role of protecting heritage. So, for the traditional method to sustain durability there is need for its extension to incorporate the curation of technology. Most of the problems confronting traditional museum collections can be traced to a number of factors, among which are: (1) Poor administration and policies (2) Lack of finance and resources (3) Lack of interest and knowledge (4) Poor handling in transit and exhibition (5) Lack of security against threats, or any combination of these factors. Among the notable contributions of technology in preserving and conserving museum collections are: (1) Easy record accessibility and retrieval (2) Protection of artefacts against theft, fire, vandalism, temperature, humidity, and other hazards (3) Tourism and generation of income. Based on the aforementioned contributions of technology in the storage of museum collections, the objective of this paper is to appraise the impact of technology in museum collection storage, and, the maintenance culture of the digital storage media.

Keywords: Technology; Museum; Collection; Storage; Traditional; Culture Heritage

I. INTRODUCTION

The traditional role of museum is to collect objects and materials of cultural, religious and historical importance, preserve them, research into them and present them to the public for the purpose of education and enjoyment. Museum collections require a great deal of care and protection in order to ensure their safety from external loss or damage, but they also require in-depth documentation to assist in tracking the life of the object within the holding

institution. To accommodate these needs, collectors adhere to collections management and collections care standards and practices, which serve to create a safe environment for collection objects with clear and precise accompanying documentation. Where collections care addresses the physical actions necessary to prevent or delay damages of cultural heritage; collection management can be defined as "a process of information gathering, communication, coordination, policy formulation, evaluation, and planning." [1] These processes influence decisions about records management and the collections management policy, which outlines protocols for the collection scope, collections care, and emergency planning and response. A museum is defined by the International Council of Museums (ICOM) as a "non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment". Heritage can be divided into two main categories. On the one hand, there is a heritage that presents itself in a material, tangible form; examples are archaeology, art, movable objects, architecture and landscape (all these primarily formed the museum collections). On the other hand, another form of heritage exists, which arouses the interest of the international community and the African people in particular: it is referred to as "Intangible Cultural Heritage". This designation was conceived so that certain realities, which remained unseen over a long period of time, and which did not fit in as part of any other established heritage category, could be recognized and taken into consideration. "Intangible heritage" designates the cultural wealth of a given society, which is complex and should be carefully preserved, for it is even more vulnerable than material heritage, as it is in danger of disappearing with its traditional custodians. Museum in its zeal to conserve both the tangible and the intangible heritage has devised different traditional methods for preserving and conserving the collections. But these methods for conserving museum collections are faced with a lot of challenges such as theft, fire, depreciation, vandalism, temperature, humidity, vibration and so on. These challenges have made it difficult for museum to achieve its purpose, hence, the need for technology intervention in form of digital storage media and technological museum for virtual conservation of heritage resources. A virtual museum is a digital entity that draws on the characteristics of a museum, in order to complement, enhance, or augment the museum through personalization, interactivity, user experience and richness of content. [2] As with a traditional museum, a virtual museum can be designed around specific objects (such as an art museum or a natural history museum), or can consist of online exhibitions created from primary or secondary resources. Moreover, a virtual museum can be referred to as the mobile or World Wide Web offerings of traditional museums (e.g., displaying digital representations of its collections or exhibits); or can be born digital content such as 3D environments, net art, virtual reality and digital art. This paper appraises the impact of technology in museum collection storage in that, for the traditional method to sustain durability there is need for its extension to incorporate the curation of technology as most of the problems confronting traditional museum collections are not beyond what technology can handle. Among the notable contributions of technology in preserving and conserving museum collections are: (1) Easy record accessibility and retrieval (2) Protection of artefacts against theft, fire, vandalism, temperature, humidity, and other hazards (3) Tourism and generation of income. However, digital storage media application in museum collection storage can only facilitate storage of, and easy access to electronic data, it does not provide long-term archival storage.

II. DIFFERENT VIEWS ON MUSEUM

In [3], museum as an institution tells the story of man the world over and how humanity has survived in its environment over the years. It houses things created by nature and by man and in our modern society it houses the cultural soul of the nation. (It holds the cultural wealth of the nation in trust for all generations and by its function and unique position, it has become the cultural conscience of the nation.) As a result of their historical beginnings in many "developing" nations, museums are seen as places where unwanted objects or materials are deposited; in addition, they are regarded as places where objects associated with idolatry and fetish religions are kept. This negative interpretation of what museums mean has continued to inhibit their development in most countries, (especially in third world countries). Museums are agents of change and development in that, they mirror events in society and become instruments of progress by calling attention to actions and events that will encourage development in the society. They have become institutions that foster peace, promote the ideals of democracy and transparency in governance in their communities, and they are part of the bigger communities that they serve by

reaching out to every group in the society. As institutions possessing critical resources in society, they can encourage, promote and foster the best of the cultural and democratic ideals of the nations. Without being political, they can give voice to the citizenry in matters pertaining to how they are governed by creating avenues for free discussions and dialogue; they can create a confluence where the events of today can be exhibited and discussed for the collective good of all. Through their programmes and activities, the museums can sensitize target groups like teachers, adults, the youth, and women's organizations through popular forum discussions on the goals of the nation for the promotion and better understanding of its heritage and its agenda for national growth, development and general emancipation. [3] Education is critical for development; therefore, education that is devoid of the cultures of the people in the society is empty and incomplete. One of the fundamental objectives of the museum is to educate, and it is only the museum that has the capacity and the ability to impart cultural education effectively as it houses the tools and materials for doing so in its collections. In modern society, the museums enrich the educational process by exposing children and indeed the public to their history in a positive way; they assist our future generations to understand and appreciate their history and culture and take pride in the achievements of their fore-bearers. Museums possess materials and information that can and should be used in enriching and improving the school curriculum in various disciplines. According to [3], what is important is for the educational planners to work closely with museum experts on how the educational resources that are available in the museum can be integrated into the curriculum and the learning process at all levels. On its part, the museums should develop educational programmes for the various tiers of the school system, namely, primary schools, secondary schools, teacher training colleges, technical colleges and universities, among others. A properly articulated museum education programme will become an essential component in the overall educational system of society. Educational visits to the museums should be developed and encouraged to cater for all interest groups. [3] Postulates that museums, do promote unity in the society by using their resources to ensure understanding and appreciation for the various groups and cultures that exist in that society because peace is essential for happiness and joy in the family, in the community, in the society, in the nation and in the world. In [4], depending on the reasons that warrant museums establishment, the primary purpose of any museums is to collect, preserve, interpret, and display items of artistic, cultural, or scientific significance for the education of the public. From a visitor or community perspective, the purpose can also depend on one's point of view. To the government of a nation, the purpose may be to generate income through tourism and the likes. And to individual, museum can be an entertaining and enlightening place to visit on holidays. To community leaders, a healthy museum community can be seen as a gauge of the economic health of a community, and a way to increase the sophistication of its inhabitants. To a museum professional, a museum might be seen as a way to educate the public about the museum's mission, such as civil rights or environmentalism. Museums are, above all, storehouses of knowledge. In 1829, James Smithson's bequest, that would fund the Smithsonian Institution, stated he wanted to establish an institution "for the increase and diffusion of knowledge." [4] Museums of natural history in the late 19th century exemplified the Victorian desire for consumption and for order. Gathering all examples of each classification of a field of knowledge for research and for display was the purpose. As American colleges grew in the 19th century, they developed their own natural history collections for the use of their students. By the last quarter of the 19th century, the scientific research in the universities was shifting toward biological research on a cellular level, and cutting edge research moved from museums to university laboratories. [5] While many large museums, such as the Smithsonian Institution, are still respected as research centers, research is no longer a main purpose of most museums. While there is an ongoing debate about the purposes of interpretation of a museum's collections, there has been a consistent mission to protect and preserve artefacts for future generations. Much care, expertise, and expense is invested in preservation efforts to retard decomposition in aging documents, artefacts, artworks, and buildings. All museums display objects that are important to a culture. As historian Steven Conn writes, "To see the thing itself, with one's own eyes and in a public place, surrounded by other people having some version of the same experience can be enchanting." [6] Museum purposes vary from institution to institution. Some favor education over conservation, or vice versa. For example, in the 1970s, the Canada Science and Technology Museum favored education over preservation of their objects. They displayed objects as well as their functions. One exhibit featured a historic printing press that a staff member used for visitors to create museum memorabilia. [7] Some seek to reach a wide audience, such as a national or state museum, while some museums have specific audiences, like the LDS Church History Museum or local history organizations. Generally speaking, museums collect objects of significance that comply with their mission statement for conservation and display. Although most museums do not allow physical contact with the associated artefacts, there are some that are interactive and encourage a more hands-on approach. In 2009, Hampton Court Palace, palace of Henry VIII, opened the council room to the general public to create an interactive environment for visitors. Rather than allowing visitors to handle 500-year-old objects, the museum created replicas, as well as replica costumes. The daily activities, historic clothing, and even temperature changes immerse the visitor in a slice of what Tudor life may have been. [8]

III. DIGITAL TECHNOLOGIES AND HERITAGE

In [9], digital technologies refer to applications, platforms and tools used to create, store, manipulate, retrieve, and transmit information coded in the binary computing system, as combinations of 0 and 1 digits. Digital technologies have radically transformed the way contemporary societies deal with information and communication and feature widely in the methods utilized by contemporary society to produce and enjoy communication flows. Consequently, they are to be found not only in the fields of computing or the computer industry, but in all walks of life—employment, Culture, services, public administration, and leisure time. Digital heritage on the other hand refers to digital content and materials that represent, reflect or describe human knowledge and cultural manifestations, that are invested with cultural value, and considered a legacy that ought to be transmitted to future generations. Digital heritage content can be produced by converting materials originally in analogue format, or can be “born digital”—objects such as documents, artworks, software or websites that originate in digital format. With the advent of digital technology and the extended practice of digitization of collections, many cultural and heritage institutions create and maintain digital repositories. Digital repositories, also termed “digital libraries”, are collections of digital objects spanning different media formats (text, audio, and video, among others) and accompanied by registries, protocols or standards for classifying, storing, preserving, consulting and retrieving data. Most digital repositories are provided with a search interface which allows information retrieval. When offered for public usage, the content of these libraries can be accessed remotely via computer networks. Online catalogues are another way of offering access to information. These are online list-like arrays of items arranged according to predetermined classification standards and provided with descriptive details. To be effective, online catalogues should be designed in accordance with usability principles (clear structures and terminology, appropriate contextual information) to allow users to effectively search for and retrieve the records without any assistance. Digitization refers to the process of converting analogue to digital data, with the purpose of enabling data processing, storage, and transmission through digital circuits, equipment, and networks. Digitization is enabled by different electronic devices such as scanners, cameras, and 3D technology. Cultural heritage digitization is part of today’s agenda for many cultural and memory institutions and has two main purposes: (1) Providing a wider range of audiences’ access to (digital) heritage and (2) assuring long term preservation for the (digital) objects which are created, so that those objects can be located, rendered, used and understood both in the present and in the future. However, no process can guarantee to be eternally effective as one must consider the implications of fast-changing technology and the possible obsolescence of the electronic devices or the digitalization tools available in the present. Metadata refers to “data about data”, where the root Meta derived from Greek— means “alongside”, “with”, or “next”. Metadata records display a set of attributes used to describe context-specific resources such as the books in a library, or the items in an archive, according to metadata standards, which are context or discipline-specific. Traditionally, the main use of metadata has been in libraries and archives. Nowadays, metadata are used not only for classifying items in digital libraries and archives, but also to describe the main attributes of web pages and improve usability. The main purpose of using metadata is to enhance information discovery. Achieving this goal becomes a complex task with the proliferation of digital collections and archives, especially when the aim is to improve information retrieval across multiple collections. Metadata harvesting enables information retrieval across multiple collections. It is an automated process by which metadata descriptions from various sources (for instance digital archives and libraries) are combined to design aggregated services. An important aspect for facilitating metadata harvesting is the development of protocols that can enable retrieval and aggregation of data over multiple archives of different kinds. Major digital reconstructions of sites, cities now range from 1- 10 terabytes (TB). Software continues to change so rapidly that there are serious problems of continued access to digital versions because it is difficult to keep these materials in an up-to-date form. Many born-digital objects, especially in the form of new multi-medial and multi-modal art pose special problems of conservation and preservation. While the new media bring many potential advantages, they also bring dangers. Some of these dangers are obvious and as might be expected these are being addressed on many fronts: e.g. the challenges of permanent storage using new media; challenges of authenticity and veracity. More subtle are those dangers which are not yet clearly recognized. Among which are: (1) Over zealous commercialism (2) An anti-technology stance of some intellectuals (3) A trend against universal narratives (4) A tendency to perceive the past only in terms of the present (5) A tendency to destroy systematically the evidence and collective memory of the past. The enormous potentials of ICT have inspired many innovations and are leading to emerging fields such as humanities computing, new developments in textual and hypertextual analysis and many new methodological discussions concerning sources, authenticity, veracity and reliability, a range of questions which were previously sparked by the introduction of manuscript and later print culture. At the same time, a number of intellectuals are intuitively against all technology as if this posed a threat to their humanist aims. [10] Instead of seeing the new technologies as extensions of man, as did McLuhan, [11] they perceive technologies simply as a threat to independent thought and insight. Instead of seeing technology as a tool to help in their critical analysis,

reflection and synthesis, they see technology as something simply to be opposed. In the past, it was the scholarly world, which helped to articulate and uphold a set of values that rose above the greed and short-sightedness of the everyday to open larger vistas of comprehension and understanding. Ironically, in a world where it is ever more difficult to attain viewpoints that reflect sufficiently developments at a global level, a significant number of scholars are rejecting the very tools that could help them to achieve such comprehensive viewpoints.

IV. DIGITAL STORAGE MEDIA AND MAINTENANCE

Application of digital storage media in museum collection storage has so many advantages and disadvantages. [12] The advantages are: (1) Space saving and portability—volumes of converted tangible artefacts (data) can be stored on a single piece of media (2) Data can be located, accessed, and modified quickly (3) Easy record accessibility and retrieval (4) Protection of artefacts against theft, fire, vandalism, temperature, humidity, and other hazards. The disadvantages are: (1) Hardware and software obsolescence can render data irretrievable (2) Media can fail suddenly or unpredictably; even when kept in ideal conditions, all types of media can and do fail without warning (3) Media can be corrupted by virus. To help improve data longevity, the following actions are necessary: (1) Media should be stored in a cool, dry and dark location (2) Unnecessary moving or handling should be avoided (3) Storage media should be checked and activated (load) regularly (4) Routine backups of all data regardless of the type of digital storage media used should be performed (5) Data should be backup regularly to multiple locations (6) Updated backups of varying media should be kept in several off-site locations to reduce the risk of data loss due to accidents or disasters (7) Backups should be made using varied media (such as different disks purchased from different sources) in case of unforeseeable manufacturing weaknesses or defects. Because digital storage technology evolves quickly, a strategy should be developed and implemented to systematically transfer digital data to the most appropriate storage media. Failure to do so can render data difficult or impossible to retrieve because of hardware or software obsolescence. Hard copies should be produced on archival paper or microforms of important data wherever possible. This prevents data loss due to obsolescence or unexpected media failure. Archival paper can endure centuries, while the lifespan of digital formats is limited to years, or decades at best. There are different types of digital storage media that can be used for museum collection storage, they are: (1) Flash Memory Media—data is stored in memory chips that are modified electronically. A lack of moving parts or sensitive external surfaces make this type less vulnerable to physical damage, but not impervious. Sudden failures can and do occur, particularly when media is subjected to physical or environmental stress. Common forms of flash memory media data are: (i) USB flash drives—also known as “thumb drives,” they are extremely portable and compatible with virtually all PCs (connected via USB port) (ii) Memory cards—used most often in digital cameras or other devices for convenient, temporary storage of data intended for later transfer to a PC or other device (iii) External solid-state disk (SSD) drives—offers the large storage capacity of a magnetic hard disk drives but are more durable due to lack of moving parts that can fail or be damaged (2) Writable Optical Media—data is written to writable optical media by a laser which alters light-sensitive dyes within the disk. Once data is written to a disk, it usually cannot be modified. Re-writable (erasable) disks are available, but their more complex composition may render them less reliable than non-erasable disks. Because of the materials used in their construction, writable optical disks are particularly sensitive to environmental conditions. The dye layer where data is recorded or the metallic layer that reflects laser light can be easily damaged by exposure to light, high humidity or heat. Even disks stored in optimal (cool, dry, dark) conditions can fail in as little as two years. Laboratory testing has shown that disks manufactured using a certain type of dye (Phthalocyanine) and a reflective layer containing gold (or a gold alloy) are more resistant to premature failure. [12] Because the surfaces of writable optical media are sensitive to mishandling, therefore, the following precautionary measures are necessary: (1) The writable (bottom) side of the disk or the label (top) side of the disks should not be touched unnecessarily (2) The disk should always be handled by grasping the outside or inside edges (3) Only pens or markers with solvent-free, permanent ink should be used to label the disk. Common forms of writable optical media are: (i) Writable CDs (CD-R) —largely eclipsed by the use of writable DVDs (ii) Writable DVDs (DVD-R, DVD+R) —offer much larger storage capacity than writable CDs at virtually no extra cost (iii) Writable Blu-ray disks (BD-R) —use a more precise type of laser (blue in color) to store much greater amounts of data on a disk. The disk surface is also more resistant to scratching than that of most CD or DVD media (3) Magnetic Media—data is stored by altering the magnetic polarity on disks or tape. To record the data, the disk or tape must be rotated or otherwise moved. Because this type of media requires moving parts, it is prone to mechanical failure and damage due to mishandling. However, it offers the greatest storage capacity relative to cost. Common forms of magnetic media are: (i) External hard disk drives—similar to disk drives used for storage inside of most PCs, but mounted inside a portable metal or plastic case. Connect to a PC through a cable (usually USB) (ii) Tape cartridges—these cartridges contain spooled magnetic tape. Used almost exclusively by IT professionals for critical backups of computer systems. [12]

V. CONCLUSION

The impact of technology on traditional museum collection storage was the primary task looked into in this paper; museum as a repository of artefacts needs to be well planned for and managed to sustain the preservation and conservation of the heritage in its care for the overall achievement of the museum agenda. The traditional role of museum is to collect objects and materials of cultural, religious and historical importance, preserve them, research into them and present them to the public for the purpose of education and enjoyment. But this comes with challenges. These challenges through the different views on museum were taken into consideration for the application of digital storage media in museum collection storage, and this led to the aspect of technology that was presented in this paper. However, digital storage media application in museum collection storage can only facilitate storage of, and easy access to electronic data, it does not provide long-term archival storage. Therefore, technological museum for the virtual preservation and conservation of museum collections was introduced but not explicitly. Research work on technological museum development and implementation as alternative to long-term archival storage of museum collections for the overall realization of the goals and objectives of museum is recommended.

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