



SUDANESE MEMORY INSTITUTIONS AND DIGITAL TECHNOLOGIES

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Abstract: Advances in information and communication technologies led to the emerging of modern digital systems which facilitate sharing of information and innovations. These systems are thus supportive to the Sudanese cultural “collective” memory institutions as a collective memory bank of the nation achievements and indigenous knowledge. This article aims to investigate these digital systems in these institutions as transfer of information and communication technology from perspectives of the users. It has reviewed and assessed infrastructures, resources, systems and ICT readiness, which will contribute in these institutions to adopt digital memory of Sudan. The outputs guide to carry out reforms and rehabilitation to build capacities and revitalize infrastructure of digital environment which affect reliance and shared resources in memory institutions. It is concluded that these repositories which will be represented in Sudan national digital content. Finally, the article proposes to revitalize of the country’s cultural policies in line with the principles of cultural diversity and development of a comprehensive strategy for long-lived digital explicit and tacit knowledge.

Keywords: digital technologies, memory institutions, sudan, nation’s memory, ICT transfer, sudanese digital content

INTRODUCTION

Memory, in psychology, refers to the storing of learned information, and the ability of recalling which has been stored. It has been hypothesized that three processes occur in remembering: perception, registering of a stimulus; temporary maintenance of the perception, or short-term memory; and lasting storage of the perception, or long-term memory. Two major recognized types of long-term memory are procedural memory, involving the recall of learned skills, and

declarative memory, the remembrance of specific stimuli. For long-term memory to occur there must be a period of information consolidation (http://en.wikipedia.org/wiki/Long-term_memory). The ancient Greeks and Egyptians had called the term information consolidation outside human memory as Extra Somatic Memory (Taylor, 1986).

Maurice Halbwachs (1992) has launched the term collective memory in 1925 in his proposed provocative theory about the

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relationship between shared memories and personal memories. This term is invested heavily in modern society by many scholars to include memory sites, such as monuments, museums, archives, documentary works, historic and heritage places because these have replaced "real environments of memory" the living memory that was once nourished spontaneously in pre-modern societies. The wave of computerization, which has broken our societies over the last half-century and today, reached a kind of maturity in the age of memory. This wave of the transformations, have affected all areas of information, creativity and knowledge in fact on the entirety of our culture. The computer has challenged this notion of memory as archives ordered and preserved accumulations of the past (Wingard, 1975). It holds all manner of information, not just "memories" of past events, in hard disks, on data tapes, on compact discs and floppy disks. These data can be stored, copied, downloaded, transmitted, and shared - shaped and reshaped into an ever-changing whole (Thompson, 1982). Therefore, the terms "computer memory" and "memory institutions" may be regarded as metaphors. The use of metaphor with archives or documentary institutions which play vital importance in preserving cultural identities, in linking past and present and in shaping the future (Abid, 1998).

This article aim to facilitate the contribution of memory institutions in the digital era using mixed approach (Creswell, 2003) which is combination of documentary analysis surveys distributed to memory institutions either directly or emailed. This combination of data collection methods was used to gather and analyze data on the nature and types of collections as well as ones to be digitized in institutional memory. The universe expanse of this research of high

potential memory institutions were grouped into: research centres and units; cultural and folkloric centres; academic institutions; documentation and information centres; herbaria and botanical gardens, museums, archives; libraries; broadcasting and television; mass media centres; and parks and reserved areas which constitute main criteria of repositories that contribute effectively in building 'Memory of the Sudan' and will have real existence in the Nation memory. The efforts in memory institutional systems have currently directed toward the development and implementation of new technological tools in memory institutions which is important because it can help them to become of more relevance and adaptable. The drafted current digital initiatives or projects in Sudan have a strong relationship with UNESCO's Memory of the World Program (http://www.unesco.org/webworld/mdm/en/index_mdm.html) and Global Memory Net (<http://www.globalmemory.net>) was examined

DIGITAL TECHNOLOGY

Continuing innovations in data processing and the generally low cost of microcomputers encouraged documentary institutions to begin automation or computerization projects designed to automate and control their records. Today, digital technologies also permit objects to be documented effectively and rendered researchable in a multitude of ways. Original material can be protected from wear and tear by the use of digital copies, and administrative processes can be organized more effectively as well as increase the accessibility of databases and image materials accessible via the Internet i.e. making increased use of these new opportunities for presenting and providing information in the future.

Digital technologies offer a new preservation paradigm. They offer the opportunity of preserving the original by providing access to the digital surrogate of separating the informational content from the degradation of the physical medium. In addition, digital technologies liberate preservation management from the constraints of poor storage environments typical of the tropical and sub-tropical climates in which many developing countries are located (<http://archive.ifla.org/VII/s19/pubs/digit-guide.pdf>). Digitization is becoming the process of converting any physical or analogue item into an electronic representation (Baker, 2002). This guide to represent a collection digitally in forms of recorded images, sound files, text documents, and other data of historical, scientific, or cultural interest that are accessed through electronic media virtual reality. It leads to “digital preservation” and often arises when selecting special collections of unique and treasured items in documentary institutions for digitization. This indicates that the virtual memory institutions do not house actual objects and therefore lack the permanence and unique qualities of a documentary institutional definition of the term (Schweibenz, 1998). Attention has been drawn to the ever-growing digital heritage in the world and the need for an international campaign to safeguard endangered memory at different levels. Nicholas Negroponte (1995) commented that being digital allows for expanded learning possibilities for future generations. Coupled with the advent of high-speed digital networks, this conversion has permitted the memory institution to provide more information to a wider public. Just as computer use became prevalent in the 2000s, the use of digital technologies recently has increased in the memory institutions in different fields as they begin to develop their own digital collections.

SUDANESE NATION

The Sudanese Nation is built of multi-ethnic communities of Arabs, Bantu, Nubians, Nilote, Nilo-Hamitic and migrant groups in addition to refugees from neighbouring nations (<http://www.arabmediawatch.com/amw/CountryBackgrounds/Sudan>). The largest cultural group is African, making up fifty two per cent of the population, with those of Arab culture making up thirty nine per cent of the population. Sudan is located in the northeastern part of Africa with an area of about 2.5 km and homes about forty million people and seventy five percent of which inhabit rural areas (<http://www.cbs.gov.sd>), speaking over a hundred and thirty indigenous languages and dialects (Braukamper, 1991) and official languages Arabic and English. The Sudanese nation has distinctive culture, which passed several transformations, some individual; some compelling; but local culture is the estuary of the total. Cushitic “Kushitic” and Nubian cultures as well as neighboring Arab and African ones either incoming exclusive or welcomed and both constitute distinct culture. The traditional practices continue to have a strong hold on Sudanese societies, in additions of original or local constitutions and conventions, significant documents, charters and ephemera. The traditional practices continue to have a strong hold on Sudanese societies, in additions of original or local constitutions and conventions, significant documents, charters and ephemera. The collection includes Sudanese flag designs, and the original design entries for national cities, presidential palace and parliament building. Therefore, they play vital importance in preserving cultural identities, in linking past and present and in shaping the future. These identities are affiliated to tangible, intangible and natural heritages, which constitute an integral component

of the memory of the Sudanese nation. It is recognized as Nation's Knowledge Capital despite the economic benefits from globalization.

MEMORY INSTITUTIONS

Memory Institutions (MI) are resources which came at a very early stage to include organizations specialized in the conservation and arrangement of documents and objects as to facilitate access to knowledge they contained. Even in the ancient time, there existed remarkably organized libraries and archives, where the only people able to use were ruling class and educated. With progress in education and social organization, memory institutions grew and attracted broader public. They are considered as the main pillars of the nation's documentary heritage "nation's memory", and are concerned with the management, preservation and exploitation of rich collections of old, rare and valuable materials ('treasures') as well as the provision of access of the society to the information and knowledge (Welsby et al, 2004). The success of any nation lies, not just on its resources (money, buildings, people, tools and technologies), but on how it deploys these resources and builds them into capabilities to deliver well and serve (Knight, 2003).

Traditionally, memory institutions have adopted continuous improvement initiatives and some challenges. However, even though these initiatives have been successful in the past, the internet operating environments of many research and academic institutions are showing signs of organizational stress that requires more radical/radical solution. The major symptoms of the organizational stress in these institutions (Ghobrial, 2007):

- Decline in resources
- A decreasing ability to meet client needs and expectations in old ways.
- Addition of new ways of doing things without dispensing with old ways
- Inability to shift resources quickly
- Chronic under-investment in new technologies
- Inability to re-examine the need for existing practices and/or need to change
- A tendency to shift the blame to others
- Organizational structures and cultures which are unreceptive to innovation and unable to accommodate change easily
- Management information that address the "many?" question, but not "the cost?" and how long did it take? Questions.

Sudanese Memory Institutions (SMI) are resources developed by societies which came at a very early stage to include organizations specialized in the conservation and arrangement of documents and objects as to facilitate access to knowledge they contained. Even in the ancient time, there existed remarkably organized libraries and archives, used by the ruling class and educated. In the past, SMI collections were not well recognized or very small, scattered or kept in private collections. They contained valuable and rare collections of books, manuscripts and objects owned by religious leaders, tribal chiefs or province commanders. These collections were consulted for different social, economic, political, religious matters and customs practices (Ghobrial, 1992). They reflected the peculiar aspects of the culture and heritage of Sudan. Therefore, SMI have been established, upgraded and subjected to sequential re-structuring to ensure the long-term accessibility of recorded information. That is what they do now,

and that is what they will do in the future. This means they should acquire, catalog or process, organize, offer for use and preserve publicly available material irrespective of the form in which it is packaged in such a way that, when it is needed, it can be located and used. This is the unique function of the documentary institution, and no other institution carries out this long-term systematic work. The modern era has seen increase in the number and variety of users, a rapid expansion of supply and demand as regards information and new techniques for dealing with increase and refinement. SMIs play a very important role, one that will far surpass the simple conservation of patrimony and become mediators in the Sudanese Information/Knowledge Society. They contain variety of information, which covers different sectors of national resources, which are agriculture, education, economy, industry, finance, natural resources, social welfare and research and development depending on mission of the parent institution of information unit. The collections are generally well organized traditionally. These institutions provide a measure of the relative numbers, size and capacity of the information infrastructures in the country and indicate the intensity of the economic activities devoted to information. However, there is no proper statistics with their numbers, staff and physical resources to quantify them. In addition, almost all of their buildings are very small areas or rooms or corners or stores which are not based on any standards, or not fit for many users at the same time and not well furnished or equipped. Furthermore, with the expansion in books, collections of paper and other resources become bulky and create storage problem. Their patrons or clients who are customers are more and more demanding. They expect them to have long opening hours so that they can consume their information services where,

realistically; they open certain hours of a day or specific days/week. Beside a single paper document/object, only one person can use especially Sudanese collection at a time. Each extra copy of the same document requires the double space for storage. Traditionally, SMI have adopted continuous improvement initiatives to deal with some of these challenges. However, even these initiatives have been successful in the past; and the internet operating environments of many research and academic institutions are showing signs of organizational stress that requires more radical solution.

The range of SMI is complicated by diversity of titles and by variety of activities. Authors attempted to distinguish and classify them according to a number of criteria. The most important criterion is kind of information activity on which they tend to concentrate on three which currently coexists:

- a) conservation;
- b) content description, dissemination and signaling the information;
- c) answering the queries by exploitation of available resources including evaluation and transformation.

As the increasing in number of units and offer of many services is depending on each other, this study concentrates on memory institution based on primary resources which are classified according to the available criteria of repositories in the country as follows:

Academic Institutions

Learning organizations are instilling basic values and actively continuous self-development. Their aim is to recognize and perform necessary change processes.

This is institutionalized learning and adaptation culture assumes a “learning culture” which fosters innovations and creativity are embedded in organizational memory (Argyris, 1991). Fritz Machlup (1962) puts “the work performance by schools, other basic educational institutions, and vocational centres as essentially for the reproduction of knowledge, its production in new minds - that is to say, its transmission from “knowledge-haves” to “knowledge-have-nots”. A literate, well-educated, and skilled population is essential for the efficient creation, acquisition, dissemination and utilization of relevant knowledge. In the new knowledge environment, new entrepreneurial opportunities and jobs being created tend to require a higher level of basic skills than before. Therefore, educational community should work together to ensure coherence between knowledge acquired at school and knowledge required for gainful employment and innovation.

The Sudanese Higher Education revolution in 1990s has guided to establish universities and colleges in most states of the Sudan and consist presently of 35 governmental institutions (25 universities + 11 colleges) 47 private and foreign institutions (5 universities + 42 colleges) [extracted from Directory of Students’ Enrolment of Governmental and Private Higher Education Institutions for the year 2007/2008, Sudan Ministry of Higher Education]. These institutions are supervised and coordinated by The National Council of Higher Education. Its main activities and tasks are run by the nine specialized consultative scientific committees, which promote and develop the skills in higher education. The council is assisted by organizational permanent committees, whose tasks are enrollment, planning, financing, and training. The basic mission and strategy of the higher education is to

familiarize the students with methods of coping with the rapidly growing and changing amount of knowledge and communicating certain amounts of factual knowledge. The ministry facilitates firm basic development of the knowledge culture to ensure that the human resources understand the knowledge transfer and sharing as essential instrument for keeping the knowledge culture alive. It also supports the lifelong learning through the departments of community development and update information to improve and invest local or technical innovations. This kind of learning system is process by which tacit knowledge is transferred into explicit and become available for sharing.

The higher education institutions aim to ascertain national identity, the adaptation of modern technology for the service of the Sudanese society, taking into account the diverse issues of human development, training in different specialties, and conducting scientific research, particularly that which is related to the needs of the society. The introduction and application of information and communication technology, specifically the computer, has become one of the most important means to the higher education and scientific studies during the last decade. This is due to the natural outcome of the huge technological development, the whole world is currently witnessing, represented by the revolution in the field of information and communication. Thus, computer programs have been introduced in the most of curricula, the proper way for the acquisition and adaptation of technology as well as tools in the preparation and provision of qualified and competent cadres and skills in the country. Academics have become the most important bases of knowledge creation, which is obviously in the world of academic research and knowledge dissemination through regular classes as the

whole complex of attitude formation, value transfer in the sense of building scientific services and capacities. (El Tom, 2006)

Research Centres and Units

Scientific research in the Sudan dates back to the beginning of the year 1902. Since then great efforts have been made to improve research and development, a great revolution in scientific research that is closely related to development and improvement of the production with a bulk of researches conducted in the colleges of universities and research institutions. This focuses on the applied research to solve problems facing the production and to provide realistic technology to improve and sustain productivity. In the 1970s, the National Council for Research was established to formulate the comprehensive policy for scientific research and suggested the required plans, organization, and methods necessary for the implementation of general research policy in such a way so as to ensure efficient and effective utilization of the human and material resources available at centres and units of scientific research in the country. Followed by restructuring, the National Council for Research was renamed as the National Centre for Research of Ministry of Higher Education and Scientific Research. It was the only multi-disciplinary research institute with specialization not available in universities and other research centers which were renewable energy; environment and natural resources; technology, economic and social studies; genetic engineering; remote sensing and medicinal and aromatic plants, documentation, information, traditional medicine (<http://www.ncr.sd>). It was becoming clear after the endorsement of the chapter of science and technology in the Tenth Comprehensive Strategic Plan (1992-2002) (Centre for Strategic Studies, 1998) which clarified some of the pitfalls

mainly the fragmentation of the scientific research. Therefore, many suggestions and reforms were endeavored to enable the country to modern means of technology and their application in production/service sectors as well as educational and guidance curricula as the development of scientific research methods. In 2002, this guided the Sudan government to establish a Ministry of Science and Technology (2003) "MOST" (<http://www.most.gov.sd/>) which was mandated to enhance the capacity and building of the national science and technology research and base powerful incentives for researchers to network themselves both professionally and technically with their peers in other research organizations and universities. It drafted the final shape of the science and technology strategy, which aims to:

- harmonize and coordinate between science policy and the holistic and sectoral policies of the country
- tackle national scientific and technological research programs
- invest research in the basic science as means of accumulating knowledge and ground of innovations
- upgrade the research institutions to institutions of excellence and futuristic studies
- encourage research institutions to generate scientific knowledge and development of indigenous knowledge
- exploit ICT means and encourage information industry

The scientific research and innovation drive today's economies and serve as twin pillars of progress for advances in knowledge for all humankind. The scientific knowledge often has international applicability. The information and communication technologies have the capacity to in-

crease accessibility to scientific knowledge worldwide (Ghobrial, 2003). The Sudanese research community has formulated a number of research programs based on national, regional and international initiatives uphold and organize the distribution of the information in order to reduce these inequalities and to achieve the sustainable millennium development goals, science, technology and innovation. The Sudan supported this objective to ensure that information was protected from all forms of discrimination and corrupting influences. In this context, it would be important to eliminate monopolies in software and hardware and to respect cultural and linguistic diversity. The important thing is to achieve a balance between change and traditionalism; indeed, change itself becomes an essential factor in the process of building the nation, and defining Sudan national identity. The goal of all the initiatives is a continually evolving and directly useful setting of best practices and guiding principles for doing research and reference work. The process is collective - building "Collective Scientific Memory" on the shared knowledge that everyone learns in doing their work - and that is why work culture is so important. However, it also involves management leadership: identifying the driving or core principles, clarifying what is valuable in evolving the best practices and boiling them down into the actionable standards and expectations. The constant informal interaction focused all about knowledge sharing about building corporate memory and collective expertise is an essential underpinning of research work. This team-based environment also involves considerable delegation of defined leadership or coordinating responsibilities. Such collaborative work and team culture is common in the knowledge industry and is designed to encourage individual initiative and autonomy for front-line

service providers and support flexible planning and continual innovation.

National Records Office "NRO" (<http://nrosudan.gov.sd>)

As keeper of Sudan's national archive, it is a resource of unparalleled importance to the Sudanese historical heritage and immense value of its future for development. Sudan Records Office was set up to receive, preserve and make available to the authorized user. NRO is governed by special laws and administrative regulations. The collection can only be communicated to public under certain lapse of time under certain conditions. The staff of NRO makes extensive use of microfilms for obvious reason of space and security. They often have to deal with filing and maintenance of records being used in government departments. Recently, finds a great appreciation of government, restarts its restructuring based on international standards and norms, and collaborates with local government offices in different Sudan States. NRO building has been constructed based on the international standards. In 2006, it has established link with University of Khartoum Computer Network and Ministry of Council of Ministers, all the hardware and connections for the digital archives. The priority for establishing the national digital archive is given to capacity building by training for librarians, archivists and memory institutions employees of the governmental departments. Under the supervision of Khartoum University, the software Open Source Software has been adopted and designed MYSQL database based on NRO collections in bibliographic form due to shortages of professional scanners and digitizers, limited capacities of the servers and lack of universal digital specialized system or copyright or security system. The University of Khartoum has advised in availing web server and wireless networks

with very high specifications and reliable connection to the Internet. (Source: Visit to National Records Office on 22/08/2007)

The Sudan National Library “SNL” (<http://www.natlib.gov.sd>)

“SNL” is fully fledged as national library and placed currently through amalgamation of Ministry of Culture fulfilling national library functions. SNL is neither national library services nor archival institution. However, it has formulated its role as custodian of Sudan published information heritage. Now, SNL is in the planning stage supervised by a board of trustees. SNL is key memory resource in promoting heritage and information awareness, preserving and supporting knowledge infrastructure in the development of Sudanese community. As the SNL focuses on collecting both published and unpublished materials based on partnership will help support the library by promoting the legal deposit and heritage functions of the national library, and introducing potential donors of private collections to the library. SNL focuses on collecting both published and unpublished materials, Sudanese information/knowledge partners will help support the library by promoting the legal deposit and heritage functions of the national library, and introducing potential donors of private collections to the library. Sudan National Library accommodates both ISBN and ISSN since 2004 (Source: Visit to National Library on 03/03/2008)

Academic/University libraries

They are over eighty and belong to Ministry of Higher Education and Scientific Research, which had established a number of universities in the different states. They are mere storehouse of books attached to a reading room as well as a dynamic instrument of

education. They act as intellectual and cultural houses for students, teaching staffs and university campuses outsiders. They are the local repositories and the principal gateways to current information and the scholarly records for the current and future students and faculty of the university, while also serving other Sudanese community sectors. Some of them have started to acquire electronic resources and introduce technology as single efforts but the Ministry of Higher Education and Scientific Research is planning virtual library to provide academic staff and students the necessary information for teaching, learning and scientific research in digital form in the futurity. The draft Sudanese Universities Virtual Library “SUVL” is part of a project of Sudanese Universities Information Network “SUN”, which aims to support educational activities, research and promotion methods to gain knowledge and the development of management systems and modernization of the university by providing books, journals and electronic teaching materials, research and management information (direct and indirect) by using tools based on digital technologies (<http://www.suvl.edu.sd>).

Government libraries, specialized libraries and Documentation and Information Centres

They are embodied mainly in governmental bodies, non-governmental international agencies working in Sudan and private institutions. Government Libraries have a long and proud history in the country and information profession including also national parliament library. Each institution manages its own library information system “LIS” focusing on the subject area and information needs of the parent body, but there is no extensive co-operation between library and information services in areas of job opportunities, career development,

training and co-operative procurement. The research libraries and documentation and information centers are the forefront regarding the use of ICT for knowledge management. These institutions are also experiencing shortage of people and unqualified personnel and run by junior staff not in the librarian stereotype which led to the performance of knowledge. It is necessary to know what skills becoming more valued and required in identifying what areas of staff development and need attention.

*The National Centre for Research -
Documentation and Information Centre*

“NCR-DIC” is designated as one of the institutions that serve as national depository of scientific and technological knowledge, established in 1979. It can play an important role in disseminating information and organization activities that create user awareness and understanding important national concerns based on modern line with a number of assistances from un-organizations and international organizations. NCR-DIC has developed a number of databases based on UNESCO ISIS software from which currently publishes National Register of Current Research “research projects”, biannual Sudan Science Abstracts is extracted from national bibliographic database related to science and technology of national scope; and Union Catalogue of Periodical Lists in Sudanese Libraries (Ghobrial, 2003)

*The Centre for Folklore Studies and
Cultural Documentation, Ministry of
Culture, Sports and Youth*

This specialized centre carries out research into aspects of popular creativity in music, speech, decoration, rhythm and the visual arts. Its fundamental tasks are to set up national archives for Sudanese folklore; by studying Sudan’s heritage and arts to play an

effective part in giving concrete expression to national unity; to undertake the studies needed to develop our popular arts; and to work to establish a link between individual and popular creativity. In this way the Centre is becoming an important source and repository of specialized information about the various kinds of folk creativity in form of catalogues and exhibition objects , which helps in general cultural planning and assists the activities of other bodies. (Source: Extracted from Centre for Folklore Studies and Cultural Documentation Report 2007, unpublished and visits to the Ministry of Culture, Sports and Youth).

The Sudanese Traditional Music Archive
(<http://www.uofk.edu>)

“TRAMA” is a research and documentation center, which concerns with collection, documentation, preservation and dissemination of traditional music and folklore. It belongs to Department of Folklore of the Institute of African and Asian Studies at the University of Khartoum. Its collection is mainly derived from live recordings obtained through fieldwork among ethnic communities in Sudan. The huge archival recording material is currently proposed for digitization for enhanced presentation and dissemination (Source: Visits to the Institute of African and Asian Studies. 11/09/2006).

Public Libraries and Cultural Centres

Public libraries play role in development of intangible and tangible heritage, building of capacities, and encouragement of reading habit. Generally, public libraries are institutions run by state or locality authorities, their collections serve the cultural, recreational or practical needs of the local community and leading the community into knowledge revolution. These facilities

in Sudan are scarce and belong to private or charity organizations in most cases. They are scattered and poor infra-structured libraries. That is due to uncertainty in the relationship and coordination between these authorities, which affects the deterioration of position of public library and is reflected in acute reduction of service delivery. Diplomatic Missions Cultural Centres are established within diplomatic missions in Sudan as part of culture exchange programs. The British Cultural Council has played a key role in development of knowledge resources in Sudan since its establishment. There are also considerable numbers of youth centres in the various Sudanese towns/villages which enable young people to acquire further skills through training or artistic hobbies such as music, drawings, folklore etc. There are also cultural, educational, sports, cultural clubs as well as religious institutions (Ghobrial and Abdel Gadir, 2007)

Museums

These organized and permanent nonprofit institutions are essentially devoted to education or aesthetics. They acquire, collect, conserve, research, communicate, and exhibit for the purposes of study, education, and enjoyment (ICOM, 1999). The Department of Antiquities and National Museums "DANM" is a specialized academic department engaged in a wide range of activities to do with the location, excavation and conservation of ancient remains (Source: visit site of DANM on 08-11/04/2007). It disseminates historical and archaeological awareness among the masses, using the information media. The department supervises a number of museums, which houses the archaeological heritage, arts and artifacts of various Sudanese tribes. There is a huge number of local tangible and natural heritage artifacts kept by individuals or

tribes or a specific area or community, small amounts are preserved and displayed in museums (<http://www.sudan-tourism.gov.sd/mesum>) namely Sudan's National Museum, Ali Dinar Museum, The Khalifa House Museum, Sudan's Ethnographic Museum and Natural History Museum. Their recent trends are towards virtual museums.

Mass Media

Mass Media Systems in Sudan, under the supervision of the Ministry of Information and Communications, are at the forefront of Sudanese print, audiovisual and electronic media policy (<http://www.mic.gov.sd>). The printed newspapers are political and social ports and they only reach a tiny proportion of the population. The Sudanese News Agency acts like a newswire for Sudan "News Memory" and its output is available in Arabic, English and French (<http://www.sunanews.net>). Radio and television are public broadcasting integral systems, which consist of two bodies operated by the government (<http://www.sudanradio.org>; <http://www.sudantv.org>). There is one central broadcasting service and a number of rural/state radio/television stations, besides the national radio/television centre in Omdurman. These television stations and the booster stations located in various parts of the country are linked through a microwave network. The general program on national television is transmitted via the artificial satellite stations. The radios community is affected with the "FM revolution" depending on the conventional names, which broadcast in frequency modulation today, are experiencing development at lightning speed in both rural and urban communities. Recent and current evolution shows that radio can be an adapted means in this approach, and undoubtedly, it is a beneficial situation for oral tradition. However, this raises at the same time a major question

concerning the real nature of the “new” oral tradition thus created or stimulated. It is a matter of clarifying new roles radio can play in the safeguarding, preservation and use, broadcast and reproduction of oral tradition (<http://www.sudanradio.org>. They are producers of daily and weekly knowledge, which provide tremendous awareness to Sudanese community. The production could be broadcasted live or recorded for the future. They serve as a national depository for audio-visual collections in the country.

Natural Heritage

Natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from an aesthetic or scientific point of view; geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation; natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty. Blake (2002) commented that the distinction between tangible and intangible heritage reflects an official or administrative Eurocentric view of cultural heritage that has traditionally valued monuments and sites over the intangible values associated with them (<http://www.china.org.cn/english/TR-c/76273.htm>). Natural heritage under the convention on biological diversity obliges governments to conserve their biodiversity (<http://www.cbd.int/doc/world/sd/sd-nbsap-01-p1-en.pdf>). Based on the historical knowledge on which is available; such as botanical gardens and arboretums, herbaria which are considered as the “dictionaries” of the plant kingdom, the reference specimens are essential to the proper naming of unknown plants, specimens

cited in extant publications and keywords to find research materials such as herbaria in research units, The representation of this Sudanese knowledge is bound internally which seems so little or not realized and conveyed in “Biodiversity Collections Index”. Sudan is party of the convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention). Based on this convention, “Sanganeb” the Sudanese Marine National Park is recorded in the World Memory Register for its richness of distinguished marine life forms among which 124 groups of coral reef exist, three species of sharks, dolphins, turtles, fishes and a quite good representation of molluscus and urchins (<https://Sanganeb National Park - UNESCO World Heritage Centre.htm>). In addition to the Wadi Howar National Park is one of the most remarkable natural features of the south eastern Sahara was proclaimed as one of the largest national park in the world, with an area of 100 thousand km sq. with diverse flora and outstanding geological features including the volcanic and crater landscape of Meidob Hills, Jebel Rahib complex. The Wadi was the largest Nile’s tributary from the Sahara between 9500 -3000 years before present. (<https://Wadi Howar National Park - UNESCO World Heritage Centre.htm>)

DIGITAL TECHNOLOGIES IN SUDAN

The modern information technologies have offered the Sudanese Society a great chance of projecting its culture to world, in addition to the outcome of local research efforts or intellectual production in various fields of knowledge including agriculture, medicine, science, engineering and technology scattered all over the country. These are mostly owned by individuals/tribes/category of society/private or public offices/stores/

memory institutions, sites including internet sites are largely unutilized or unrealized or unorganized even some are semi deteriorated. Such materials can easily become an important essential part of memory of the Sudan as well as the Sudanese nation indigenous knowledge.

The Sudanese information/knowledge/heritage/collection institutions must also embark on aggressive acquisition of the Sudan collections including grey literature, materials, databases, physical objects, multifunctional information and knowledge systems and networks. Nevertheless, the cultivation of these technologies in the Sudan is weak, what is conceptually known as digital divide. ICT Opportunity Index has introduced the notions of a country's info-density and info-use based on which the Sudan was classified as less economy in Info-state growth and showed achievement Info-state value of 38.56 in 2007. This growth leads the country to catch up to ICT and employ them to store large amounts of information economically and efficiently which are capable of retrieving that information for as long as it is needed (<http://www.itu.int/ITU-D/ict/doi/index.html>). Sudan has set up an effective regulatory framework, adequate safeguards to ensure fair competition and protection of consumer interests that are represented in National Telecommunication Corporation "NTC" mission which is to coordinate, promote and provide excellent and reliable telecommunication services with high quality and affordable price. It intends to encourage competition, and acquaint with the latest international developments in telecom technology. NTC mandate is to set up the plans, policies and regulations for the provision of the telecommunication services, and their establishment thereof on the national level taking into consideration the sustainable development and the service of the social

and national objectives. It regulates licenses, protection, security in the different fields of services and activities of telecommunications through National Telecom Operators (<http://www.ntc.gov.sd/>) For example, Sudatel's "National Telecom Operator" (<http://www.sudatel.net>) whose mission is to improve and extend the telecommunication service portfolio in Sudan to one of the highest level within the Africa continent by transforming to an innovative, well organized company and with professional service and business oriented personnel. It has clear network, marketing and finance policies and strategies, which are well defined in its business and technical plans. Its network strategy is mandated to build a backbone optical fiber in the national core network and optical fiber ring in Greater Khartoum and the access-network in urban areas and interfaced broadband carriers, for regional and global communication network. In addition to the Global System for Mobile [GSM] Cellular Network Operator, which is a vision for a 3rd Generation (3G), and 3.5G mobile system was the provision of internet services on mobile phones. Mobile phones in the Sudan proved to be the best penetrating, the fastest and cheapest technology to make a real uptake, demolishing all features of inequality in terms of connectivity and access. The technology invaded the rural areas equally well as it invaded urban societies sweeping all signs of technological and social barriers. (<http://www.uneca.org/aisi/nici/Documents/REGULATOR.ppt>)

The more advances are made in the field of digitization, the more digital pictures, audio recordings and films being generated and the more index card systems are being replaced by databases, the long-term preservation of electronic data is gaining an importance for our growing information society because the percentage of information which is available exclusively in digital form

is rising rapidly. The authors referred to the generation of public knowledge in advanced information and communication technologies (technology and applications) using digitization on which is based the vision of networks and services. They attempt to establish; maintain and reinforce the Sudanese "local" knowledge or content which does not find position at the international forefront of scientific and technological developments, address the most urgent needs for research and novel applications in the present unfolding of new technology.

The use of information and communications technology (ICT) offers a vehicle for memory institutions to drive the necessary changes, and within the digitization and networked communication technologies represent several paradigm shifts in the social conditions of memory institutions. Random sampling of memory institutions and grouped into academic institutions, research centers, archives, museums, mass media centers, broadcasting and television, herbaria, and parks and reserved areas where their population ranges and varies from little to abundance depending on the population density seems heterogeneous, complicated and unidentified. The vision of this research is to consider digitization as communication and information transfer from the perspectives of the users upon which this survey was based and was conducted in the period of June 2006 -June 2008 to address the knowledge chain in communication in the direction of this new paradigm.

The role of the memory users grew from that of a collector and preserver of information resources to a professional involved in very complex issues of organization, the dissemination of and access to information. The role of the memory professionals, particularly during the past two decades,

has further evolved to encompass the burgeoning technological developments. Their role is to select, acquire, organize and make available an appropriate subset of resources in the digital world. They have done these jobs; but they are moving beyond the traditional roles of collection, maintenance and custodial duties to newer functions of translating, accessing and marketing resources beyond the physical boundaries. In the internet and web resources era, client services are of great importance in memory institution services, as most of the time, which was in the past devoted to the technical services, is now being devoted to their clients who are becoming the core of their services. There is a considerable number of females in these institutions and the scattered gender in these institutions was mainly depending on the discharging activity of the institution. They are in a relatively equal distribution among the three age groups (31-40, 41-50, and 51-60 years).

Their level of educational attainment indicated that they had a bachelor's, higher diploma, and Master and Ph.D. degrees. A majority of the professionals were graduates of Faculty or Arts (Departments: Library; Anthropology; Archeology, Mass Media, and History). Those who were working in herbaria and botanical gardens/parks and reserved areas and museums (excavations) were graduates of Faculty of Science [Departments: Zoology; Botany; Geology] or Natural Resources Colleges. Some of those working in folkloric and cultural centres were graduates of Faculty of Fine Arts or Folkloric departments. It was found that a range of 2-4 graduates/memory institution was of computer sciences and information technologies mainly in the information centers or units. Majority of M.Sc. and Ph.D. holders had completed the required coursework on traditional techniques and were not acquainted with any technological

requirements during their research program. The research centres and academic institutions hosted the highest population of Ph.D. holders. The authors tried to explore the relationship between the use of digital technologies and the content of different jobs. More than ten divisions within memory institutions were represented by the respondents: administration, collections management, research, conservation, development, education or teaching staff, conservation and preservation, technical processing (registration, cataloguing, classification, indexing, abstracting), information technology, publications, public awareness/marketing, in addition to categories for miscellaneous memory institutions which work individually. The authors used the classification of common jobs categories among the memory institutions for this survey based on job similarities and relevance in these institutions. Many memory professionals who responded to this survey had been in their current job for over ten years in all institutions. Those had worked between five and ten years mainly at libraries and a very few had just begun their current position, having worked less than one year. They had been using computers in their work for one to four years in archives, cultural and folkloric centres and museums; and five to ten years with high ratios at libraries, mass media centres and parks and reserved areas. A majority of respondents indicated that they have used computers for their tasks for more than ten years mainly at libraries, research centres, academic institutions and documentation and information centers. The approximate peak time which the respondents had spent in using computers at their work institution ranges from one to three hours daily. This indicated that computers have been introduced in some aspects of memory institutions. The population of computer users has grown as more and more professionals find it a space where they can express their

points of view and communicate with others as they can access internet from desktop in the majority of memory institutions.

The majority of memory institutions' professionals described themselves as having an expert level of computer skills and that they are novices in the use of software tools. Also, the authors examined the relationship between respondents' age and level of computer and internet expertise. Not surprisingly, 40-50 age groups reported the highest level of computer expertise. Accordingly, older professionals tended to use the computer less than younger ones.

The preference of professionals to resources, particularly in relation to their job needs when searching for images and information related to their needs or work resources they use. The preference to journals and books and followed by catalogues and citations mainly in libraries, academic institutions, research centres, documentation and information centers and archives. Some indicated the importance of both the originals in research and folkloric/cultural in their work received similar ratings as well as in CD-ROMs. Among those surveyed, the majority used digital images for their work, suggesting that digital images were a major, commonly-used digital resource for today, a smaller number indicated that they do not use digital images. Of those who reported not using digital images in their work, most said the reason is related to the content of their jobs. In the words of one professional 'because most of their work deals more with the financial and business aspects I did not have a need to access digital images with any frequency in order to perform my duties'.

Most professionals in this research used digital images for a variety of needs: conservation purpose, IT/technology-based

jobs, training and educational programs, research and personal use. Interestingly, the main purpose of use in conservation and preservation is for documentary works in libraries and archives. The professionals tested IT/technology-based applications and did their experiments in information and research centres. In training and education, they practiced for oral presentation or lecture, communication with other professionals, photographing samples from the originals. Those professionals, who used digital images in their work, were mainly in research centres, academic institutions and mass media centres. The responses indicated that internet search engine and other links on the websites were always used, followed by artists/commercial dealers and personal websites. Whereas, the responses to use of Commercial Image Collection Database and CD-ROMs were all chosen with about the same frequency. They always used Internet Search Engine mainly Google and Yahoo. When asked about other links provided with websites, interestingly, respondents said that they never used either commercial image collection/database sites or personal websites of individual artists or dealers or websites or links provided by website while slightly less respondents said that they sometimes used CD-ROMs

The perceived benefits of the use of digital products among professionals indicate the degree to which they agree or disagree with a series of statements about digital images including concerned ease of use and edit; accessibility; interactivity; image selections and distribution; text information; and protection for the originals. Their responses to these statements related to the benefits of the use of digital images in terms of easy to access instead of going to storage/library facilitates my work as their

top choice, easy to reproduce/copy digital images, adequate delivery speed, manipulate/edit digital images respectively. On the other hand, the quality of digital image resolution is adequate, lowest amount of digital images online databases/website is adequate, digital images prevent wear and tear of the original document. The results revealed that respondents believed that the amount of digital images available on websites and databases to the public is insufficient. Interestingly, the respondents chose neutral as their response to this prompt. However, results according to memory institution also showed the most beneficiaries of these statements are libraries, academic, research centres and mass media while cultural centres, museums, parks and reserved areas are the least beneficiaries.

When barriers and problems perceived by them in the use of digital images on the job were assessed, perceptions were rated by the respondents in terms of the following categories: image selection, unreliability, lack of technology support, cost, lack of incentives, and image right and permission. The results suggest that most respondents chose ratings between Neutral and Agree. "Management permission such as copyright/fair": there are not enough staff and/or instructions on searching and using digital images in memory institutions that is due to not enough computer equipment and/or software Tools, to use digital images more effectively at work, technical problems and weak incentives to discharge the work efficiently or run smoothly, in addition to the high cost of acquiring of digital collection is barrier in use. On the other hand, indicated to mentality of change, low delivery speed, inadequate databases/websites and the quality and information offered by digital image collections/databases are not reliable

DIGITAL TECHNOLOGIES IN BUILDING THE MEMORY OF SUDAN “MS”

Digital technologies are undergoing rapid and continuing development and many issues are unresolved, giving rise to a delusive reliance on the “wait-and-see” approach. The basis of a commitment to ongoing digital is an acknowledgement that the technology will change and change often. The crucial management decision is therefore less about the “when”, or the “whether” to begin. It is rather a question of whether the institution can afford to ignore the opportunity to reach wider audiences in a global community, in a manner afforded by the technology to improve access to and the preservation of cultural and scholarly resources. There are considerable numbers of guidelines, which have been produced with specialized working groups, international and allied governmental organizations within the UNESCO strategy of knowledge for all. They also have a strong relationship with UNESCO’s Memory of the World Programme, which is aimed at safeguarding the world’s documentary heritage, democratizing access to it, and raising awareness of its significance and of the need to preserve it. These elaborated guidelines are aimed at decision makers, memory institutions managers, and curatorial and technical staff members, particularly those in institutions, which satisfy a large and more diverse population. This can help to seek partnerships with other institutions to capitalize on the economic advantages of a shared approach and to take advantage of financial opportunities, for example the likelihood of securing funding to implement a programme, or of a particular initiative being able to generate significant income.

This building of MS will be based on UNESCO (<http://www.unesco.org>) initiatives in sustainable digital archival and

preservation system. The socio-technical imperative of digital technologies is applied in all aspects. Repositories are the products of the interaction of people and these technologies, and as such, their sustainability is dependent on the continuation of that interaction. In order to build an open scalable infrastructure of MS will be guided by Global Memory Net’s “GMNet” vision and conceptual framework which is a multi-purpose image knowledge base and portal to meet multiple needs of multiple users in the world (<http://www.globalmemory.net>), who are interested in cultural, historical, and heritage contents. MS development is a very challenging task; but attempts to be beneficiary and guided by the multiple kinds of technologies utilized to enable dynamic retrieval of the valuable resources as well as dynamic management of various system components, which include collections, archives, policies, users, evaluation, as well as news. The most important component is clearly “Collections” because content is of overriding significance of any digital memory institution, and technology is only the tool. In order to build more content, GMNet is truly an excellent experiment of content, technology and global collaboration. It is an exciting collaborative and workable model at all levels for delivering multimedia content over the web by utilizing cutting edge content-base image retrieval technologies in addition to the traditional metadata-based searching. It allows users to find images based on an integration of visual similarity and metadata relevance.

The fast growing number of collections of GMNet from collaborators includes UNESCO’s Memory of the world national libraries of various countries, universities, museums, and archives. In addition to that, over 2400 world digital collections are also linked in such a way that they are searchable, thus the gateway function is not just a

simple web-link. The infrastructure is ready to embrace more participation including digital contents for some African regions and countries which will be incentive for Sudan. Since 2003, University of Khartoum has developed in-house Linux/MySQL/PHP-based platforms on open standards which lead to carry out a number of upgrading to be compatible with and suit interactive Multimedia Content retrieval System (i-M-C-S) with much added functionalities (Zhang et al, 2005). In addition to global knowledge partnership in the collection technology development areas, extensive community builds efforts to include the provision of Research and Development and education/training opportunities. The partners not only contributed to the content development by bringing relevant materials, but also enhanced our technology capabilities with their knowledge and expertise in multilingual, web application, etc. All these have enhanced the capabilities of i-M-C-S system. But, what is more important is to motivate and actualize the contribution institutions in terms of MS based on integrated access of distributed knowledge on Digital Cultural Content focusing on the right added value for the users re-use of accomplishments which achieved were within the Nation. Also, combine ICT infrastructure and skills development with capacity building, and a range of social and environmental activities empowering the local community for sustainable development sites based on content management and shared memory systems via multi functional servers.

CONCLUSION

Finally, we can conclude that there are no magic wands in our world, human memories fade and can be completely lost when people die. Events can be forgotten, also

extend to causes of storage failures and damage of fragile physical media and memory devices. However, appreciations to the careful work of our memory institutions have always been an integral part of societies and canonize the pasts and presents of individuals and communities. In Sudan's cultural, educational and scientific collections reside millions of things that document our past and present. The Sudanese collections are distributed nationwide in diverse institutions and memory resources.

As this research revealed the ways in which users are currently using digital technology images to perform their jobs effectively and efficiently after the identification the positive and negative uses of digital images. The advances in digital technologies create new interesting ways among professionals and provide them with mechanisms of extractions and integration of their professional work. For this purpose, the Sudanese Nation received guidance from UNESCO, which also supports the preparation, evaluation and revitalization of the country's cultural policies in line with the principles of cultural diversity and development of a comprehensive strategy for long-lived digital explicit and tacit knowledge based on global digital initiatives.

BIOGRAPHY

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REFERENCES AND WEBSITES

- Abid, Abdel Aziz (1998). "Memory of The World -Preserving our Documentary Heritage" in the *64th IFLA Conference, Amsterdam*. Available online at <http://www.ifla.org/IV/ifla64/099-69e.htm>.
- Argyris, C., (1991), "Teaching Smart People How to Learn".- In *Harvard Business Review*, Vol. 69, May/June 1991, p. 99-109.
- Baker, David (2002). "Digital Library Development in Sudan: Report of a Workshop for Senior LIS Professionals". In: *Digital Libraries Workshop, Khartoum, and 14-18 December*. Sudan British Council in collaboration with Documentation and Information Center of National Centre for Research and Sudatel Company [unpublished, workshop document]
- Blake, Janet (2002). "Developing a New Standard-setting Instrument for the Safeguarding of Intangible Cultural Heritage Elements for consideration ".- Paris: UNESCO
- Braukamper, Ultrich (1991). "The roots of Baggara culture in Eastern Bilad Al Sudan". In: *The Sixth International Congress of African Studies, Khartoum, Sudan 11-14 December*
- Centre for Strategic Studies (1998). Sudanese Strategic Report, Khartoum, Sudan, 1998.
- Creswell, J. W. (2003). "Research Design. Qualitative, Quantitative, and Mixed Methods Approaches".- Canada: SAGE Publications, Thousand Oaks
- El Tom, Mohamed Al Amin Ahmed, (2006), "Higher Education in Sudan: Towards a New Vision for a New Era", Sudan: Sudan Center for Educational Research and Friedrich Ebert Stiftung
- Ghobrial, Rafaa Ashamallah (1992). "Evaluation of Information Products and Services of the Documentation and Information Centre, Khartoum", M.SC. In Information Science, Addis Ababa University, Ethiopia
- Ghobrial, Rafaa Ashamallah (2003). "Establishing Basic Levels of Technology Transfer in Libraries and Documentation in Sudan". In: *the 6th scientific conference on Technology Transfer in Sudan, by National Centre for Research, Khartoum 8th -11th December 2003*
- Ghobrial, Rafaa Ashamallah (2007). "Portal/ Portable Knowledge for Development: case of Sudan". In: *IST Conference Proceedings 09 - 11 May 2007, Maputo, Mozambique*. Paul Cunningham and Miriam Cunningham (Eds).- Dublin, Ireland: International Information Management Corporation
- Ghobrial, Rafaa Ashamallah and Abdel Gadir, Hamad (2007). "The way to Knowledge Economy: a review of Sudan Knowledge

- Services". In: *Fifth Session of the Committee on Development Information (CODIV), UNECA, KLIS subcommittee, 30 April – 4 May 2007*
- Halbwachs, Maurice (1992). "On collective memory".- Chicago: The University of Chicago Press
- International Council of Museums (ICOM) (1990). "Status/Code of Professionals Ethics".- Paris: ICOM
- Knight, Tom and Howes, Trevor (2003). "Knowledge Management – A Blueprint for Delivery: a Programme for Mobilizing Knowledge and Building the Learning Organization".- Oxford: Butterworth-Heinemann
- Machlup, Fritz. (1962). "The production and distribution of knowledge in the United States Princeton".- New Jersey: Princeton University Press
- Ministry of Science and Technology (2003). "A Policy Review for Science and Technology in the Innovation in Sudan". (Draft: unpublished)
- Negroponte, Nicholas (1995). "Being digital".- New York: Alfred A. Knopf, Inc
- Schweibenz, W. (1998). "The Virtual Museum: new perspectives for museums to resent objects and information using the Internet as a knowledge base and communication systems". Available Online on http://www.informationswissenschaft.org/download/isi1998/14_isi-98-dvschweibenz-saarbruecken.pdf; retrieved on 13/9/2006
- Taylor, R.S. (1986). "Value added processes in Information systems". - Norwood: Ablex Publishing Corporation.
- Thompson, James (1982). "The End of Libraries".- London: Clive Pengley
- Welsby, D. A. and Anderson, J. R. (2004). "Sudan Ancient Treasures".- London: British Museum Press
- Wingard, Terry (1975). "Computer memories: a metaphor for memory organization in C.N." Ed. The structure of Human memory. -San Francisco: W.H. Freeman and Co.
- Zhang, Shengqiang and Ching-chih Chen (2005) "Global Memory Net and development of digital image information management system: Experience and practice" In *Journal of Zhejiang University SCIENCE*, vol. 6A , no 1

WEBSITES

- <http://archive.ifla.org/VII/s19/pubs/digit-guide.pdf>
- http://en.wikipedia.org/wiki/Long-term_memory
- <http://nrosudan.gov.sd>
- <http://Sanganeb National Park - UNESCO World Heritage Centre.htm>
- <http://Wadi Howar National Park - UNESCO World Heritage Centre.htm>
- <http://www.cbs.gov.sd>
- <http://www.unesco.org>
- <http://www.arabmediawatch.com/amw/CountryBackgrounds/Sudan>
- <http://www.cbd.int/doc/world/sd/sd-nbsap-01-p1-en.pdf>
- <http://www.china.org.cn/english/TR-c/76273.htm>
- <http://www.globalmemory.net>
- <http://www.itu.int/osg/spu/publications/worldinformationsociety/2007/WISR07-Africa.pdf>
- <http://www.most.gov.sd>
- <http://www.natlib.gov.sd>
- <http://www.ncr.sd>
- <http://www.ntc.gov.sd/>
- <http://www.sudatel.net>
- <http://www.suvl.edu.sd>
- <http://www.uneca.org/aisi/nici/Documents/REGULATOR.ppt>
- http://www.unesco.org/webworld/mdm/en/index_mdm.html
- <http://www.uofk.edu>