

Integration of Sustainable Development by Digital Documentary Heritage Industry: A New Synthetic Model of Integration as Learning and Potential Research Direction

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Abstract

Purpose – The primary purpose of this paper was to assess the status of digital documentary heritage management in Malaysia. The following research objectives were addressed: investigate digital documentary heritage management in information institutions, find out the content which is prioritized for digital preservation, describe the challenges of digital documentary heritage preservation management and propose a framework to address challenges of digital heritage preservation in Malaysia.

Design/methodology/approach - Concept mapping is used to illustrate the relationship between the sustainable development and digital documentary heritage frameworks. A concept mapping is a structured conceptualization or process, focused on a topic or construct of interest, involving input from one or more participants, that produces an interpretable pictorial view (or concept map) of ideas and concepts and how they are interrelated; in this case, mapping the relationships between barriers of DDH and the DOI theory, TOE framework and the DELOS digital library reference model.

Findings – Results revealed growing awareness among institutions with statutory responsibility for heritage management about digital documentary heritage preservation in Malaysia through the support of international agencies, civil societies and governments. The findings revealed several challenges hampering digital documentary heritage preservation management: weak policy and regulatory frameworks, limited capacity, inadequate government support and limited connectivity and bandwidth.

Originality/value – This paper presents an integration of sustainable development by digital documentary heritage industry especially related to Malaysian context.

Keywords – Documentary heritage, Manuscripts, Digital documentary heritage management, Sustainable development, Malaysian libraries.

Paper type–Literature review

Introduction

UNESCO (2010) defines documentary heritage as items that are moveable; made up of signs, codes, sounds and images; capable of preservation; reproducible; and they are products of deliberate documentation process (Mkuwira, 2015). A further definition is given by Edmondson (2015) who describes documentary heritage as comprises those single documents – or groups of documents – of significant and enduring value to a community, a culture, a country or to humanity generally, and whose deterioration

or loss would be a harmful impoverishment. The significance of a document may become clear only with the passage of time. For each state, its documentary heritage reflects its memory and identity, and thus contributes to determining its place in the global community. This definition is close to that of Robert (2016) who defines heritage as “our legacy from the past, what we live with today and what we pass on to future generations”.

The first serious discussions and analyses of the causes of natural damaged of world documentary heritage emerged during

the 1880s with the printer and bibliographer William Blades published "The Enemies of Books". Among the enemies he described are fire, water, gas and heat, dust, ignorance and bookbinders. In 1949, Suzanne Briet, a conservator at the Bibliotheque Nationale in Paris, published a report on Bibliothèques en détresse (Libraries in distress). UNESCO has made initiative to published the inventory of the damage caused by the war. At the time, the organization was primarily concerned with rebuilding libraries and restocking them. Since the time, many other disasters have hit the library world and in many cases no effort has been spared to compensate for the losses.

Statement of the research problem

The motivation for investigating the subject of digital documentary heritage preservation management in Malaysia is lack of knowledge of Digital documentary heritage management (DDHM) implementation among librarians, curators, archivists and information professional. According to Pandey (2020), lack of expertise or limited technical knowledge was one of the key challenges in digitization. Manaf (2010) found that limited knowledge was a factor affecting digitization initiatives at the initial stage among Malaysian cultural institutions. The traditional libraries should be developed as a well-equipped and interconnected as digital libraries to fulfil the need of new generation whose demand for information is never. The concept is accepted all over the world in 21st century that the information is for use and for all then the libraries, museums and archives should be for all. For all those who seek for information, the information institutions must become universal open. Stresses that the multimedia nature of the next generation of digital libraries requires the digital librarians to be essentially a type of specialist librarian who has to manage and organize the digital library, handle the specialized tasks of massive digitization, storage, access, digital knowledge mining, digital reference services, electronic information services, search co-ordination, and manage the archive and its access.

Research objectives

The main research objective of this study was, therefore, to assess the status of digital documentary heritage preservation management. The following four were specific research objectives:

- (1) Investigate the development of digital documentary heritage management in libraries, museums and archives.
- (2) Find out the content which is prioritized for digital preservation.
- (3) Describe the challenges of digital heritage preservation management in libraries, museums and archives.
- (4) Propose a framework to address challenges of digital heritage preservation in Malaysia.

Documentary Heritage Industry as Integrator of Sustainable Development

Documentary heritage represents a huge proportion of the world's cultural heritage. Many of these resources have lasting value and significance, and therefore constitute a heritage that should be protected and preserved for current and future generations. Manuscript can be categorised as one of valuable asset and historical documentary heritage. UNESCO established the Memory of the World Programme in 1992. Impetus came originally from a growing awareness of the parlous state of preservation of, and access to, documentary heritage in various parts of the world. War and social upheaval, as well as severe lack of resources, have worsened problems which have existed for centuries. The vision of the Memory of the World Programme is that the world's documentary heritage belongs to all, should be fully preserved and protected for all and, with due recognition of cultural mores and practicalities, should be permanently accessible to all without hindrance. As of December 2018, 381 documentary heritages had been inscribed in the Register, with 274 of these from Europe and North America and 116 from Asia and the Pacific as could be seen in **Figure 1**.

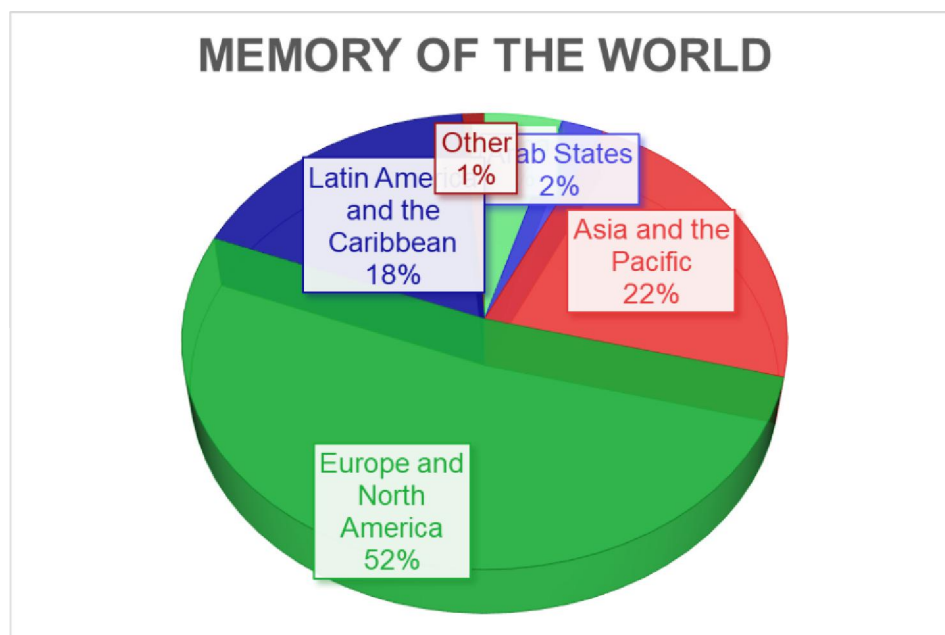


Figure 1: The Statistic of Memory of the World as of December 2018

Over the past century, there has been a dramatic increase in the world documentary heritage lost by acts of war, bombardment and fire, whether deliberate or accidental. In the 1990s, Van Lit (2019) pointed to some of the lost memory in which war, in particular the two world war, caused considerable losses, numerous libraries and archives has been destroyed and badly damaged in the course of fighting, notably in France, Germany, Italy and Poland. War has also been the source of

untold destruction to libraries and archives in the former Yugoslavia since 1991. Shelling by gunners of the National and University library of Bosnia and Herzegovina started a fire that burned down the building and destroyed most of the collections. Many books in the library had been salvaged from the collection in libraries that were damaged during World War II. The list of the world documentary heritage lost could be seen in the **Table 1**.

Table 1: The list of world documentary heritage lost.

| Year | Country | Building | Reason for damaged | Total lost |
|-----------|-----------|--|--------------------|--|
| 1904 | Italy | Biblioteca Nazionale Universitaria di Torino | Fire | Manuscript department |
| 1914 | Belgium | Library of the Catholic University of Louvain | World War I | 300,000 volumes, 1000 incunabula, and hundred of manuscripts. |
| 1923 | Japan | The Imperial University Library in Tokyo | earthquake | 700,000 volumes, hundred of manuscripts, picture scrolls and old prints. |
| 1931 | Nicaragua | Biblioteca Nacional | earthquake | Most of its stock |
| 1932 | Spain | University of Valencia Library | Spanish Civil War | Most of the collections |
| 1937-1945 | China | National University of Tsing Hua, University Nang-kai, | Sino Japanese War | 200,000 of collection, 224,000 volumes ,Most of the collections |
| 1937 | USA | Ohio, Indiana | Floods | Most of the collections |

| | | | | |
|-----------|----------------|--|-----------------|-------------------|
| 1938-1945 | Czechoslovakia | Prague National University Library | Fire | 2,000,000 volumes |
| 1939-1945 | Poland | National Library of Warsaw | Fire | 700,000 volumes |
| 1939-1945 | Germany | University Library of Wurzburg | World War II | 550,000 volumes |
| 1940-1944 | France | National and University Library | Fire | 800,000 volumes |
| 1940 | Belgium | Library of the catholic University of Louvin | Fire | 900,000 volumes |
| 1940 | Netherland | Provincial Library of Zeeland | Water/Fire | 160,000 volumes |
| 1940-1944 | Italy | University Library | Air raid | 200,000 volumes |
| 1940-1941 | United Kingdom | British Museums | Bomb | 200,000 volumes |
| 1941-1944 | Soviet Union | Russian Libraries | German invasion | 100 million books |
| 1966 | Italy | Florence | Flood | 200,000 volumes |
| 1986 | USA | Los Angeles Central Library | Fire | 700,000 volumes |
| 1994 | Great Britain | Norwich Central Library | Fire | 350,000 volumes |

The Concept of Malay Manuscript

Since the early days when the Malays first learned how to write particularly during the period when Islam penetrated into the Malay world, thousands of Malay manuscripts were produced covering a wide range of subjects spanning from literature, history, religious Islamic teachings, medicine, to court customs and beliefs reflecting the rich cultural heritage and high intellectual attainment of the Malays (Mariani, 2001; Makmur et al, 2018). The data locked up in them offer an abundance of knowledge for a proper understanding of the cultural history of the Malay world. The manuscripts were considered as a prized collection to the European collectors (Ding, 2014). It was given as gifts by the Malay rulers to the colonials as a symbol of friendship. Malay scribes were paid to copy valuable works of literature for their keep. Many of the early manuscripts, some of which are of considerable importance and interest, were transported to the country of origin of the colonials and eventually found themselves housed and preserved in repositories outside the Malay world.

It should be noted that paper acidity, ink, pests and the natural environment are the factors which cause disintegration and

damages to the manuscripts (Naoko, 2016). Human negligence and ignorance of preservation procedures and standards are also to blame. It is well known that manuscripts stored in damp, hot and badly ventilated storage areas are prone to pests, bacteria and fungi growth. Unfortunately, this is the normal condition of storage for manuscripts in private collections. Preserving Malay manuscripts in the hands of families pose a problem. They are usually stacked in cupboards or left lying in dark corners unattended, mistakenly regarded as an old reading material of no significant importance upon the death of their owners' years before. Left in such a state it becomes a prey to household pests of which are favourites of cockroaches and silverfish. The current owners who are ignorant to its value should be approached and persuaded to part with their precious heritage, either as bequest or surrendering ownership through purchase by interested institutions, for purpose of proper preservation, documentation and future access. It may be a huge sacrifice on the part of the new owners but one that will be appreciated by posterity (Mariani, 2001; Amer, 2017). The **Figure 2** shows the factors that caused the deterioration of Malay manuscript.

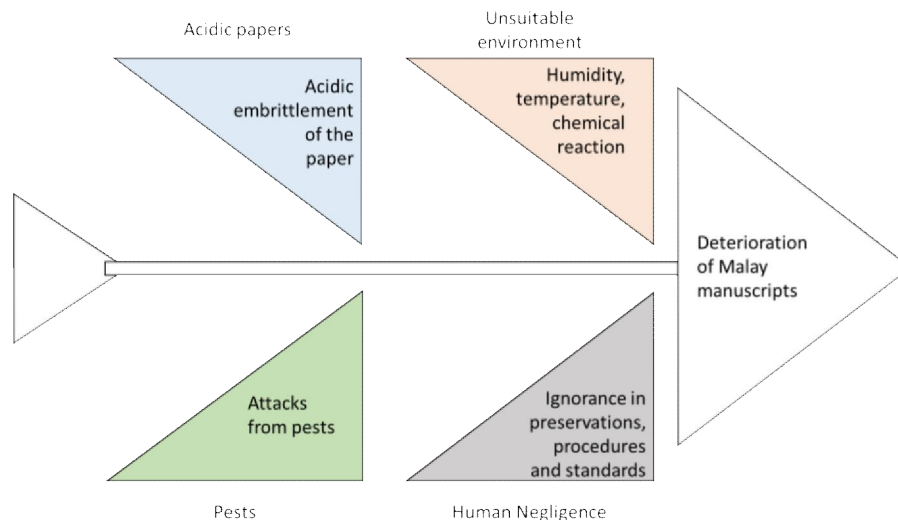


Figure2: The factors that caused the deterioration of Malay Manuscript (Mariani, 2001, Amer, 2017)

Awareness of the impending total destruction of the manuscript is not sufficient. If the problem of preservation persists and not addressed immediately, libraries may lose the documentary heritage of the nation through indifference in attitude towards these fragile but valuable material (Mariani, 2001; Samsu, 2021). Librarians need to develop effective means to preserve the manuscripts and to prevent further deterioration. Libraries which have been bestowed the responsibility to collect this precious material should include conservation and preservation aspect in their collection management policy. This involves conservation expertise and cultivation of a love towards these old, dirty and fragile looking documents. Proper storage conditions which are conducive to prolong the lives of the manuscripts are prerequisites of conservation. The best storage situation is creating an area with optimum temperature of 20°-25° C (600-70° F) and humidity at 55-65 %, if possible, with 24 hours air-conditioning. The recently acquired manuscripts are fumigated prior to storing them with the rest of the collection as a preventive measure of spreading destructive agents. After controlling the temperature and humidity level, it is vital that the manuscript is placed in an acid-free box as an assurance of delaying or even stopping the deterioration process. Manuscripts which show signs of disintegration should immediately be repaired and strengthened.

Proper handling is another factor which can prolong their life span. Researchers should be made aware of the correct method of handling manuscript, if the use of original

copy is necessary (IFLA Rare Book and Special Collections Section, 2014). Microfilming the collection is another way in preserving the information. It is advisable that each manuscript acquired by any institution be reproduced in a microfilm copy, one to be kept as master copy and another one for reference use. By doing so, the original manuscript can be prevented from repeated reference as it will hasten damage through constant handling. At the same time, it is also preferable to produce paper print from the microfilm to meet the demands of researchers (Ding, 2014).

Recent efforts made by various government institutions in Thailand, Laos and Myanmar at preserving manuscripts in Buddhist temples in rural or provincial areas indicates the importance and urgency of preservation (Mariani, 2001; Amer, 2017). The method adopted is field preservation which means in situ preservation using appropriate technology and basic methods of preventive preservation. The documents are not removed from the original site. Thailand has aggressively carried out preservation of its traditional manuscripts. Chiang Mai University initiated a project called The Project for the Preservation of Northern Thai Manuscripts with the support of the Government of the Federal Republic of Germany. Its aims are to restore and preserve the traditional manuscripts, promote awareness of the value of the manuscripts and to establish a model for preservation and conservation activities by setting up institutions and network among scholars, monks and the public.

The onus of field preservation in Myanmar lies with National Commission for the Preservation of Traditional Manuscripts (Suleiman, 2013). Another mega project carried out in the region is The International Dunhuang Project which was established in 1993 to promote the study and preservation of manuscripts and printed documents from Dunhuang and other Central Asian sites through international cooperation. Its secretariat is The British Library in the Oriental and India Office Collections. Among its objectives are to develop new techniques for the preservation of original documents, promote common standards of preservation and documentation, stimulate research and increase access and share information on the Dunhuang project through the development of an international database (Hu et al, 2017).

Sustainable Development and its integration: Learning from Others Discipline

Building on the Millennium Development Goals set in 2000, 17 SDGs were formally adopted by all 193 member states of the UN in September 2015, aiming at ending extreme poverty, protecting the planet and ensuring prosperity for all by 2030 (UN, 2015). The SDGs expanded the agenda to include issues such as climate change, sustainable consumption, innovation and the importance of peace and justice, requiring all countries to take action, including those with high levels of development. Knowledge is usually fragmented in disciplines, in educational and professional environments, but interdisciplinarity can increase the ability to understand the complex challenges the world currently faces (Annan-Diab & Molinari, 2017). Integrating disciplines facilitates problem-solving as it promotes better understanding of each part that comprises a problem and fosters solutions which blend concepts from different disciplines. Interdisciplinarity enables “mutual development of the distinctive areas of expertise which different subjects may have to offer” (Summers, Childs, & Corney, 2005).

According to Clark and Wallace (2015), knowledge is classified as disciplinary (when disciplines work in isolation), multidisciplinary (disciplines working in parallel to address common goals), interdisciplinary (when disciplines work in

an integrated way) and transdisciplinary (when there are no limits between disciplines), being a discipline defined as “any comparatively self-contained and isolated domain of human experience which possesses its own community of experts” (Nissani, 1997). Interdisciplinarity is built on disciplinarity (Foster, 1998), as an individual must know at least one discipline for exploring new ways of thinking beyond its limits. For Dale and Newman (2005), sustainable development literacy “derives from a progression of disciplinary thought from both the natural and social sciences”. Burgess and Slonaker (1978) highlight the dynamics and openness of interdisciplinarity:

[Interdisciplinarity promotes] ways and means for blending wisdom and science, for balancing free association and intellectual discipline, for expanding and refining information, and for building a problem-solving culture that mixes ‘permanent’ with ‘transient’ membership, thereby remaining open to new membership and fresh ideas while retaining a capacity for cumulative learning that refines, clarifies, and simplifies

Rapid advances in information technologies have revolutionized the role of libraries, museums and archives. As a result, information institutions face new challenges, competitors, demands, and expectations. Information institutions are redesigning services and information products to add value to their services and to satisfy the changing information needs of the user community. Traditional libraries, are still handling largely printed materials that are expensive and bulky. Information seekers are no longer satisfied with only printed materials. They want to supplement the printed information with more dynamic electronic resources. Demands for digital information are increasing (Da Rosa, 2007; Peter, 2019). Because with this digital system, the information institutions can format information available from printed format to electronic or digital format. This is the answer for users who want that information packaged briefly, solidly and accurately. Ideally, every information institution takes advantage of technological sophistication information to support collection management.

It is one of the newest methods of managing information resources in the new information age, whereby information technology has assisted in making information

accessible to people even in their homes (Anuradha, 2017; Pandey, 2020). Via digital libraries, a person can: obtain access to information about library holdings worldwide through online public access catalogues; find both physical and digital copies of scholarly papers and books; refine searches, concurrently scan the internet, commercial records, and library collections; and store search results and conduct additional processing.

Contribution of Learning Theories of the Integration of the Sustainable Development

As we move towards knowledge society era, it is very important to provide services that are identified as a process of profound social change. Advances in computing and communications technology has and will continue to create new infrastructure for business, scientific research, and social interaction. This expanding infrastructure provides new tools not only for communication but also for acquiring knowledge and insight from information. Digital projects provide new and exciting opportunities for libraries to make their collections more accessible to researchers and to engage the public more directly and more compellingly with the documentary heritage of their communities and state.

One of the most significant current discussions nowadays in the world is Sustainable Development Goals (SDG) as stated in Goal 4 to ensure comprehensive and equitable quality education and stimulate lifelong learning leaving chances for all. In addition, access to information was recognized as a priority in SDG 16 with the objective to ensuring public access to information and safeguarding fundamental freedoms in compliance with national legislation and international agreements. Access information is essential for the empowerment of individuals, the effectiveness of policies, and the accountability of governments. When everyone can enjoy it, it is a driver of sustainable development across all of its dimensions. When it is absent, insufficient or unequal, opportunities are missed, decisions are poorer, and progress is stifled. Information institutions are vital in ensuring that everyone can benefit from access to information,

making stronger, fairer societies a reality for all. DDH is known as the medium to ensuring public access to information in line with SDG 16.

Many DDH initiatives focus on preserving various cultural heritages. Often, the initiatives comprise of various materials such as pictures, maps and paintings, and manuscripts are one of the materials included. Shafi (2004) listed some Western and Indian digital library of manuscripts initiatives; among others MASTER (Manuscript Access Standards for Electronic Records), The Digital Scriptorium (<http://sunsite.berkeley.edu/scriptorium/>), Oxford University Manuscripts, (<http://image.ox.ac.uk>), Medieval Manuscripts of Syracuse University (<http://libwww.syr.edu/digital/collections/m/Medieval>), The Bibliotheque National De France (<http://www.bnf.fr/enluminures/>), "Medical Manuscripts in NLM", "European Manuscript Server Initiative" (EMSI), and "Unesco Memory of World". Those projects have used photographic and digital methods to develop a full or partial archival copy of the manuscripts available on-line using different software with JPEG format for image processing in association with different metadata initiatives. Shafi (2004) argues that these attempts could be very useful in evolving a common strategy for digitization of vast manuscripts resources.

The proliferation of electronic information; the dwindling budget for acquisition of library stocks; the desire to access materials in remote locations; the quest for collaboration, partnerships and resource sharing; and the ever increasing cost of preserving analogue materials, and so on, are some of the forces that prompted digitization of archives and records (Anundhra, 2017; Pandey, 2014). The aim of digitizing library materials is for preservation and easy access by any user or researcher. Digitization improves access to library resources. By digitizing library collections, information will be accessible to all instead of a group of researchers. Digital projects allow users to search for collections rapidly and comprehensively from anywhere at any time. Digitization makes the invisible to be visible. Several users can access the same material the same time without hindrance. It also removes the problem of distance, as users do not have to travel to libraries that possess the hard

copies of library materials before they can access and use such materials (Ukwoma, 2019).

Based on the previous research on DDH, it was seen that there have been conceptualized and proposed several frameworks for the design, development, evaluation and interaction of digital libraries (Levy, and Marshal, 1995; Moen, and

McClure, 1997; Marchionini and Fox, 1999; Saracevic, and Covi, 2000; Fuhr, 2001, Candela et al., 2007). In this section a brief summary of Diffusion of Innovations Theory, Technology-Organisation-Environment (TOE) Framework and The DELOS Reference Model. This theory and model are closely aligned to exploring the factors underpinning these interactions.

| | Diffusion of Innovation Theory | | | Technology-Organisation-Environment (TOE) Framework | | DELOS reference model | |
|---------------------------------|--|--|--|--|--|--|---|
| | Maanja | Wu | Adnan | Eze et al | Ram | Xi et al | Singh |
| Tahun | 2005 | 2015 | 2019 | 2019 | 2019 | 2014 | 2020 |
| General bidang (specialization) | Library and information science | Information management | Information system | Business studies | Information system | Information management | Information management |
| Justifikasi Pemilihan Teori | Its potential application to information technology ideas, effects and techniques | Grounding on the R&V as an overarching theoretical basis and the IOT as a specific theoretical foundation | Assesses how, why, and at what speed new concepts and technology are communicated and adopted | TOE is a more robust theoretical foundation (Alshamali et al, 2013) which may have the capacity to unravel broad factors influencing the information behaviour of SMEs | TOE provided a robust theoretical underpinning to conceptualize various factors that drive the adoption of SD in construction, hence adopted by this study. | Researchers strive to identify a set of evaluation criteria for digital libraries. However, | Knowing what is needed and its importance help the libraries to not only know their current level of DL services but also direct their efforts to doing what is necessary for further improvement |
| Elemen atau Pembolehubah | Innovation, communication channel, time, social system | Technology, task, user, organization, and environment, IT unit, intra-organization, and inter-organization | Relative advantage, compatibility, complexity, trialability and observability | Perceived information need, Organization, technology, organization, environment, Determinants of perceived information need for emerging ICTs adoption decision making | Augmented SD-BIM integration, SD relative advantage, improved design and execution efficiencies, improved project management capabilities and Augmented availability | Collection, information organization, interface design, system and technology, effects on users services, user engagement, and context | Content, user, functionality, quality, policy and architecture |
| Metodologi | Qualitative | Quantitative | Quantitative | Qualitative | Secondary data | Quantitative | Quantitative |
| Teknik Analisis | Interview/Observation | Survey | Survey | Interview | Two key databases, i.e. Scisearch and Emerald | Survey | Survey |
| Unit Analisis (Responden) | Individual | Individual | Individual | Individual | NA | Individual | Individual |
| Dapatan | The study found out that despite the efforts to expand and modernize ICTs in the agricultural sector, its growth has been hampered by inadequate funding | Technology and environment has significant effect across all of the three innovation types | Competitive environment, complexity, ICT infrastructure, observability, relative advantage, regulatory environment, ICT skill, and top management support had a significant influence on the adoption of cloud ERP | Technology context related determinants represented 70 percent of the total supporting cases, organization context related determinants | The study proposes a set of five antecedent factors explaining the adoption of SD in construction encapsulating technology, organization and environment context | Comprehensive examination of users' perception of evaluation criteria across different dimensions of digital libraries. The | There were a few substantial overlaps between constructs, and this has to be refined as coding is an on-going organic process |

Figure 3: Matrix for Research Theory Selection (Main/ Basic)

1. Diffusion of Innovations Theory by Rogers (1983)

The diffusion of innovation (DoI) theory is essentially a social process in which subjectively perceived information about a new idea is communicated and rests on the premise that a new idea, practice or object has perceivable channels, time and mode of being adopted by individual or organisations (Rogers, 1983). This theory is widely used to study the adoption of innovations such as the Internet and other ICTs (Rogers & Scott, 1997). To understand the theory, it is important to examine the concepts on which it is built. Diffusion is a special type of process of 'communication by which an innovation in the form of new ideas, practices or products, is spread, through certain channels, over time, among the members of a social system' (Rogers & Scott, 1997). From this definition, there are four main concepts namely innovation, communication channel, time and social system, which form the four major elements of the diffusion process.

An innovation is an idea, practice or

object that is perceived as new by members of a social system (Rogers & Scott, 1997). Innovation theorists postulate that certain characteristics determine the rate at which an innovation is adopted by a social system, and these characteristics include relative advantage, compatibility, complexity, trialability and observability of the innovation (Rogers & Scott, 1997). Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. The degree of relative advantage may be measured in economic terms, prestige, convenience or satisfaction. Accordingly, the greater the perceived advantage, the faster its adoption (Rogers & Scott, 1997).

The second element of the DoI theory, Communication Channels, refers to the means by which messages about an innovation are transmitted among members of a social system (Rogers 1995). Information regarding the innovation has to be disseminated so as to introduce the innovation, form or change attitudes, influence decisions regarding the innovation and support the evaluation of the

innovation (Rogers & Scott, 1997). Interestingly, the major channel of communication about ICTs has been these technologies themselves. The third element is ‘time of diffusion’, which focuses on three dimensions namely, the decision-making processes, an individual’s innovativeness and the rate of adoption (Rogers, 1995).

2. Technology-Organisation-Environment (TOE) Framework by Tornatzky and Fleischer (1990)

The technology–organization–environment (TOE) framework is described in Tornatzky and Fleischer’s *The Processes of Technological Innovation* (1990). He describes the entire process of innovation – stretching from the development of innovations by engineers and entrepreneurs to the adoption and implementation of those innovations by users within the context of a firm. The TOE framework represents one segment of this process – how the firm context influences the adoption and implementation of innovations. The TOE framework is an organization-level theory that explains that three different elements of a firm’s context influence adoption decisions (Baker, 2012). These three elements are:

2.1 The technological context

The technological context includes all of the technologies that are relevant to the firm – both, technologies that are already in use at the firm as well as those that are available in the marketplace but not currently in use. A firm’s existing technologies are important in the adoption process because they set a broad limit on the scope and pace of technological change that a firm can undertake (Collins et al. 1988). Innovations that exist but are not yet in use at the firm also influence innovation –both by demarcating the limits of what is possible as well as by showing firms ways in which technology can enable them to evolve and adapt. In a study by Jia et al (2017), she emphasized that the “technological” context is meant to consider technologies within and outside an organizational ecosystem which influences organizations to adopt and use the available latest technologies, and deploy change. An organization considering adopting new technologies will look at the benefits of the technology and how its adoption will enhance efficiencies and add value to its

operations (Baker, 2012). As such a host of factors including, but not limited to, relative advantage, higher technological competence, perceived benefits/ usefulness, cost efficiencies have been identified by earlier research (Jia et al., 2017)

2.2. The organisational context

The organisational context refers to the characteristics and resources of the firm, including linking structures between employees, intra-firm communication processes, firm size, and the amount of slack resources. There are several ways in which this context affects adoption and implementation decisions. First, mechanisms that link internal subunits of the organization or span internal boundaries promote innovation (Galbraith 1973; Tushman and Nadler 1986). The presence of informal linking agents – such as product champions, boundary spanners, and gatekeepers – is associated with adoption. Cross-functional teams and employees that have formal or informal links to other departments or to other value chain partners are additional examples of such mechanisms. Organizational context is another element of TOE which involves assessing inwardly the organizational strengths, weaknesses and characteristics. It includes the structure; processes; means of communication; human and physical capabilities; top management involvement and support; size and slack resources among others (Baker, 2012).

2.3 The environmental context

The environmental context includes the structure of the industry, the presence or absence of technology service providers, and the regulatory environment. Industry structure has been investigated in several ways. For instance, intense competition stimulates the adoption of innovation (Mansfield 1968; Mansfield et al. 1977). Also, dominant firms within the value chain can influence other value chain partners to innovate (Kamath and Liker 1994). Environmental context provides a lens to look into those factors that are related to an organization’s business ecosystem and the opportunities and challenges present in the corresponding business environment (Baker, 2012). Researchers have identified a host of factors that either influence or influenced by the environmental context. Some of these factors are competitive pressures, regulations

and policies, industrial protocols, marketing opportunities, and value chain dynamics (Jia et al., 2017).

Singh (2020) in his article indicate that TOE is a framework that would be beneficial in facilitating the understanding of DL organisational success which classifies three areas that affect the process by which organisations implement or adopt technology. TOE examines institutional-level adoption of various information systems and IT products and services and has advanced to become a valuable theoretical lens for understanding technology adoption (Ramli, 2017) and a widespread theoretical perspective on IT adoption (Ravichandran, 2018). While the technological context describes the internal

and external technologies relevant to the institution, the organisational context explains the descriptive measures of the institution, such as scope, size and managerial structure, and the environmental context refers to the arena in which an institution conducts its business processes. TOE elucidates that an institution's resolve to adopt a technological innovation is not only based on technology but also incorporates the related organisational and environmental contexts which, according to Krisnan and Teo (2017), will in time impact performance. Thus, this review has identified the TOE framework by Depietro et al. (1990) to be mapped with the constructs of the DDH framework to establish the likely success dimensions for DDHs.

| DLMM framework | DOI theory | TOE framework | DELOS reference model |
|--|---|--|---|
| Technology: Represents the technologies that are used in DLs services; focuses on DL software that are already in use | | Technological context: technologies within and outside an organizational ecosystem which influences organizations to adopt and use the available latest technologies, and deploy change. | Architecture: Refers to the DL system entity. Represents a mapping of the functionality and content offered by a DL onto hardware and software component |
| Organisational: Organizational factors have to do with the top management support, IT expert and staffing. At a more local or meso level, the size of the organization, infra-structure, organizational readiness and culture, capabilities and beliefs of the workforce were also identified as important when considering the application of the identified factors. | Social system: norms, opinion leaders and change agents, which variously influence the diffusion process | Organizational context: the structure; processes; means of communication; human and physical capabilities; top management involvement and support; size and slack resources among others | Users: Are the actors who are interacting with the system. Content: Denotes the information made available, all forms of information objects that a DL collects, manages and delivers. Includes primary objects, annotations and metadata. Functionality: Facilities/services supported (e.g. searching and browsing) |
| Social: As conceptual objects with meaning for human beings, and as a set of essential elements that must be preserved to offer future access to the essence of each of those objects | Innovation: innovation is adopted by a social system, and these characteristics include relative advantage, compatibility, complexity, trial-ability and observability of the innovation Communication Channels: messages about an innovation are transmitted among members of a social system | | Policy: Refers to the rules and conditions, including digital rights governing the operation. |
| Cultural: The main elements in this factor are the lack of sensitivity and understanding of the problem | Time: focuses on three dimensions namely, the decision-making processes, an individual's innovativeness and the rate of adoption | Environmental context: competitive pressures, regulations and policies, industrial protocols, marketing opportunities, and value chain dynamics | |
| Economic: Represents the economic factors including the cost for digitization, cost for editing, cost for registering, cost for storage mechanism, and cost for upgrading. | | | Quality: Are the parameters (content, functionality, policy user, architecture) that can be used to characterize. |

Figure 4: Mapping of the factors to the constructs of the three DDH models

3. The DELOS Reference Model by Candela (2007)

The DELOS Reference Model (Candela et al., 2007) approaches the problem of modelling the digital library universe by highlighting six domains or main concepts, which are at the core of what digital libraries are and what their purpose is:

3.1. Content

The Content concept encompasses the data and information that the Digital Library handles and makes available to its users. It is composed of a set of information objects organised in collections. Content is an

umbrella concept used to aggregate all forms of information objects that a Digital Library collects, manages and delivers. It encompasses the diverse range of information objects, including such resources as objects, annotations and metadata. For example, metadata have a central role in the handling and use of information objects, as they provide information critical to its syntactical, semantic and contextual interpretation.

3.2. User

The User concept covers the various actors (whether human or machine) entitled to interact with Digital Libraries. Digital

Libraries connect actors with information and support them in their ability to consume and make creative use of it to generate new information. User is an umbrella concept including all notions related to the representation and management of actor entities within a Digital Library. It encompasses such elements as the rights that actors have within the system and the profiles of the actors with characteristics that personalise the system's behaviour or represent these actors in collaborations.

3.3. *Functionality*

The Functionality concept encapsulates the services that a Digital Library offers to its different users, whether classes of users or individual users. While the general expectation is that DLs will be rich in capabilities and services, the bare minimum of functions would include such aspects as new information object registration, search and browse. Beyond that, the system seeks to manage the functions of the Digital Library to ensure that the functions reflect the particular needs of the Digital Library's community of users and/or the specific requirements relating to the Content it contains.

3.4. *Quality*

The Quality concept represents the parameters that can be used to characterise and evaluate the content and behaviour of a Digital Library. Quality can be associated not only with each class of content or functionality but also with specific information objects or services. Some of these parameters are objective in nature and can be measured automatically, whereas others are subjective in nature and can only be measured through user evaluations (e.g. focus groups).

3.5. *Policy*

The Policy concept represents the set or sets of

conditions, rules, terms and regulations governing interaction between the Digital Library and users, whether virtual or real. Examples of policies include acceptable user behaviour, digital rights management, privacy and confidentiality, charges to users, and collection delivery. Policies belong to different classes; for instance, not all policies are defined within the DL or the organisation managing it. The policy supports the distinction between extrinsic and intrinsic policies. The definition of new policies and re-definition of older policies will be a feature of digital libraries.

3.6. *Architecture*

The Architecture concept refers to the Digital Library System entity and represents a mapping of the functionality and content offered by a Digital Library on to hardware and software components. There are two primary reasons for having Architecture as a core concept: (i) Digital Libraries are often assumed to be among the most complex and advanced forms of information systems; and (ii) interoperability across Digital Libraries is recognised as a substantial research challenge. A clear architectural framework for the Digital Library System offers ammunition in addressing both of these issues effectively.

The concepts populating all the six areas just introduced share many similar characteristics and are all concepts referring to internal entities of a DDH that can be sensed by the external world. Introducing a higher-level concept referring to any of these, namely, Resource, enables us to reason about these characteristics in a consistent manner.

The synthesis related to the factors influencing the development of DDH can be summarized as in Figure 5.

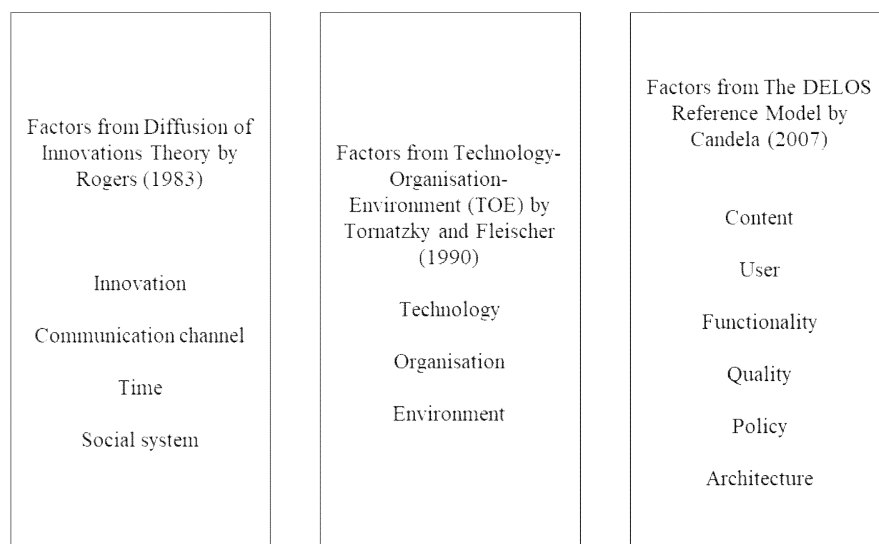


Figure 5: Factors contributing to development of DDH according to DoI theory, TOE framework and DELOS model

Findings and discussion

The findings and discussion are organized around the research objectives under the following sections:

- digital documentary heritage preservation management in information management;

- content prioritization for digital documentary heritage preservation;

- challenges of digital documentary heritage preservation management; and

- amelioration strategies for digital documentary heritage preservation management challenges.

Digital documentary heritage management in information management

Today's technology offers many options for accessing the ever increasing amount of information. Information is now being delivered when and where people work and live. National Preservation Office (2001) defines digitisation as the conversion of analogue materials into a digital format for use in computer applications. Eighteen years later, Anau (2019) summarises digitisation transforms materials from analogue (human-readable) formats to a format that can only be interpreted by computers (digital). He also states that digitisation could help preserve precious materials, making high-quality digital images available electronically. Muhammad Zaffwan (2016) analysed that the listed advantages offered by digitisation tend to come under the headings of increasing access, preservation and meeting strategic goals (i.e. raising the profile of the institution running the

project and so on). Further, it has been said that digitisation leads to the development of internet-based digital libraries as the Internet is now the preferred form of publication and dissemination (Baomah, 2017; Isa, 2018).

Misbah (2017) and Karol (2018) emphasized that digitization is only a solution for providing ease and speed of access to documentary heritage. However, owing to uncertainties about their long term survival, digitization will not generally be used as the sole preservation method. Also, there exist the unwillingness of researchers from the old school of thought to accept digital facsimile as a surrogate copy. Manaf (2010) pointed out that it is becoming a trend for documentary heritage institutions in Malaysia to digitise their resources. However, they most often overlook the issue of sustainability of their materials that have been digitised. Findings from previous research revealed that there are many issues involved in the management of digitisation of documentary heritage resources in the country. One of the significant findings is the ability of the institutions to ensure sustainability of their digitised resources. Besides that, there are several risks related issues that might be faced by these institutions if their digital files are not being managed accordingly. According to Misbah (2017), among the risks related issues that will be faced by these institutions if their digital resources are not managed accordingly would include:

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- Availability and accessibility of information;

- ii. Authenticity and integrity of information;
- iii. Long-term storage of information; and.
- iv. Information disaster recovery issues

Content for digital heritage preservation

There is no unanimity in the literature reviewed about what type of content should be prioritized for digital preservation as national heritage. Ross (2000) is of the view that such content should include data of economic advantage: data created as part of drug development (e.g. clinical trial data); nuclear dump and reactor data; engineering and manufacturing data to protect companies in the event of product liability lawsuits; or data that cannot be recreated when lost. Moreover, aspects of our culture should be targeted for preservation, especially those materials that have academic and commercially reusable value (e.g. digital film, academic research data or petroleum survey data), or data which are valued for their contribution to corporate or national memory (Ross, 2000). Wamukoya and Mutula (2005) suggest that web-based literature, such as online databases, newsgroups, chat rooms and virtual communities, should be earmarked for preservation, as a great diversity of sources are critical for reconstructing the past. Many governments in Malaysia are implementing e-government which is largely an information-intensive environment that consists of decision support systems such as records management systems, integrated financial management systems, human resource management systems, communication systems, databases and portals that must be preserved.

Similarly, social media is impacting people of varying ages and professional persuasions in Malaysia as elsewhere, particularly in education, research, business, government, politics, professional practice and in the general society. There is, therefore, a large repository of content that is generated and moved around within the social networks without proper archiving mechanisms. Lundsay (2010) observes that, although the social media is relatively a new innovation compared to cell phones, the medium is now the number one online activity with its use accounting for 10 per cent of all users' time on the Internet. In addition, social media use is growing three times faster than the Internet's

overall growth rate. Mathen (2012) adds that today's employees create and receive information from a host of different sources and formats that cannot be met by typical corporate intranets which although house the data people require, their network capabilities fall short of supporting new work environments and working style. Besides, with globalization, employees now routinely work with people outside their territories and different business units. Therefore, social media-generated content and content on organizational intranets should be candidates for preservation.

Challenges of digital documentary heritage preservation management

Digital heritage management is new to many organizations and poses several challenges. A primary reason why libraries and archives fail in digitization projects is a lack of funding or working capital (Pandey, 2020; Khan, Shafi and Ahangar; Rafiq, Ammen, and Jabeen, 2018). Pandey (2020) states that initial funding was including the cost of digitization in-house that is, with its own employees, equipment and within its facilities or to hire a provider specialized in these services. Similarly, a study by Khan et al (2018) found that inadequate funding for the library is one constraint against practical digitization of library materials. There is a significant need for standard policy or national-level policy, rules, and methods to bring uniformity. In the absence of policy, professionals feel confused, eventually leading to a loss of consistency in their work. Mesui, Andrade, and Waizenegger (2019) emphasised that despite awareness of Information Communication Technologies, there is a lack of ICT policy in heritage institutions in Tonga. Similarly, Rafiq, Ammen and Jabeen (2018) explored that lack of established digitization plan, policies and procedures in Pakistan as one of the most important barriers in implementing DL.

In any organization, standards and guidelines are the protocols for professionals. Like business organizations, libraries also require standards and guidelines for keeping up uniformity in their administrations and practices. In this context, previous studies reported severe negligence in the implementation of standards and guidelines and termed it as one of the hindrances in the success of digitization projects. The survey

conducted by Masenya (2020) in Africa analysed the responses of libraries with respect to the availability of standards on preservation and revealed that only 14.3% of libraries follow de facto standards while 85.7% do not support any standard. A few of them were even not aware of any standards. Deterioration of digital media is responsible for the disappearance of, or inaccessibility of digital information in the long run. This is because media deteriorates or decays within few years after digitization. Another challenge is that digital media get lost during disaster or virus attacks. Anuradha (2017) analysed the reason why re-digitization is inevitable is the likelihood that electronic resources created in previous years using older technologies may not be accessible or compatible with the new technologies. Furthermore, Toyo (2017) found that deterioration of content is a big concern in the conservation of manuscripts. In his study he sample size was forty-seven (47) library staff (professional and para-professional) from John Harris Library. The finding was that 97.9% of the respondents agree that deterioration of digital media as the major challenges in DL project.

Undoubtedly, digital archives should be transcribed every ten to twenty years to ensure that they will not become technologically obsolete (Joselt, 2019). The continuous changes in computer hardware and software cause technological obsolescence which is a threat to digitization and digital preservation. It causes the loss of the means to access to information in digital form. Technological obsolescence is caused by continuous upgrade of operating system, programming language application and storage media.

Amelioration strategies for digital documentary heritage preservation management challenges

Based on the findings presented in this paper, multipronged approaches to digital heritage preservation management that include socio-technical, policy, legal and regulatory are proffered. These include, among others:

- enhancing the capacity of institutions with statutory responsibility for documentary heritage preservation management to effectively carry out their mandates;

- enactment of enabling digital documentary heritage preservation policies and strategies;
- embracing both social and technical approaches in digital documentary heritage preservation; and
- deploying cloud and grid computing technologies to address processing and storage needs associated with digitization.

Training needs in digital heritage preservation management should be identified, and relevant capacity building programmes developed. Furthermore, institutions with statutory responsibility for heritage management should identify models of excellence which can serve as centres of technology and skills transfer. In addition, capacity building should be prioritized in the following areas: digitization, e-records management and automation of archives and records management. Furthermore, institutions with statutory responsibility for national heritage preservation such as national archives, national libraries, museums, hospitals and media organizations should endeavour to build capacity for the preservation of information materials that include, among others, artefacts, maps, documents, audio-visuals and other materials.

Given the dynamic nature of ITs and the obsolescence issues associated with them, it is important to put in place digital preservation strategies to ensure that digital resources are preserved and remain accessible and useable over time. Such strategies would also facilitate the collection, archiving and preservation of the burgeoning amounts of digital content, especially materials that are of cultural and national importance (UNESCO, 2003). In addition, the strategies would ensure regular back-ups, physical security, network security, security of computer systems and data encryption to ensure data security during transmission. Moreover, legislation requiring funded researchers to deposit their final peer-reviewed manuscripts in a nationally designated online digital archive, as is the case in the USA and Canada (Association of Research Libraries, 2006), should be considered in Malaysia.

Digital preservation management should take cognizance of the importance of both the social and technological factors to effectively bridge the content divide between and within countries. In this regard, Article 3

of UNESCO's guidelines (2003) advocates for multipronged prudent digital heritage management to avert the loss of the world's digital heritage on account of rapid obsolescence of hardware and software. Ross (2000) is of the view that if digital materials are to remain accessible over decades, their preservation must be an integral element of the initial design of systems and projects. Metadata must also be provided showing details of how, why and when a record was created; details about its intended function or purpose; guidelines about how to open and read the record; terms of access; the migration history of the record and any changes made to it after it was created; and, information about how it is interrelated to other software and records used by the organization or other organizations. Finally, due to the sheer amount of electronic content being generated in education, business, government and the private sectors, the Malaysia Governments should consider deploying cloud and grid computing technologies in archiving its national heritage. Cloud and grid computing technologies would host data and applications among other products on remote servers rather than on privately owned computers and databases to reduce costs associated with computer processing power and storage, backup facilities, space, expertise for support and more.

Conclusion

This paper has discussed on the management of documentary heritage that is often overlooked by the cultural institutions in managing their holdings. Theoretically, this paper has explored the integration of sustainable development for Digital Documentary Heritage Industry especially related to Malaysian context. A concept mapping is a structured conceptualization or process, focused on a topic or construct of interest, involving input from one or more participants, that produces an interpretable pictorial view (or concept map) of ideas and concepts and how they are interrelated; in this case, mapping the relationships between barriers of Digital Documentary Heritage and the DOI theory, TOE framework and the DELOS digital library reference model.

This paper, therefore, recommends multipronged approaches to digital documentary heritage preservation

management that include socio-technical, policy, legal and regulatory interventions. The paper further recommends the capacitation of institutions with statutory responsibility for heritage preservation management to effectively carry out their mandates. Moreover, efforts should be geared towards the enactment of digital documentary heritage preservation strategies and policies, as well as deploying cloud and grid computing technologies at institutional and national levels to address the storage needs of digitization, and to overcome software and hardware technological obsolescence.

References:

- Amer, H.H. (2017). Manuskrip melayu: isu kontemporari dan lontaran idea. *International Journal of West Asian Studies EISN: 2180-4788 Vol. 9, No. 1, (pp 25-38)* DOI: 10.22583/ijwas.2017.09.01.03
- Annan-Diab, F. & Molinari, C. (2017). Interdisciplinarity: Practical approach to advancing education for sustainability and for the Sustainable Development Goals. *International Journal of Management Education 15(2): 73-83*.
- Anau, M., Antonio, D.A. & Lena, W. (2019). Digital Technology for Preserving Cultural Heritage in Tonga. *Information and Communication Technologies for Development. Strengthening Southern-Driven Cooperation as a Catalyst for ICT4D* pp 215-226
- Anuradha, P. (2017). The impact of digital technologies on academic libraries : challenges and opportunities. *IP Indian Journal of Library Science and Information Technology, 2(2), 46-50*.
- Anyim, Wisdom O. (2018). E-Library Resources and Services: Improvement and Innovation of Access and Retrieval for Effective Research Activities in University E-libraries in Kogi State Nigeria. *Library Philosophy and Practice* (e-journal). 1647. <https://digitalcommons.unl.edu/libphilprac/1647>
- Baomah, E & Liew, C. (2017). Conceptualising the digitisation and preservation of indigenous knowledge: The importance of attitudes. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in*

Bioinformatics). July. 65-80

Candela L, et al. Setting the Foundations of Digital Libraries: The DELOS Manifesto. *D-Lib Magazine*. 2007; 13(3/4). Gives a detailed set of models and definitions for digital libraries. <http://www.dlib.org/dlib/march07/castelli/03castelli.html>

Clark, S., & Wallace, R. L. (2015). Integration and interdisciplinarity: Concepts, frameworks, and education. *Policy Sciences*, 48(2), 233-255

Da Rosa, I.B. & Lamas, D.R. (2007). Digital libraries in the developing countries. *Proceedings IADIS International Conference e-Society, ES 2007 - Part of the IADIS Multi Conference on Computer Science and Information Systems, MCCSIS 2007*

Ding, C.M. (2014). The Application of Malay Indigenous Scientific and Technical knowledge in the production of Malay Manuscripts.

PersidanganAntarabangsaManuskripMelayu, 3(1), 1-12

Edmondson, R. (2015). memory of the world: the cinema challenge. *Journal of Film Preservation*, (93), 17.

Fuhr, N., Hansen, P., Mabe, M., Micsik, A., & Sølvsberg, I. (2001, September). Digital libraries: A generic classification and evaluation scheme. In *International Conference on Theory and Practice of Digital Libraries* (pp. 187-199). Springer, Berlin, Heidelberg.

Gaona-García, P.A., Martin-Moncunill, D. and Montenegro-Marin, C.E. (2017). Trends and challenges of visual search interfaces in digital libraries and repositories. *The Electronic Library*, Vol. 35 No. 1, pp. 69-98. <https://doi.org/10.1108/EL-03-2015-0046>

Hu, Xiao, Ho, Eric M Y and Qiao, Chen. (2017). Digitizing Dunhuang Cultural Heritage : A User Evaluation of Mogao Cave Panorama Digital Library. *Journal of Data and Information Science*, Vol. 2 No. 3, 49-67.

IFLA Rare Book and Special Collections Section (2014). Guidelines for Planning the Digitization of Rare Book and Manuscript Collections. Netherlands: *International Federation of Library Associations and Institutions*.

Isa, W.M.W., Zin, N.A.M. & Rosdi, F. (2018). Digital preservation of intangible cultural heritage. *Indonesian journal of electrical engineer*.

Islam, M. A., & Ikeda, M. (2014). Convergence issues of knowledge management in digital libraries: steps towards state-of-the-art digital libraries. *VINE: The journal of information and knowledge management systems*.

Jia, Q., Guo, Y., & Barnes, S. J. (2017). Enterprise 2.0 post-adoption: Extending the information system continuance model based on the technology-Organization-environment framework. *Computers in Human Behavior*, 67, 95-105

Jolselt, J. (2019). The role of technology in the preservation of records in the digital age. *Journal Of Library, Science Education And Learning Technology*, 1(2), 49-61.

Karol J. Borowiecki & Trilce Navarrete (2017). Digitization of heritage collections as indicator of innovation. *Economics of Innovation and New Technology*, 26(3), 227-246, DOI: 10.1080/10438599.2016.1164488

Khan, S. A., & Bhatti, R. (2017). Digital competencies for developing and managing digital libraries: an investigation from university librarians in Pakistan. *The Electronic Library* Vol. 35 Issue: 3, pp.573-597, <https://doi.org/10.1108/EL-06-2016-0133>.

Krishnan, S., Teo, T. S., & Lymm, J. (2017). Determinants of electronic participation and electronic government maturity: Insights from cross-country data. *International Journal of Information Management*, 37(4), 297-312.

Levy, David M and Marshal, Catherine C. (1995). A Look at Assumptions Underlying Digital Libraries. *Communication of the ACM Journal*, April 1995/Vol. 38, No. 4.

Lundsay, J. (2010). *Managing the Workplace, Ethics of Social Media*. available at: www.corporatecomplianceinsights.com/managing-the-workplace-ethics-of-social-media

Marchionini, G., and Fox, E. A. (1999). Progress toward digital libraries: Augmentation through integration. *Information Processing & Management*. 35(3). 219-225.

Makmur, H.H. et al (2018). Jawi Writing in Malay Archipelago Manuscript: A General Overview. *MATEC Web of Conferences*, 150. 1-6

Manaf, Z. A & Ismail, A. (2010). Malaysian cultural heritage at risk?: A case study of digitisation projects. *Library Review*, 59(2),

107-116.

Mariani, S. (2001). Preservation of Malay Manuscripts As a National Documentary Heritage : Issues and Recommendations for Regional Cooperation. *Sekitar Perpustakaan, issue 23, 5-11*.

Masanya, T. M., & Ngulube, P. (2020). Factors that influence digital preservation sustainability in academic libraries in South Africa. *SOUTH AFRICAN JOURNAL OF LIBRARIES AND INFORMATION SCIENCE*, 86(2007), 52–63. <https://doi.org/10.7553/86-1-1860>

Mathen, M. (2012). Social media: enhancing customer experience. *Botswana Guardian, 16 March 2012: 8*.

MisbahJabeen, Yuan Qinjian, Zhang Yihan, MunazzaJabeen& Muhammad Imran (2017). Usability Study of Digital Libraries: An Analysis of User Perception, Satisfaction, Challenges, and Opportunities at University Libraries of Nanjing, China. *Library Collections, Acquisitions, & Technical Services*, 40:1-2, 58-69, DOI: 10.1080/14649055.2017.1331654

Mkuwira, R. (2015). Preservation of documentary heritage in {Malawi}. *JOURNAL OF THE SOUTH AFRICAN SOCIETY OF ARCHIVISTS, VOL. 48: 55-65*

Muhammad Zaffwan, I., Norshima, M. (2016). reservation of Intangible Cultural Heritage Using Advance Digital Technology: Issues and Challenges. *HARMONIA: Journal of Arts, Research and Education*, 16(1).

Naoko, S. (2016). *Exhibition, Conservation, and Documentation at the National Museum (Nay Pyi Taw)*. In New Horizons for Asian Museums and Museology, 1-204. DOI 10.1007/978-981-10-0886-3_8

Nissani, M. (1997). Ten cheers for interdisciplinarity: The case for interdisciplinary knowledge and research. *The Social Science Journal*, 34(2), 201-216

Pandey, R. and Kumar, V. (2020). Exploring the Impediments to Digitization and Digital Preservation of Cultural Heritage Resources: A Selective Review. *Preservation, Digital Technology & Culture*. 49(1): 26–37

Pérez-Soler, S. (2017). Journalism and social networks: keys to managing digital content. *Journalism and social networks*, 1-143

Peter BubaZirra, AlhassanJamilu Ibrahim, NurainiAbdulganiyyi (2019). A Review of

Digital Libraries and Their Impact in Africa. *American Journal of Computer Science and Technology*. Vol. 2, No. 4, pp. 60-67. doi: 10.11648/j.ajest.20190204.13

Rafiq, M., Ameen, K., & Jabeen, M. (2019). *Barriers to digitization in university libraries of Pakistan: a developing country ' s perspective Article information :May 2018*. <https://doi.org/10.1108/EL-01-2017-0012>

Ramli, R. M. (2017). E-government implementation challenges in Malaysia and South Korea: a comparative study. *The Electronic Journal of Information Systems in Developing Countries*, 80(1), 1-26.

Ravichandran, T. (2018). Exploring the relationships between IT competence, innovation capacity and organizational agility. *The Journal of Strategic Information Systems*, 27(1), 22-42.

Robert, M.M. (2016). Preservation of documentary heritage in Malawi. *Journal Of The South African Society Of Archivists, Vol. 48, 2015. 55-60*

Ross, S. (2000). *Changing Trains at Wigan: Digital Preservation and the Future of Scholarship*. University of Glasgow, Glasgow.

Sahoo, P. (2016). Culture and Trans-Border Cooperation in the Age of Globalization. *Researchpaedia*, 3(1), 7.

Samsu, L. M., Saiful, M., Fathurrahman, I., & Bahtiar, H. (2021, April). Digitization of Takepan Sasak manuscript based on the OPF flipbook. In *Journal of Physics: Conference Series* (Vol. 1869, No. 1, p. 012073). IOP Publishing.

Saracevic, T., and Covi, L. (2000). Challenges for digital library evaluation. In Kraft, D. H. (ed.), *ASIS 2000: Proceedings of the 63rd ASIS Annual Meeting*. Vol. 37 (p. 341-350). Medford, NJ: Information Today

Shafi, S.M. (2004). Digitization Perspective of Medieval Manuscripts. *Paper presented at the 2nd Convention PLANNER – November 4-5, 2004, Manipur University, Imphal*.

Shiri, A. (2003). Digital library research: Current developments and trends. *Library Review* 52 (5): 198 - 202

Singeh, F. W., Abdullah, A., & Kaur, K. (2020). Critical success factors for digital library implementation in Africa: Solution focused rather than problem focused. *Information Development*, 0266666920918002.

Suleiman, S.A. (2013). *Best Practice in a Digital Library of Arabic Manuscript*. PhD diss. Department of Computer and Information Sciences University of Strathclyde. Glasgow, United Kingdom

Summers, M., Childs, A., & Corney, G. (2005). Education for sustainable development in initial teacher training: Issues for interdisciplinary collaboration. *Environmental Education Research*, 11(5), 623-647. <http://dx.doi.org/10.1080/13504620500169841>

Tatjana, A.J. (2017). Digital Libraries for Cultural Heritage: Development, Outcomes, and Challenges from European Perspectives. *Synthesis Lectures on Information Concepts, Retrieval, and Services*, Vol. 9, No. 4, Pages i-175

(<https://doi.org/10.2200/S00775ED1V01Y201704ICR058>)

Toyo, O. D. (2017). Library Resources' Digitization and Its Impact on the Services of Academic Libraries: The Case of John Harris Library, University of Benin. *International Journal of Education and Evaluation*, 3(7), 33-48.

Trivedi, M. (2010). *Digital Libraries : Functionality , Usability , and Accessibility*. *Library Philosophy and Practice* (e-journal). Paper 381. <http://digitalcommons.unl.edu/libphilprac/381>

Ukwoma, S. C., & Ngulube, P. (2019). Obstacles to the Utilization of Institutional Repositories by Academics in Higher Education in Nigeria. *Webology*, 16(1).

UN. (2015). *Transforming our world: The 2030 agenda for sustainable development*. United Nations. Available at: <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf> (Accessed 12 November 2016).

UNESCO Science Report (2010). UNESCO.

Van Lit, L. W. C. (2019). *Among Digitized Manuscripts. Philology, Codicology, Paleography in a Digital World*. Brill.

Wamukoya, J.M. and Mutula, S.M. (2005). E-records management and governance in East and Southern Africa. *Malaysian Journal of Library and Information Science*, 10(2): 67-83.