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Planning for building Digital Memory of the Sudan "DMS"

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Abstract:
Advances in information and communication technologies led to the emerging of modern digital systems which facilitate sharing and preservation of information and innovations. These systems are thus supportive of the cultural "collective" memory of the nation, a local repository of explicit and tacit knowledge. This paper aims to study the digital systems that help to secure and improve the reliability of memory of the Sudanese nation with the transfer of information and communication technology from perceptions of the users. This paper has reviewed and assessed infrastructures, resources, systems and ICT readiness which will contribute to building the Digital Memory of Sudan. The outputs guide running reforms and rehabilitation, building capacity and revitalizing the infrastructure of the digital environment, which affects reliability and shared resources in memory institutions. It is concluded that memory institutions are a repository of Sudanese intangible and tangible content which will be represented in the Digital Memory of Sudan. Finally the paper proposes to revitalize 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.

Introduction

Human memory was the only knowledge storage and access device (1). Then man had realized the importance of accumulated knowledge and carried out many trials to find a way to store and keep his tremendous signs, marks and information for his future or the next generations. The various waves of inventions were really milestones in the history of information storage which led the development of external memories or aided memories and today have reached a kind of maturity in the age of memory in digital era.

Wikipedia (2), the free encyclopedia, has simply defined the documentary heritage as institutional memory containing a collective of facts, concepts, experiences and know-how held by a group of people. Elements of institutional memory may be found in corporations, professional groups, government bodies, religious groups, academic collaborations and by extension in entire cultures.

It is noticed that, as institutional knowledge, that memory depends upon the preservation of data and also the analytical skills necessary for its effective use within the institution. Peter and Mirta (3) define national memory as the sum of information contained in a country's documentary heritage, i.e. as assets of national knowledge systems. Archives, documentation centres, libraries and museums are guardians of the documentary heritage of mankind.

As humans, we are looking for our existence and recognizing that memory is an integral part of our existence. It is the retention of, and ability to, recall information, personal experiences and procedures (skills and habits). Wingard (4) refers to the terms "human memory", "computer memory" and "memory institution" as metaphors. UNESCO expert Abid (5) has clarified these metaphors in light of his explanation of the term of the "memory of the world". Considered as the source of knowledge and memory of the peoples (nations) of the world, they are of vital importance in preserving cultural identities, in linking past and present and in shaping the future. These identities are affiliated to heritage, which is a vast domain covering archives, libraries, documentation and information institutions, museums, monuments and places, botanical gardens, zoological gardens and all kinds of collecting institutions. They are considered the main pillars of the nation's documentary heritage, "the 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 for the society to this information and knowledge. The success of any nation lies not just in its resources (money, buildings, people, tools and technologies), but in how it deploys these resources and builds them into capabilities for good delivery and services (6).

Digital world

We are living in a digital world resulting from the information and communication technologies revolution from which our fundamental resources of knowledge and heritage are becoming interchangeable and secure. Digitization is becoming the process of converting any physical or analogue item into an electronic representation (7). This guide represents the 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 institution as defined (8). 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.

Sudan

The Sudan is a diverse, multicultural nation rich in heritage with valuable indigenous knowledge known as the silent Sudan treasures. This heritage is still abundant locally and not yet disseminated or accessed by the outside world. At the same time they are intensively discussed individually or collectively at regional, national and international levels. Modern information technologies have given Sudanese society the great opportunity of projecting its culture into mankind's global culture, in addition to the outcome of local research efforts and intellectual production in various fields of knowledge including agriculture, medicine, science, engineering and technology from all over the country. These are mostly owned by individuals or the tribe or a

group in society, by private or public offices, in stores, memory institutions, or sites including Internet. Sites are largely unutilized or unrealized or not organized; some are even partly deteriorated. Such materials can easily become an important essential part of the memory of the Sudan as well as the indigenous knowledge of the Sudanese nation.

The Sudanese information, knowledge and heritage collection institutions must also embark on aggressive acquisition of Sudan collections, including grey literature, materials, databases, physical objects, multifunctional information and knowledge systems and networks. But the cultivation of these technologies in the Sudan is weak – the concept known as the digital divide. The ICT Opportunity Index has introduced the notions of a country's "info-density" and "info-use", based on which the Sudan is classified as a lesser economy in "info-state" growth and achieved an "info-state" value of 38.56 in 2007. This growth drives the country to catch up in ICT and use ICT to store large amounts of information economically and efficiently, capable of retrieving that information for as long as it is needed (9).

Sudan has set up an effective regulatory framework, adequate safeguards to ensure fair competition and protection of consumer interests that are represented in the National Telecommunication Corporation, NTC, mission which is to coordinate, promote and provide excellent and reliable telecommunication services at high quality and affordable price. It intends to encourage competition and acquaintance with the latest international developments in telecom technology. The NTC mandate is to set up plans, policies and regulations for the provision of telecommunication services, and their establishment on a national level, taking into consideration sustainable development and service of social and national objectives. It regulates licences, protection, security in different service areas and activities of telecommunications through national telecommunications operators.

The mission of the Sudatel national telecom operator (10), for example, is to improve and extend the telecommunication service portfolio in Sudan to one of the highest levels within the African continent, by transforming itself into an innovative, well organized company 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 backbone optical fibre in the national core network and an optical fibre ring in Greater Khartoum, as well as the access network in urban areas and interfaced broadband carriers, one for the regional and one for the global communications network.

In addition to the Global System for Mobile (GSM) cellular network operator, a vision for a Third Generation (3G) and 3.5G mobile system was the provision of internet services on mobile phones. Mobile telephones in the Sudan proved to be the best penetrating, the fastest and cheapest technology to make a real impact, demolishing all features of inequality in terms of connectivity and access. Internet hosts, apparently despite the fact that Internet now is evolving independently without any obstruction of physical location, still remain influential when issues such as the content and language used in communication are dealt with. Technology more often than not is well adapted and related in terms of usage to certain unique actual or potential norms and values that shape utility of technology such as personal computers. Saudani, MTN "Areeba" and Zain offer GSM services in the country. For example, Zain in Sudan (formerly Mobitel) offered mobile operations back in February 1997. Today it serves the largest number of mobile

customers in the country with 3,991,611 active customers as at 31 March, 2008 (www.zain.net). The technology invaded the rural areas equally as well as it invaded urban societies, sweeping away all signs of technological and social barriers.

Since the application of ICT in the Sudan, most users have been familiar with the problems of physical carriers that require specific media. In such cases they will need to decide whether it is reasonable to require transfers via specific media that they can process, or to invest in facilities to handle a wider range of media. The more advances are being made in the field of digitization, the more digital pictures, audio recordings and films are being generated and the more index card systems are being replaced by databases. The long-term preservation of electronic data is gaining in importance for our growing information society because the percentage of information which is available exclusively in digital form is rising rapidly. The problem is becoming more acute; especially for institutions whose principal task is the preservation and documentation of our cultural heritage.

This paper refers 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. It specifically aims to establish, maintain and reinforce the Sudanese "local" knowledge or content (which does not find a position at the international forefront of scientific and technological developments), and to address the most urgent needs for research and novel applications in the present unfolding of new technology. Since the Sudan has started to introduce and design or propose digital/electronic/virtual initiatives, some are currently at the initial implementation phases. The effectiveness of these initiatives is however affected by

- insufficient testing of these initiatives and projects under task-loaded conditions and lack of understanding of changing requirements and environments;
- information, knowledge and heritage systems do not constitute the totality of the nation's concerns with this technology; the most frequently cited obstacles to optimal technology adaptation in the memory institution setting were lack of digitization policies, staff time, funding, and inadequate collaboration on digitization efforts;
- Lack of work about the perception of digital technology by users.

This study aims to present the importance of building the Memory of the Sudan and attempts to facilitate its contribution as more significant for, and as a partner in, the Global Digital Memory/ Memory of the World / Global Knowledge/Heritage initiatives.

Methodology

The components which build a Digital Memory of Sudan (DMS) are not one-dimensional. They lead to understanding the complex and recurrent relationships between factors related to technology, management, and policy. Mingers (11) presents several reasons for using a combination of research methods in conducting research. This study has adopted a mixed approach which is a combination of surveys distributed to memory institutions either directly or by email. This combination of data collection methods was used to gather and analyse data on the nature and types of collections as well as those to be digitized in institutional memory. The universe of this study of high-potential memory institutions was grouped as 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, all of which constitute the main categories of repositories that contribute effectively in building the Memory of the Sudan and will have real existence in the nation's memory.

The existing memory institution systems are elaborate and effort has been directed toward the development and implementation of new technological tools in memory institutions. This is important because it can help them to become more relevant and adaptable. The current draft of digital initiatives or projects in Sudan has a strong relationship with UNESCO's Memory of the World Program and the Global Memory Net, which were examined according to these principle factors: criteria for selection; technical requirements and implementation; legal aspects; budgeting; human resource planning; development and maintenance of web interfaces; and preservation of digital content.

The surveys of users consist of the following elements:

1. The basic characteristics of users, who were asked to provide such information as gender, age group, residence, educational background, and current place of employment in the memory or the visited institutions;
2. Their experience and level of expertise with both computers and the Internet were determined;
3. The use of Internet resources as digital images was identified;
4. The views of facilitators, and barriers to the use of these digital technology products, were discussed in terms of fulfilment of needs and overall satisfaction;
5. Their overall values and judgments concerning the impact of digital technology on their practices were identified;
6. The perceptions by non-users of digital technology, in order to study more about the perceived barriers that non-users of digital technology experience and other Internet resources they use instead.

Assessment of digital technologies in Sudan

Memory Institution analysis

Memory Institutions (MI) are resources developed by human societies and came at a very early stage to include organizations that specialized in the conservation and arrangement of documents and objects so as to facilitate access to the knowledge they contained. Even in ancient times there existed remarkably organized libraries and archives; the only people able to use them were the ruling class and the educated. With progress in education and social organization they grew and attracted a broader public. In the past, MI collections were not well recognized or very small, scattered along the country or kept in private collections. They contain valuable rare collections of books, manuscripts and objects owned by religious leaders, tribal chiefs or provincial heads of government. These collections were consulted for different social, economic, political and religious matters, customs and practices. They reflected the particular aspects of the culture and heritage of Sudan.

Memory Institutions have been established, upgraded and subjected to repeated 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 acquire, catalogue 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 an increase in the number and variety of users, a rapid expansion of supply and demand as regards information, and new techniques for treating it with ever-increasing refinement.

One consequence has been the proliferation of organizations specializing in the activities that emphasize the functions of documentary chain. They play a very important role, one that will far surpass the simple conservation of patrimony; they will become mediators in the Sudanese Knowledge Society. They hold a variety of knowledge, which covers different sectors of national resources, including agriculture, education, economy, industry, finance, natural resources, social welfare, and research and development that depends on the mission of the parent institution of information unit.

Traditionally the collections are generally well organized. The institutions provide a measure of the relative size and capacity of the information infrastructures in the country and indicate the extent of the economic activities devoted to information. There are no proper statistics that quantify their numbers, staff and physical resources. In addition, most of their buildings are very small areas or rooms, or corners or stores on the roofs, which are not based on any standards, and not fit for many users at same time, nor well-furnished or equipped. Furthermore, with the expansion of books, collections of paper and other resources become bulky and create storage problems. Their patrons or clients are more and more demanding. They expect them to have long opening hours so that they can use their information services whenever they are open certain hours of the day or specific days of the week. Besides, only one person can use a single paper document or object at a time, especially from the Sudanese collection. Each extra copy of the same document requires double the space for storage. Traditionally, memory institutions have adopted continuous improvement initiatives to deal with some of these challenges. However even when 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 solutions.

The major purpose of this paper has been to investigate and analyse the current situation of memory institutions in regards to information and communication technologies availability and connectivity to the Internet network and examines the draft proposals and rate of application of digitization approaches in Sudan in general and in memory institutions specifically.

A scientific systems analysis can identify all the components of the MI that are in a functioning entity or that contribute to its maintenance. The scope of the MI is complicated by the diversity of titles and by the variety of its activities. In this study the authors attempt to distinguish and classify them according to a number of criteria. The most important criterion is the kind of information activity on which they tend to concentrate. Three kinds of activity currently coexist:

(a) conservation, (b) content description, dissemination and transmitting the information and (c) answering the queries, including evaluation and repackaging, using available resources.

As the number of units is increasing and offer many various services depending on each other, this study concentrates on memory institutions based on primary resources, classified as follows:

1. **National Records Office** (NRO) (12) is keeper of Sudan's national archive and a resource of unparallel importance to the heritage of Sudan, of immense value of its future for development. The Sudan Records Office was set up to receive, preserve and make resources available to the authorized user. The NRO is governed by special laws and administration. The collection can only be made available to the public after a certain lapse of time and under certain conditions. They make extensive use of microfilms for obvious reasons of space and security. They often have to deal with filing and maintenance of records being used in government departments. Recently it experienced great appreciation from government, and has restarted its restructuring based on international standards and norms; it collaborates with local government offices in the Sudan States.

   The NRO building has been constructed based on international standards. In 2006 the NRO established a link with University of Khartoum Computer Network and the Ministry of the Council of Ministers, all the hardware and connections for the digital archives. The priority for establishing the national digital archive is capacity building by training for librarians, archivists and memory institutions' employees of government departments. Under the supervision of Khartoum University, the Open Source Software has been adopted and designed the 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 systems, copyright and security systems. The University of Khartoum has advised and made available a web server and wireless networks with very high specifications and reliable connection to the Internet. (Source: El Raheed Abdel Majid, Network Administrator)

2. **The Sudan National Library (SNL)** (13) is a fully fledged national library fulfilling national library functions and located currently through amalgamation in the Ministry of Culture. The SNL is neither a national library service nor an archival institution; it has formulated its role as custodian of Sudan's published information heritage. Now the SNL is in the planning stage, supervised by a board of trustees. The SNL is a key memory resource in promoting heritage and information awareness, preserving and supporting the knowledge infrastructure in the development of the Sudanese community. The SNL focuses on collecting both published and unpublished materials, and Sudanese information and 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. The SNL accommodates both ISBN and ISSN since 2004.

   Since its establishment it has been housed in several rented buildings, none of which are intended for specific use as a national library. This may result in damage of collections, impediments to service delivery and development. Numerous attempts were made to obtain an appropriate permanent building or accommodation of the SNL, and finally this was supported by the Vice-President, Uztaz Ali Osman, who has helped to specify land for the

building (Source: Minutes of Board of Trustees of Sudan National Library). All efforts have been committed to construction as soon as possible.

3. **Academic/ University libraries** have been established in a number of universities in most states of the Sudan. There are at present 35 Government institutions (25 universities + 11 colleges), and 47 private and foreign institutions (5 universities + 42 colleges) (Source: Directory of Students Enrolment of Governmental and Private Higher Education Institutions for the year 2007/2008, Sudan Ministry of Higher Education). Academic libraries are the central organ of any academic institution and educational instrument. They are the storehouse of books attached to a reading room as well as a dynamic instrument of education. They act as intellectual and cultural houses for student, teaching staff and university campus outsiders. They are the local repositories and the principal gateways to current information and the scholarly records for current and future students and faculty of the University, while also serving other Sudanese community sectors.

   They are mainly located in government universities (University Library and Faculty Library) and private universities and colleges (single library per university or college). Some of them have started to acquire electronic resources and introduce technology as individual efforts but the Ministry of Higher Education and Scientific Research is developing a virtual library to provide academic staff and students the necessary information for teaching and learning and scientific research. The Sudanese Universities Virtual Library (SUVL) (14) is part of a project of the Sudanese Universities Information Network (SUIN), which aims to support educational activities and research and promote methods to acquire knowledge and develop management systems and modernize the University by providing books, journals and electronic teaching materials, research and management information (direct and indirect) by using tools based on information technology and communications (Source : Dr Iman Abu Maaly, SUIN Network director).

4. School Libraries are the "**Memory of the Basic Educational System"** where teachers and students develop their intellectual skills. In Sudan, they are mainly located in private schools while public schools are neglected but recently have been supported by mobile libraries on a limited scale (15). The term "mobile library" may be considered as all travelling or movable library activities by any means such as large enclosed trucks or vans or large motor vehicles equipped with shelves and a staff enclosure. They travel to the three main cities and visit schools in districts where there is no other library service at specific times on a certain day or days of the week.

   PETRONAS is the Malaysian national oil corporation working in Sudan. It contributes portable knowledge through its education and capacity building through the Mobile Library- Experience and its Journey which targets students in basic level schools, to encourage reading habits and provide an avenue for students to acquire knowledge, and through its impact on academic performance. More than 60,000 students are expected at the Basic School Level by 2010 (Source: Presented by Samah Mohamed Elnour Executive, Corporate Affairs PETRONAS Sudan, 27 November, 2006 –Library School Day). There is a real crisis in the literacy and knowledge creation abilities of Sudanese children and the gap can, in a very major way, be

attributed to the lack of sufficient support for libraries and library programmes in our schools by parents, school boards and the government (16).

5. **Government libraries, specialized libraries and Documentation and Information Centres** are established mainly in governmental bodies, non-governmental international agencies working in Sudan and private institutions. Government Libraries, including the national parliament library, have a long and proud history in the country and the information profession. 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 information centres are in the forefront in the use of ICT for knowledge management. These institutions are also experiencing a shortage of people and unqualified personnel and are run by junior staff not in trained as librarians. It is necessary to know what skills are more valued and required in identifying what areas of staff development need attention.

   The National Centre for Research - Documentation and Information Centre NCR-DIC (17) is designated as one of the institutions that serves as the national repository of scientific and technological knowledge. It can play an important role in disseminating information and organizing activities that create user awareness and understanding of important national concerns based on modern lines, with assistance from UN organizations and international organizations. NCR-DIC has developed a number of databases based on UNESCO ISIS software, from which it currently publishes a National Register of Current Research "research projects", and records of NCR researchers. Sudan Science Abstracts is biannually extracted from the national bibliographic database related to science and technology of national scope; and the Union Catalogue of Periodical Lists in Sudanese Libraries.

   The Centre for Folklore Studies and Cultural Documentation 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).

   The Sudanese Traditional Music Archive (18) TRAMA is a research and documentation centre 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 very large collection of

archival recording material is currently proposed for digitization for enhanced presentation and dissemination.

Public libraries and cultural centres where various cultural and heritage materials are held, cut across their functions. Therefore public libraries play a role in the development of intangible and tangible heritage, building of capacity, and encouragement of reading habits. Generally, public libraries are institutions run by state or local authorities; their collections serve the cultural, recreational or practical needs of the local community and lead the community into knowledge revolution. But these facilities in Sudan are very scarce and belong to private or charity organizations in most cases. They libraries in the country are scattered and have poor infra-structures. That is because of uncertainty in relationships and coordination between authorities, which causes the deterioration of position of public library, reflected in acute reduction of service delivery. Cultural Centres of Diplomatic Missions are established within diplomatic missions in Sudan as part of culture exchange programmes. Centres such as The British Council have played a key role in the development of knowledge resources and sources in Sudan since its establishment. There are also considerable numbers of youth centres in Sudanese towns/villages, which enable young people to acquire further skills through training or artistic hobbies such as music, drawings, folklores and similar activities. There are also cultural, educational, sport, and cultural clubs as well as religious institutions.

6. **Museums** are organized permanent non-profit institutions that essentially are devoted to education or aesthetics. Museums acquire, collect, conserve, research, communicate, and exhibit for the purposes of study, education, and enjoyment (19). The Department of Antiquities and National Museums is a specialized academic department engaged in a wide range of activities to do with the location, excavation and conservation of ancient remains. It acquires, collects, conserves, runs research, communicates, and exhibits for the purposes of study, education, and enjoyment. It publishes scientific research work in the Department's annual journal *Kush*, which is an international reference source for Sudanese archaeological studies. It also disseminates historical and archaeological awareness among the masses, using information media.

   The Department supervises a number of museums which house the archaeological heritage, arts and artefacts of various Sudanese tribes. In 2003 the Department also introduced a database based on Microsoft Access software using British National Museum specifications and standards which are mainly used in the registration and documentation of valuable archaeological artefacts. This consists of about 8000 records which are only used for internal retrieval and purposes. (Source: Dr, Abdel Rahman Deputy Director and Huda Magzoub ElBashir, Chief Museum curator, Department of Antiquities and National Museums).

   There is a large amount of local tangible and natural heritage held by individuals or tribes or in a specific area or community; small amounts are preserved and displayed in museums (18) such as Sudan's National Museum, the Ali Dinar Museum, the Khalifa House Museum, Sudan's Ethnographic Museum and Natural History Museum.

7. **Mass Media Systems** in Sudan are under the supervision of Ministry of Information and Communications which is at the forefront of Sudanese print, audiovisual and electronic media

policy. At present there are16 "political" newspapers, six sports and four social. Newspapers however 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 (20). In addition, the two online newspapers on Sudan operate outside the country. Radio and television form a public broadcasting integral system which consists of two bodies operated by the government. There is one central broadcasting service and a number of rural and state radio and television stations, besides the national radio and television centre in Omdurman. They are daily and weekly producers of information which provides tremendous awareness for Sudanese community. The productions may be broadcast live or recorded for the future. They serve as a national depository for audiovisual collections. (Source: Dr. Direr Mohamed Fadl Elmoula Sudanese Corporation for Broadcasting and Television)

8. **Natural Heritage:** The Convention on Biological Diversity obliges governments to conserve their biodiversity (21). Historical knowledge based on this is available: botanical gardens and arboretums; herbaria which are considered the "dictionaries" of the plant kingdom, the reference specimens 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. This Sudanese knowledge, with little or no internal awareness and understanding, is conveyed in *Biodiversity Collections Index*.

   Sudan is party to 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 molluscs and urchins (22). In addition, the Wadi Howar National Park is one of the most remarkable natural features of the south Eastern Sahara and was proclaimed as one of the largest national parks in the world, with an area of 100,000 km^2 and 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 and 3000 years before the present (23).

Users Survey Analysis

The use of information and communications technology (ICT) offers a vehicle for memory institutions to drive the necessary changes, and within digitization and networked communication technologies ICTs represent several paradigm shifts in the social conditions of memory institutions. Random sampling of 42 memory institutions was carried out. These were grouped into academic institutions, research centres, archives, museums, mass media centres, broadcasting and television, herbaria, and parks and reserved areas where the population ranges from low to high. It seems heterogeneous, complicated and unidentified. This section presents the findings of the digital approaches taken by these institutions in the following areas: descriptive analysis of the variables that represent general characteristics of the professional and client respondents; and views of some directors, administrators and advisors. The vision of this research is to consider digitization as communication and information transfer from the perspective of the professionals and clients, upon which this research survey was based. It was conducted in the period June 2006-June 2008, to address the knowledge chain in communication in the direction of this new paradigm.

Memory Institution professionals

The role of memory professionals grew from that of collector and preserver of information resources to that of a professional involved in very complex issues of organization, dissemination 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 era of the Internet and web resources, client services are of great importance in memory institution services, because most of the time which was in the past devoted to technical services, is now being committed to their clients who are becoming the core of their services.

A total of about 300 questionnaires were distributed (284 (95%) were sent online to the email addresses of those who agreed) to different memory institutions in the Sudan mainly in Khartoum State and some of African and Arab countries targeting Sudanese working there. These were answered by memory institutions professionals directly. The rate of questionnaires was 14.1% received by returned email survey and 85.9% returned by direct survey. The density of professional population varies and ranges from high to low as presented in Table 1.

Table 1. Distribution of Professional Respondents Population Density In Memory Institution

Institution	Count	%
Research Centres and Units	37	13
Culture/Folkloric Centres	15	8.8
Academic Institution	36	12.7
Documentation/information Centres	30	10.6
Herbaria /botanical garden	10	3.5
Museums	11	3.9
Archives	22	7.7
Libraries	76	26.8
Broadcasting and TV	11	3.9
Mass Media Centres	24	4.9
Parks and Reserved Areas	12	4.2
	284	**100**

Characteristics of the Professionals

There was a significant difference in the number of male and females among memory institution professionals: 170 (59.9) were female and 114 (33.59) were male. The number of females is considerably higher than males in these institutions and the scattered gender in these institutions was mainly dependant on the discharging activity of the institution. There is a relatively equal distribution among the three age groups (31-40, 41-50, and 51-60).

Their level of educational attainment: 20.4% indicated that they had a bachelor's degree, 12% higher diploma, half of the respondents, 50%, had a master's degree and 17.6% have PhD degrees. The majority of professionals were graduates of the Faculty of 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 the Faculty of Science (Departments: Zoology; Botany; Geology) or Natural Resources Colleges. Some of those working in folkloric and cultural centres were graduates of the Faculty of Fine Arts or Folkloric departments. It was found that there were 2-4 graduates of computer sciences and information technologies per memory institution, mainly in the Information Centres or units. The majority of MSc and PhD holders had completed the required coursework on traditional techniques and were not familiar with any technological requirements during their research program. The research centres and academic institutions hosted the highest population of PhD holders**.**

This study tried to explore the relationship between the use of digital technologies and the content of different jobs. There were more than ten areas within memory institutions 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 and marketing, in addition to individual categories for miscellaneous memory institutions work. The authors used the classification of common job categories in 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 (61.6% in all institutions); 35.4% had worked between five and ten years mainly in libraries; and 13% had just begun their current position, having worked less than one year.

There were 19.4% who indicated that they had been using computers in their work for one to four years in archives, cultural and folkloric centres and museums; and 39.1% for five to ten years, with a high proportion at libraries, mass media centres and parks and reserved areas. A majority of respondents indicated that they had used computers for their tasks for more than ten years, 41.5% mainly at libraries, research centres, academic institutions and documentation and information centres. The approximate maximum time that the respondents had spent in using computers at their work institutions ranged from one to three hours daily (84.5%). This indicated that computers have been introduced in some aspects of memory institution work. 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 the Internet from desktop in the majority of memory institutions (190 (66.9%)).

The majority of memory institution professionals described themselves as having an expert level of computer skills (40.8%); 31.7% respondents indicated that they are intermediate, and 21.37% said that they are novices in the use of software tools. Only 21.53% consider themselves to have a novice level of experience, 32.7% an intermediate level of experience, and 45.8% an expert level of experience in Internet searches (via Internet Explorer). The authors also examined the relationship between respondents' age and level of computer and Internet

expertise. Not surprisingly, the 40-50 age group reported the highest level of computer expertise. Older professionals tended to use the computer less than younger ones, as in Figure 1.

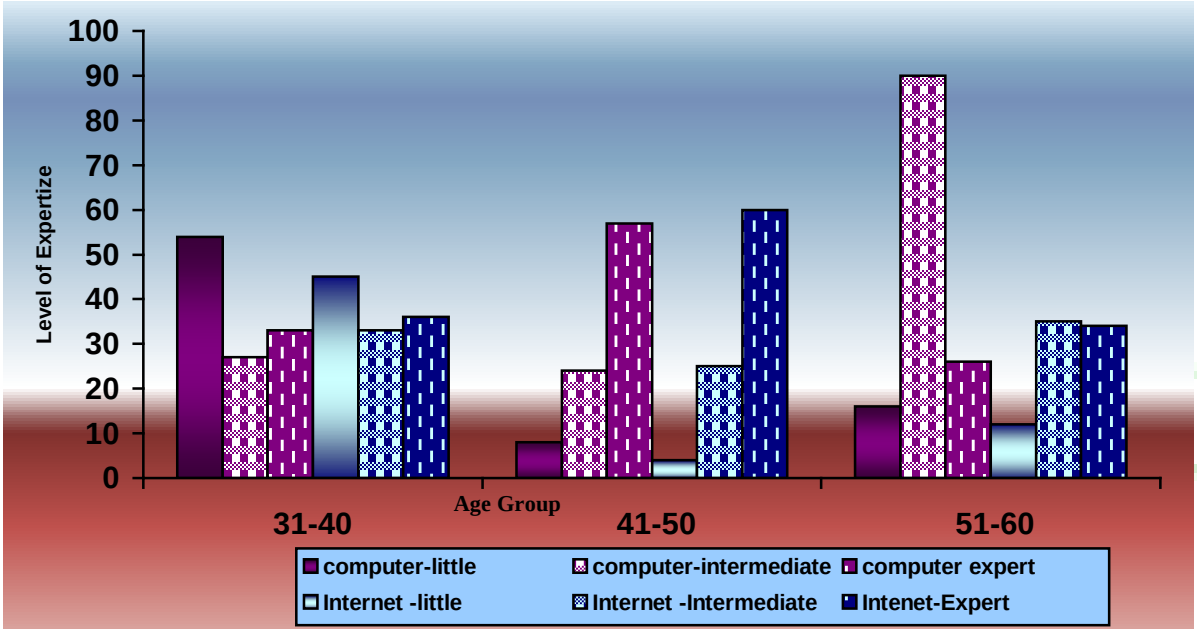

Figure1: Relationship between respondents' age and levels of computer and internet expertise

Actual Use of Digital Technology

The preferred resources of professionals, particularly in relation to their job needs when searching for images and information related to their needs or work showed which of the following resources they use. The preference for journals and books was 61.6%, followed by catalogues and citations (61.6%, mainly in libraries, academic institutions, research centres, Documentation and Information Centres and archives). A further 25% reported a preference for the use of digital images in research centres and mass media. Some (22.2%) indicated the importance of both originals in research and folkloric and cultural centres, and photographs in their work received similar ratings (21.5%) as well as CD-ROMs (16.9%) : the same preference was shown in mass media, research and Documentation and Information Centres, with 15.8% for multimedia in parks and reserved areas, mass media centres and broadcasting and TV. They did not indicate generally a preference for using the maps (7.4%) in their work but these were kept in libraries.

There were 3.91% of respondents who used digital images on the job, while 46.1% said they did not use digital images at all in meeting their work-related responsibilities. Among those surveyed, the majority currently use digital images for their work, suggesting that digital images are a major, commonly-used digital resource for today's a quiet 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, this is because most of their work deals more with the financial and business aspects and [do not] "have a need to access digital images with any frequency in order to perform my duties."

Most professionals in the study used digital images for a variety of needs as indicated in Table 2. As in the previous section, most survey respondents (53%) said that they used digital images. Of those who reported using digital images in their work, the majority needed them for: conservation purposes (37%); IT/technology-based jobs (18%); training and educational programs (16%), research (15%), and personal use (14%). Interestingly, the main purpose of use in conservation and preservation was for documents 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 practised for oral presentation or lectures, communication with other professionals and photographing examples from the originals.

The search strategies and preferences of professionals are identified. Those professionals who used digital images in their work were mainly in research centres, academic institutions and mass media centres. The responses to" Internet Search Engine" and "Other Links on the Websites" were that these were always used, followed by "Artists/Commercial Dealers" and "Personal Websites". The responses to "Commercial Image Collection Database" and "CD-ROMs" were all chosen with about the same frequency. A total of 90.5 professionals said that they always used an Internet Search Engine mainly Google and yahoo. The second most-used tool for searching digital images was (91%) "other links provided with websites"(32%). Interestingly, about 78.5% of respondents said that they never used either commercial image collections or database sites) or the personal websites of individual artists or dealers (65.5%), or websites (47.9%) or links provided by website(44%), while slightly fewer respondents said that they sometimes used CD-ROMs (53.2%).

Table 2: Distribution of Professional Respondents by Resource Needs / Memory Institution

	Originals	Catalogues/ Citations	Books/Journ	Maps	Digital images	Photographs	Multimedia	CD ROMs
Research Centre	14	26	34	6	25	18	4	11
Culture/Folkloric Centre	15	2	10	0	0	5	0	2
Academic Institution	0	23	36	0	13	0	6	11
Documentation/information/Centre	6	24	23	0	0	0	0	9
Herbaria /botanical garden	7	10	10	3	0	3	0	3
Museums	9	0	2	0	0	0	0	0
Archives	10	14	14	0	0	0	0	0
Libraries	0	76	76	10	0	0	0	0
Broadcasting and TV	0	0	0	0	0	0	11	0
Mass Media Centres	0	0	12	0	23	23	12	12
Parks and Reserved Areas	2	0	0	2	10	12	12	0
Cumulative Need Count	63	175	217	21	71	61	45	48
%Need	22.2	61.6	76.4	7.4	25	21.5	15.8	16.9
Cumulative No Need Count	221	109	67	263	213	223	239	236
% No Need	77.8	38.4	23.6	92.6	75	78.5	84.2	83.1

Benefits of using digital technology

The survey results include data on the perceived benefits of the use of digital products by the professionals surveyed. Respondents were asked to indicate the degree to which they agreed or disagreed with a series of statements about digital images including: ease of use and editing; accessibility; interactivity; image selection and distribution; text information; and protection for the originals. The responses to these statements related to the benefits of the use of digital images. The results suggested that most respondents chose ratings between Neutral and Agree for the statements. Respondents (65.5%) chose "Easy to access instead of going to storage/library facilitates my work" as their top choice. Their second choice (57.8%) was "Easy to reproduce/copy digital images" and their third (52.1%) was "Adequate delivery Speed"; their fourth choice (52.1%) was "Easy to manipulate/edit digital images". In addition 46.8% responded that "The quality of digital image resolution is adequate"; 38.4% responded that "the lowest amount of digital images online databases/ website is adequate," followed by "Digital images prevent wear and tear on the original" (37%). These results reveal that respondents believed that the quantity of digital images available on websites and databases to the public is insufficient. Interestingly, the respondents chose "Neutral" as their response to this prompt. But results by memory institution also showed that the those that benefit most are libraries, academic institutions, research centres and mass media while cultural centres, museums, parks and reserved areas benefit least.

Barriers and problems in the use of digital technology

The survey results also include data on the barriers and problems perceived by professionals in the use of digital images on the job. Such 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 rights and permission. The results suggest that most respondents chose ratings between Neutral and Agree for "Management permission such as copyright fair" (95.4%). There are not enough staff and/or instruction on searching and using digital images in memory institutions (89.8%) and not enough computer equipment and /or software tools (80.6%) to use digital images more effectively at work. Technical problems (78.2%) and weak incentives (71.5%) to discharge the work efficiently or run smoothly, in addition to the high cost of acquiring digital collections (68.3%) are barriers to use. Additional barriers are attitudes to change (41.2%), low delivery speed (36.3%), inadequate databases and websites (18.3%) and the quality of information offered by digital image collections and databases are not reliable (16.5%).

Memory Institution clients

Neither archives/libraries/museums nor memory institutions are established for their own sake. These institutions are established to serve society and clients. If we would like to evaluate the importance of our institutions we should measure our importance for the clients and our influence on society. They are considered as actors in the digital data collections universe.

Characteristics of the clients

A total of about 400 questionnaires were distributed (340 (85%) were sent online to the email addresses collected from different clients who agreed). Of these 109 (32.1%) answered directly, 231 (67.9%): within Khartoum State 187 (55%), outside Khartoum State 69 (20.3%),and some African countries 31 (9.1%) and Arab countries 53(15.6%).

Similarly to the survey of professionals, based on the data collected there was a significant difference in the number of males and females clients: 204 (60%) were female and 136 (40%) were male. Of the 340 respondents 16.5% reported being between 10 and 20 years of age, 36.5% of age 21-30 years , 22.1% age 31-40, 13.2% age 41-50, 7.9% age 51-60, and 3.8 % over 60 years of age.

The levels of educational attainment: the majority of clients (94.3%) are university students and graduates and few are manual workers in handicrafts or workers in traditional industries, with 2.6% with basic or primary education and 2.9% with secondary education. The results indicated that 27.6% were university undergraduates and 77 (22.6%) holders of PhDs, followed by MA/MSc (19.7%) and BA /BSc (13.2%); 19.3% have a higher diploma and 0.9% a middle diploma. The results indicated the stimulus of education levels for digital technology, specifically in higher education institutions masters and doctoral holders who are spread throughout the country as result of the higher education revolution. The main categories of clients are classified according to the major categories of general knowledge which are currently followed in science and technology. Figure 2 indicates that they are specialized in Information and Communication (23.2%), Folklore and Arts (18.2%), Applied Sciences and Technologies (15.3%), Information and Communication Technologies (10%), Archives and Libraries (13.9%), History and Archeology (8.2%), Natural Sciences (6.2%) and Economic and Social Sciences (5%).

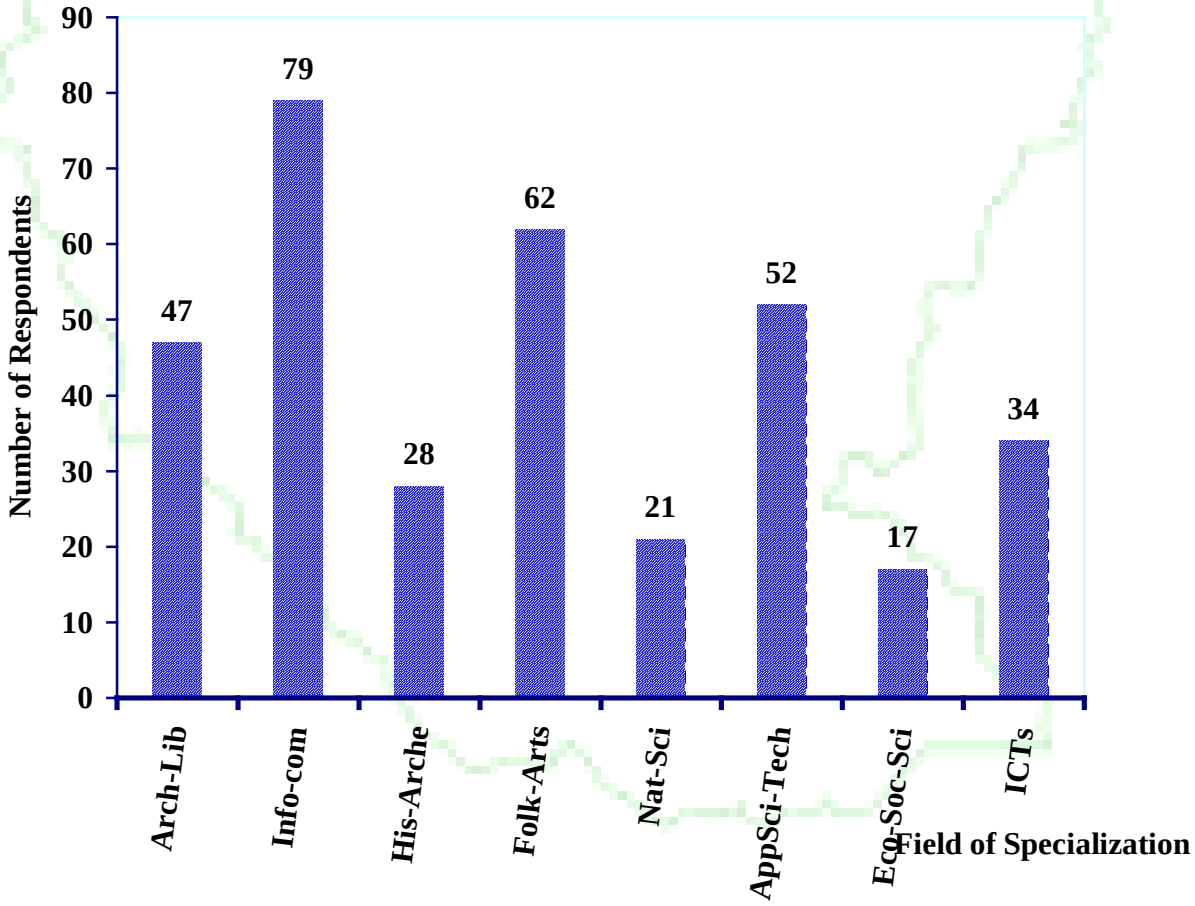

Figure2 : Distribution of Client Respondents by Field of Specialization

The very high percentage of the clients who visited libraries and Documentation and Information Centres (83.8%) provides access points to the Internet for members of their communities and also the support and skills development which are essential to effective use of the infrastructure and achievement of empowerment; cultural and folkloric centres and archives facilitated the accessibility of information for all where institutions were targeted by specialists to expand awareness and availability of their collections for their audiences.

The Sudan has been encouraging and facilitating the use of ICT services nation-wide, and attracting investors and partners in some ambitious nation-wide projects to mobilize its resources by establishing the Sudan Digital Solidarity Fund. The digital gap could be narrowed through national processes. It is becoming crucial for the competitive advantage of individuals to facilitate the adoption of computers and the Internet as low cost, user-friendly information delivery tools and functionality for all forms of electronic communications. At the same time the cost of the information and communications infrastructure is dropping rapidly. Computer and Internet literacy programs are run continuously which made login to services easy from any access point.

Users either access the Internet or use computers from their homes or offices or Internet service centre "cafés". The results showed the preference of clients for Internet and computer access from their computers at their homes (70% computer, 67% internet) and offices (48.5% computer, 44.7% internet). Their experiences in use of computer varies from 1-5 years (154, 45.3%) to 6-10 years (143, 42.1%).

As part of this analysis, the authors examined, as shown in Table 3, the relationships between client respondents' gender, age and educational level per access point. The development of ICTs gave enormous opportunities for women ("females") who have become an integral part of the knowledge society and play key roles in the Sudanese society. It ensures that educated women are empowered and ensures their full participation on the basis on equality in all spheres of society and in all decision-making processes. It was noticeable that the gender perspective indicated equality in higher education and used ICTs as a tool, which was easy through a home access point, as well as the support and skills development which are essential to effective use of the infrastructure and achievement of empowerment.

The research revealed that youth aged 20-30 years are central to the information society. These clients were heavily represented in almost every category of information society and spent between 2-3 and 1-2 hours daily in use of computers or the Internet or both. The majority (49.4%) of these clients described themselves as having an intermediate level of computer skills; 25.9% of respondents indicated that they are at intermediate level of Internet skills; and 24.7% said that they are novices in the use of software tools. It was noticeable that the level of experience with Internet searches or use was directly proportional to the use of the computer. Only 40% consider themselves to have a intermediate level of experience, 35.6% an expert level of experience, and 24.3% a novice of experience in Internet searches. The authors also examined the difference between respondents' gender, age and educational level and their level of computer and internet expertise. Not surprisingly, females showed distinguished levels in computer and internet expertise while the 21-30 age group reported the highest level of computer expertise. Expectedly, the youngest undergraduate and new graduate clients tended to use the computer more than older ones and more efficiently.

Table 3: Distribution of Client Respondents by Age/ Computer and Internet Access Points

Age	Home			Office			Internet Service Centre		
	Computer	Internet	Computer +internet	Computer	Internet	Computer +internet	Computer	Internet	Computer +internet
10 - 20	31	28	28	9	9	9	25	31	25
20 - 30	73	70	70	45	40	40	58	58	58
30 – 40	63	59	59	56	48	48	7	7	7
40 – 50	39	39	39	29	29	29	12	12	12
50 – 60	27	27	27	24	24	24	0	0	0
Over 60	7	7	7	2	2	2	0	6	0

Actual utilization of Internet Resources

This longitudinal study has been ongoing to look at the impact of the Internet associated with information searching and access behaviour, based on the scale used in the survey instrument rating from "always" to "rarely" to indicate the rate of use of internet as in Table 4 below. Email was the best known resource used by clients (68.2%), followed by strengthening online dissemination and access to information and knowledge, and utilizing new information and communication technologies via full text databases, i.e., electronic publications. Some respondents showed the same frequency of use for News (37.6%) and Chat (37.9%); Dgroups/blogs (27.4%), followed by photographs (24.7%) and e-mails (24.1%) respectively. Some resources, such as maps, photographs, multimedia and catalogues/citations were very rarely used. This was probably because some clients were not aware of which resources to choose and therefore were more likely to know about some of these resources than others.

Table 4: Distribution of client respondents by rate of use of Internet resources

Internet Resources	Rate of Use							
	Always		Frequently		Rarely		Missing	
	F	%	F	%	F	%	F	%
Email	232	68.2	82	24.1	14	4.1	12	3.5
News	33	9.7	128	37.6	60	17.6	119	35
Dgroups/Blogs	31	9.1	93	27.4	56	16.5	160	47.1
Chat	58	17.1	129	37.9	38	11.2	115	33.8
Catalogues/Citations	56	16.5	42	12.4	23	6.8	219	64.4
Publications	198	58.2	34	10	7	2.1	101	29.7
Maps	6	1.8	58	17.1	16	4.7	260	76.5
Photographs	24	7.1	84	24.7	66	19.4	166	48.8
Multimedia	41	12.1	67	19.7	41	12.1	191	56.2

The main purpose of the use of Internet sources is currently shown on a scale from high to low, to increase and diffuse knowledge among the public. The results reported high interest for use of the Internet for educational purposes (48.5%), followed by official use (37.6%) for work and studies, for cultural purposes (23.5%) and research (22.6%). Clients showed very low interest in investing in the Internet for advertising, commercial, recreational, art, religious and social purposes. Some respondents believed that they could do their work without the Internet

The World Wide Web, commonly referred to, as the "Web" or the "Internet" has become a major communication medium and is popular with the public because it provides clients with the freedom to browse at one's own pace and make information accessible. The website provides institutional information as well as access to web resources. Browsing through a website is strikingly similar to the "grazing" behaviour that clients engage in, moving from attraction to attraction, not always adhering to the programmed route. The goal of information retrieval systems (IRS) is to find, within a large database of documents, those documents which satisfy a user's information need. With the explosive growth of distributed information, and linguistic resources on the World Wide Web, IRS have become crucial for the client to find, retrieve and understand relevant information in any language. Moreover, with the increase of online non-English documents, cross-language information retrieval systems have become increasingly important in recent years and provide a query in one language and the search of document collections in one or many languages.

The degree of reliability and usefulness was scaled "very", "rather" and "not". The results indicated that the "very" useful and reliable websites are English (53.5%), followed by Sudanese (42.6 %), Arabic (16.2%) and French (11.5%). Some indicated they were rather useful and reliable for Sudanese materials, followed by Arabic and English, but the range 0.6-10.6 % indicated that the Sudanese, Arabic and English material was not useful or reliable. These results were encouraging for building Sudanese or a local content management systems.

In this era of proliferation of web services, useful web services can be planned based on subject-set information. Two words appearing in the subject sets of the same community are a good indication that they are closely related. But it is still the apperception of the clients which is considered as the main consumer for Internet resources. The results revealed that 62.4% of the client respondents did not show any interest to answer this question. This may be because of laziness or the barriers which are mentioned in the previous section.. Those that indicated their preference for clients to host their information on the Internet are about a third of the respondents 37.6%.

All information and communication networks are brought together as the Internet and intranet. The Internet and intranet are based on an open architecture that allows growth exponentially. Sometimes one refers to users' ability to connect to the Internet in different places, but not necessarily move while they use the Internet. For example, a laptop computer that is connected to the Internet using a modem, a cable and a telephone line is a nomadic device. A nomadic device does not need to be wireless. Instead, mobile end-user terminal devices in practice must be wireless and portable. ICT infrastructure with a sufficient number of networked and Internet-connected workstations will be essential in order for memory institutions to offer access to e-resources and develop e-services which affect e-initiative areas in the present and future. Some services themselves change their behaviour depending on the mobility of users or clients. Digitization and networked communication technologies represent several paradigm shifts in the social conditions of memory institutions.

The scope of initiatives like this can range from the digitization of specific collections of materials to elaborate state or national institutions devoted to developing innovative technologies for providing a range of information services. Both the modest and the large-scale versions aim at high quality digital content, and its selection, design, management and preservation, and user-friendly tools to ensure its widespread availability and usage. The survey results indicated that e-initiatives under development and in process have been currently aimed at e-culture (11.5%), e-heritage (5%), e-learning and e-library (3.8%), e-archives (3.5%), e-"others", not identified (2.6%), e-government and e-commerce (2.1%), e-literacy (1.2%) and e-strategy (1.2%). There is still a wide gap in this area and not a clear vision. The most critical features in the national public's common awareness, as indicated in their views of the future, were e-others (43. 5%), e-heritage (21.8%), e-culture (14.7%), e-archive (11.8%), e-science (10.9%), e-learning (10.3%), e-government (10%), e-commerce (9.7 %) , e-library (8.8%), e-museum (7. 6%), e-literacy (3.2%), e-health (2.6 %) and e-strategy (0.3%), with little growth from the present.

Barriers and problems in accessibility of Internet resources

The results also provided data on the barriers and problems perceived by clients in accessing information or material from the Internet. Such perceptions were rated by the respondents in terms of the following categories: high cost of acquiring of digital collections; not enough time to access internet; unreliable information offered; language; restrictions and permission; weak infrastructures; limited money and shortage of training. The rating scale used was: "agree", "neutral" and "disagree". The results suggested that most respondents chose ratings between "Neutral" and . The three top barriers were "Shortage of Training" (65.9%); restrictions and permission (54.4%), language (36.5%); followed by high cost of acquiring of digital collection

(29.4%); not enough time to access internet (25.9%); for the minor group who are busy in their study or work, limited money(25%); weak infrastructure (13.5%); and unreliable information (6.5%). It is clear from these results that no conditions were attached to charges regarding the accessibility of information or infrastructures.

Building Digital Memory of the Sudan "DMS"

Digital technologies are undergoing rapid and continuing development and many issues are unresolved, giving rise to a deluded 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 "when", or "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 the access to and the preservation of cultural and scholarly resources. There are a considerable number of guidelines that have been produced with specialized working groups of the International Federation Library Associations and Institutions (IFLA), the "International Council for Archives", 1st International Council of Museums, International Telecommunication Union, World Heritage Digital Library, and others within the UNESCO strategy of knowledge for all. These 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 detailed guidelines are aimed at decision makers, memory institution managers, and curatorial and technical staff members, particularly those in institutions which satisfy a large and more diverse population. This may assist in seeking partnerships with other institutions to capitalize on the economic advantages of a shared approach and to take advantage of financial opportunities, as for example the likelihood of securing funding to implement a programme, or of a particular initiative being able to generate significant income.

This DMS planning will be based on UNESCO (24) initiatives in sustainable digital archival and preservation system, which are

- establishing sustainable national digital repositories and preservation plans for integration of services to develop a sizeable integrated platform for Digital Memory Sudan;
- facilitating access to valuable information, which is what drives all the plans and strategies associated with digital preservation;
- adoption of repository software systems; and
- measurement of success, validity, value, and usage of a sustainable digital repository i.e. sustainable knowledge.

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 DMS, we 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 who are interested in cultural, historical, and heritage contents. The DMS development is a very challenging task but it will attempt to be a beneficiary of, and guided by, the multiple kinds of technologies which are utilized

to make possible the dynamic retrieval of valuable resources as well as the dynamic management of various system components including collections, archives, policies, users, evaluation and news.

The most important component here is clearly "Collections" because content is of overriding significance in any Digital Memory institution, and technology is only the tool. In order to build more content, GMNet is a truly 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 the 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 an incentive for Sudan. Since 2003 the University of Khartoum has developed in-house Linux/MySQL/ PHP-based platforms on open standards which will lead to carrying out upgrading compatible with and suited to the interactive Multimedia Content retrieval System (i-M-C-S) with many added functionalities.

In addition to our international collaboration in the collection/technology development areas, there are extensive community building efforts to include the provision of research and development and education and 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 applications. All these have enhanced the capabilities of i-M-C-S system. But what is more important is to motivate and actualize the contribution from institutions in terms of DMS. These are some suggestions for implementation of DMS:

- Design a pilot to integrate the access of distributed knowledge on Digital Cultural Content, focusing on the right added value for the users;
- Set up guidelines for building business, new investments and attract resources to enlarge the community and the results;
- Integrate and reuse accomplishments achieved within the nation;
- Develop an innovative financial structure approach to attract new funds in order to empower the results;
- Introduce an ontology spectrum consisting of taxonomies, thesauri, and conceptual models of the memory institutions, context and practices;
- Encourage the usage of voice applications based on VoiceXML technologies, which are easy to use for illiterate people for documentation of oral intangible heritage and also a good facility in communications networks;
- Combine ICT infrastructure and skills development with capacity building and a range of social and environmental activities empowering the local community for sustainable development;

- Design and build institutional intranet and Internet sites based on content management and shared memory systems;
- Establish multi-functional servers by interchange and management of DMS content.

Conclusion

Finally we can conclude that there are no magic wands or pansies in our world: human memories fade, can be completely lost when people die; events can be forgotten; there are also causes of storage failures and damage of fragile physical media and memory devices. But thanks to careful work, our memory institutions have always been an integral part of societies and recorded 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.

This study has revealed the ways in which users are currently using digital technology images to perform their jobs effectively and efficiently after identifying the positive and negative uses of digital images. Advances in digital technologies create new interesting ways among professionals and provide them with mechanisms for extraction 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 UNESCO and Global Memory Net initiatives.

Acknowledgement

We maintain our great appreciation and respect for all professional signs of documentary work as well as Information and Communication technologists in the Sudan for valuable work. We extend our thanks to the National Centre for Research for financing research, the Sudan Academy of Sciences Information and Communication PhD Programme to run this research, workforces in Memory of World, Memory of Arab World; and also the Network of Syrian Scientists, Technologists and Innovators Abroad (NOSSTIA) for their willingness to share their information and experiences.

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