KNOWLEDGE MANAGEMENT AND LIBRARY DIGITALIZATION IN THE 21st CENTURY: DOCUMENTAL OVERVIEW

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Abstract:
The purpose of this study was to review literature related to knowledge management and library digitization. The study used exploratory research designs. Specifically, the study reviewed literature related to the development of knowledge management in connection with library digitization, the dynamic role played by the librarians in utilizing knowledge management in library digitization and the benefits and limitations of library digitization. Digitization of libraries has been witnessed globally due to the impact of technological growth and the demand of users that keep changing due to their needs and interests. Today’s modern libraries depend mostly on electronic resources that are highly diversified in terms of products and services that they offer. The concept of knowledge management has been adapted in modern libraries worldwide because of the need to manage library resources in digital forms that need special scientific attention. Knowledge management has increasingly become vital for the libraries to address the increased
demand of the users. Technological changes have altered the way people read and how they use information by revolutionizing the concept of libraries. Unlike the conventional library system, digital library usage has intensified with the help of information communication and technology through the use of computers and web technologies to address the needs of the users. The modern digital libraries serve as knowledge dissemination centers allowing easy access to resources and information that would not be easy to find in physical form. Modern digital libraries are acting as a platform where knowledge management is leveraging the intellectual assets and as well as facilitating knowledge creation. But, their success sorely depends on the ability to acquire, create, store, share and utilize that kind of knowledge. The success further depends on the digital librarian’s ability to search for information, select, acquire, organize, preserve and disseminate such useful information to the right user at the right time. Knowledge management is a process that is applied in the collection of information and it governs the creation, dissemination, and utilization of the documented knowledge to the end-users by utilizing digital knowledge. Knowledge management has given modern libraries a new role by becoming a leading player in managing knowledge. Acquisitions of knowledge management tools are however vital for effective library management activities. Digital libraries have thus implemented the use of computers, databases and library software so as to facilitate improved library activities. The utilization of these systematized electronic tools enhances the effectiveness and performance of librarians to serve the information users in the digital environment of the modern library setup. Key benefits have been documented regarding digital libraries like; Round the clock availability, accessibility by multiple users and quick information retrieval by users who are remotely located. However, digital libraries have some key bottlenecks that continue to bother librarians. Such may include, the effect of changing technology which requires constant technology updates, security issues related to unauthorized access and virus attack, copyright, and data migration issues and lack of skilled manpower on the part of librarians.

**Keywords:** Knowledge Management, Digital Libraries, Dissemination, Intellectual Assets, Digitalization

**Introduction**

Digital technology has brought changed the way people read and use information by revolutionizing the concept of libraries. Unlike the classical library system, the use of digital
libraries has intensified with the help of information communication technology (ICT) through computers and web technologies to address the needs of the users (Okike & Adetoro, 2019; Bradley, 2010). The researchers pointed out that advancement in ICT has affected the way users acquire information, how it is processed and stored as well as the way information is retrieved and communicated. The vibrant technological changes have created an important and new environment for digital libraries. Unlike conventional libraries, modern digital libraries perform faster changing the way Librarians manage and secure information regardless of disciplinary clientele. Digital libraries rely heavily on the web environment where users have to navigate and search in the electronic ocean of knowledge. However, such changes have made it necessary for users to have some level of competences in ICT skills so as to access and utilize information systems to meet their needs.

**Objectives**

This study aimed to review related articles on knowledge management which have supported library digitization over the years. Specifically, the study focused on three issues: 1) Review of the development of knowledge management in connection with library digitization; 2) the dynamic role played by the librarians in utilizing knowledge management in library digitization, and 3) the benefits and limitations of library digitization.

**Methodology**

The study employed an exploratory research design (Yin, 2009; Thomas, 2011). Various published articles on knowledge management and library digitization were reviewed. The content of the articles focused on library digitalization and how librarians were reacting with the new technologies. The study made a comparison of the traditional and modern libraries in relation to the application of knowledge management. The study reviewed literature related to rapid structural change in library activities due to the new technologies, knowledge management process, and organization used by the librarians to support the digitization of libraries.

**Development of Knowledge Management and Library Digitization**

Access to the timely and right information as required by users is important for all libraries. In recent times, knowledge management has emerged as an essential development in information
studies as well as in management science. Literature has shown that knowledge management is a critical component in libraries’ knowledge strategy. Duffy (1999) cited by Khanal and Paudyal (2017, p.45) defines knowledge management as “a process that drives innovation by capitalizing on organizational intellect and experience.” Bair, (1999) defines it as “a discipline that promotes an integrated and collaborative approach to the process of information asset creation, capture, organization, access and use”. However, information storage and systemization have become insufficient in today’s technological competitive age. Information must be scrutinized and integrated into relevant databases based on the needs of the users. Knowledge management requires the use of strategies that take an organization’s information, its experience as well as expertise to provide better services to its clients better based on their changing information needs. Knowledge management makes it possible to avail more information as institutions become increasingly competitive and in turn display a comprehensive range of information within the right time to their users. Knowledge management has, therefore, become a critical library operation to fulfill demands placed by users.

**Knowledge Management in Libraries**

Modern digital libraries have changed the library environment which has consequently changed the business world due to the new knowledge economy and digital age. The current usage of technology as observed by Bradley (2010) has become a necessity for modern libraries to transform and disseminate knowledge consequently changing the way libraries work. In the 21st century, the new role of libraries is to create a learning and knowledge center for users. Academic and research libraries have a different role to serve the public and academic community as compared to the business organization. Their mission should be to maintain high expectations for digital library users in the 21st century. Such a role requires competent professional persons conversant with knowledge management to take a lead in modern libraries.

Yaacob, Jamaluddin, and Jusoff (2010) pointed out that knowledge management has given libraries a new dimension; meaning modern libraries have developed a new vision, becoming a leading player in managing knowledge. The digital world has created a more effective use by exploiting different types of knowledge that are needed in academic and economic activities. In education, library services have increasingly utilized electronic resources to complement traditional library materials.
Knowledge Resources Access and Utilization

The emergence of ICT and web technologies has created a new dynamic role in a knowledge society. Libraries have taken note of the web experience and utilization of such services (Bradley, 2010). Embracing the new role, libraries have sought to develop resource access and sharing strategies by migrating from a printed copy to digital resources. Utilization of these resources focus on converting scientists’ and researchers’ knowledge output into action which bring change for users in the academic community.

The knowledge access through printed copies or other electronic formats should be developed and preserved. For example, the Integrated Online Public Access Catalog (OPAC) or the online library databases containing all resources should be encouraged. This could be achieved through the creation of useful websites with hyperlinks to allow access to metadata by users at the right time. OPACs differ from conventional library systems are that online catalogues or databases which provide access to references and bibliographic material in various subject areas. OPACs have certain advantages as compared to conventional catalogues (e.g., Rathee & Kaushik, 2010; Sadaf, 2015): 1) it provides easily a greater range of access points, 2) availability of information to users remotely, and 3) users can effectively search and retrieve bibliographic records without human intermediaries.

Apart from the utilization of explicit knowledge resources, digital libraries need to develop access to tacit knowledge which is critical information users. The library websites need to have a portal for all selective and relevant knowledge sources, and information whether explicit or tacit irrespective of users who are remotely connected and in all formats. Looney and Lyman (2000) defines an ideal “portal” as "a means of gathering a variety of useful information resources into a single, one-stop Web page, helping the end-user to avoid being overwhelmed by feeling lost on the Web.” The growth of new Web pages is expanding every second in the information age. The number of users has also increased to billions yearly. Besides, Internet search engines like Google, Engine Watch, Yahoo, MSN, Soople.com, Bing.com, and Ask Reeves have increased year after year. These valuable intellectual assets in spite of whether they are explicit or tacit need to be inventoried, archived, and frequently indexed and updated, and in-turn made accessible in digital form.
Knowledge Sharing and Communication Networking

Resources of conventional libraries have been based on the practice of sharing and networking traditionally. However, lending and receiving books have been expanded through access to computers, digital technologies, telecommunications, and networking from the 1960s. The U.S has a trend where libraries are a member of several consortia for cooperative work and resources sharing. Examples may include the Online Computer Library Center (OCLC) and OhioLINK (Ohio Library and Information Network) (Rathee & Kaushik, 2010). However, knowledge sharing, as well as a communication network of digital information, is complex and dynamic. The success of library resources sharing and information networks are grounded on full cooperation as well as the participation of member libraries withholding self-interest.

Impact of Information Technology in Knowledge Management

The well-constructed knowledge management system needs to be implemented using improved collaborative technologies that enhance communication network which help in knowledge development across organizations, national, as well as international level linkages. Knowledge management could be made possible in digital libraries by network accessibility through intranet and extranets. Mainly, both intranets and extranets are powerful tools to make more efficient library services.

Intranet. Dissemination of information on the intranet enables provides a high degree of communication consistency for the whole library. Intranet gives users and information providers access to timely and critical information. Consequently, it enhances the decision-making process by allowing individuals to have the necessary information faster to make a better-informed decision. Intranets permit information centralization making it easier to maintain and keeps up-to-date data.

Extranets. The extranet extends the intranet where it allows other sister organizations and libraries to access selected internal data. Both facilitate the user to publish information electronically on library web-pages and the service is accessible to users in an organization with access to the internet. The service contains work information conducted from individual sections, details of
current and previous project results, and at times may include homepages of individuals working in the project. Intranets and extranet align with the bigger picture of knowledge management.

**Figure 1:** Intranets and Extranets in Knowledge Management


**Groupware**

It is a technological design that enables users to collaborate and share information. Groupware applications are intended to support group-work. Such applications require different approaches to understand work practices. Groupware is classified into the following areas; that is, communication, meetings, information sharing and coordinating work processes.

**Communication.** These are tools which are used to support synchronous communication like video conferencing, shared screens, media spaces, and real-time communications among users. The applications may include; e-mail and file sharing which are widely used as groupware application.

**Meetings.** They include groupware applications that support meetings; meaning, these software capture and organize ideas to aid brainstorming, summarizing and reporting.

**Information sharing.** They include databases, as well as bulletin boards and electronic newsgroups. Under this category, documents together with their responses are grouped together in folders similar to Microsoft Exchange or web pages built with Netscape. They provide access
where users get the needed information. Single information can be shared by a large number of users. This includes online discussion and online conferencing which are useful knowledge-sharing events.

**Coordinating work Processes.** Workflow systems may include decision support components. Intranet and web-based systems are tremendous sharing systems that benefit groups rather than an individual.

**Digital libraries and knowledge management utilities**

The invention of the computer and its network and storage in the 21st century has seen a paradigm shift in the library profession. In recent years, technology advancement in computer networks and storage has influenced the design of digital libraries (Yeh, Chang & Oyang, 2000; Schatz & Chen, 1996). In line with the development of a digital library is the emergent of knowledge management. The use of built-in knowledge processing utilities is to derive the library from a large amount of information. In case digital libraries contain a great amount of information and implied relationships are broad the person completing the task may get exhausted if manually done. By incorporating knowledge management utilities, professionals are relieved from tedious work and can focus on other philosophical activities to gain more knowledge that is advantageous. The application of knowledge management in the library field has been incorporated to enhance the performance of the library activities. Consequently, librarians and information professionals are offered training to be experts in areas of; information sharing, searching, selecting, acquiring, preserving, disseminating and serving.

Knowledge management covers a wide range of perspectives as it deals with the tacit and explicit knowledge processes. It also encompasses innovating processes, cultures, values and intangible assets. Besides, it is based on the subjective, interpretive and dynamic developments in IT and focuses on bringing their benefits effectively to the institution. Knowledge management supports not only the know-how of a company but also know-where, know-who, know-what, know-when and know-why (Rus & Lindvall, 2002). It is the process that provides a linkage between knowledge and action through experience. Table 1 explains the meaning of these terms clearly.
Table 1 Types of Knowledge and Action based on the activity of the experience

<table>
<thead>
<tr>
<th>Categories of experienced activities</th>
<th>Knowledge</th>
<th>Action</th>
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<tbody>
<tr>
<td>1. Know-what</td>
<td>Understanding knowledge. Basically, it is a Fact</td>
<td>To understand what it is like to do or be something. To have experience with a situation, activity, or condition</td>
</tr>
<tr>
<td>2. Know-why</td>
<td>Telexing knowledge. It is Science. Management of knowledge. It is a way of communication.</td>
<td>It is an understanding of the reasons underlying something (as a course of action) The action will delineate and define you.</td>
</tr>
<tr>
<td>3. Know-who</td>
<td>Technical knowledge or know-how refers to formulae, specifications, standards, technical data or information, processes, and methods. Know-how is, therefore, knowledge of how to do something or it is the ability to perform a task or action.</td>
<td>It is a procedural or practical knowledge on how to achieve something. Its often tacit knowledge; meaning it is difficult to transfer to other people by means of writing, or giving oral explanations. Its however a component in technology transfer.</td>
</tr>
<tr>
<td>4. Know-how</td>
<td>Timely Knowledge. To understand (something) because one has experienced it. It indicates the Competition among users. Position Knowledge. To be certain about what someone thinks or feels about you. to be certain about what your position and responsibilities are in a situation</td>
<td>To be able to recognize or identify something immediately, to know someone before he or she was famous or successful In the old days, the editor was completely in control, and we all knew where we stood.</td>
</tr>
<tr>
<td>5. Know-when</td>
<td>Source: Sumathy, Thangamani, Gracia Mary (2013)</td>
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Source: Sumathy, Thangamani, Gracia Mary (2013)
Digital Libraries and Knowledge Management

Digital library and knowledge management are inseparable, especially in agricultural scientific and technological innovations. The formation of digital libraries was based on the need of the 21st Century information users. It is an ideal digital environment in the global network but its effectiveness would not be possible without knowledge management. Knowledge management technologies enable users to simultaneously access internet sites, software, databases, intranets, and extranets resources as if they existed in a single location.

The development of digital libraries has led to the production of electronic resources without walls. Marchionini, Plaisant, and Komlodi (2003) regard digital libraries as a sound extension and supplementation of physical libraries in the electronic information society. Digital libraries based on Giannakopoulos, Kyriaki-Manesi, and Zervos (2012) refer to a technological application that allows library management and organization of archives and museum contents into digital forms. However, the formation of digital libraries has changed the established library practices by altering the monopoly of traditional libraries as the only provider of information (Sarrafzadeh, Martin & Hazeri, 2010). Based on the researchers, the growth of electronic resources has considerably changed the attitudes of library users in research as well as the way they associate with knowledge. The researchers pointed out that librarians are in quest of ways to integrate electronic and digital content with print material so as to provide a comprehensive knowledge source base for research, in addition to teaching and learning.

Metadata and Domain-Specific Markup Language

Metadata and markup language are both aimed for descriptions of information resources. However, Metadata has been developing form MARC format to DC 15 elements and from its simple description to become centralized functions of description, control, structure, storage, protection etc. But it is still limited to be a subsidiary of the documents and cannot help the users to dig into the contents of it. Being a librarian, the work does not focus only on the discovery of resources, but they also focus on discovery within resources (Zeng, 2002). The development of eXtensible markup language (XML) which has grown in usage in recent years has formed a new era of markup language. Some of the characteristics of XML include accurate descriptions of the contents, common XML rules, and grammar which allow assigning of a special mark code into
the original text in the digital resources. The standards codes make knowledge presentation easy in digital libraries.

**Librarians’ Linkage with Knowledge Management**

The development of digital libraries has affected the role of librarians in relation to traditional library activities. According to Deegan and Tanner (cited in Tedd &Large, 2005), there are two additional roles for librarians and information professionals where they serve as knowledge mediators and knowledge preservers. In reference to the work of librarians, Lor (2008) pointed out that knowledge management skills of librarians should also involve data management and other forms of knowledge. The application of knowledge management systems based on researchers is strongly connected to and also lies at the heart of creating sustainable digital libraries.

Based on the literature, (Clair, 2003; 1486), the Encyclopedia of Library and Information Science refers to knowledge management as "management practices that mission” (There are two types of knowledge in the knowledge management theory; tacit and explicit. On one hand, explicit knowledge is formal and systematic; that is, it can be easily communicated and shared. On the other hand, tacit knowledge is deeply embedded in action; it’s highly personal and quite hard to formalize (Nonaka, 1991). The concept of knowledge management started applying in the business sector, only but now it has been expanded to many other fields including library science also. Knowledge management is at the “core position in Digital libraries” and similarly digital libraries are not so efficient without effective knowledge management”. (Shuchun, 2002, p.507) inject new blood into the library culture and she describes and dissemination practices into their services.

**Library Digitization**

A digital library is an information retrieval system referring to a collection of stored digital formats that users can access through computers (Greenstein & Suzanne, 2002). In the digital era, libraries use the latest technology to organize and manage digital material and as well provide information services to users in a digital format.

The term “digital libraries” may apply to wide organized collections of information but to be referred to as a digital library, it must have an online collection of information that is managed and made accessible to all users. As such, not all websites are considered true digital libraries. A “hybrid library” is at times used to refer libraries with both physical and digital collections. For
example, American Memory is a digital library in the Library of Congress. Some significant digital libraries are used as long term archives, like the ePrint, arXiv and the Internet Archive.

The rapidly growing idea of "digital libraries" means that library users can access all information they need at the right time and on their desks, be it through multimedia databases or in hyperlink web resources. Digitization allows the handling of information at a much faster speed that is more flexible, with improved reliability and at a lower cost (Hamelink, 1997). The researcher noted that in digitization, there is a great expansion of communications channels with more varieties for consumer choice. Besides, more interactive systems opportunities have been created. Additionally, there has been a great improvement on the quality of voice as well as in video transmissions.

Hamelink (1997) argued that digitization has brought about economic efficiency through storage, retrieval, and editing which saves time and labor. Conversion to digital forms especially for images can allow digital compression and transmission over satellites at 56,000 bits per second in a computer file. Besides, digital data could be stored in computer discs and played back at the original speed. Since compressed digital data and storage systems are light-weight, they could be applicable in newsgathering. The new digital technologies are the following features: Convergence and multi-functionality, intelligence and ubiquity.

**Convergence and multi-functionality.** When signals converge into a digital form, they become similar technically. Digital technologies are, therefore, instrumental in the convergence of telecommunications, electronics, and data-processing technologies. Convergence based on Hamelink (1997) creates new modes of information handling like digital management of sounds and images and makes information appliances multifunctional.

**Intelligence.** Digital technologies according to Hamelink (1997) are smart technologies; meaning, they can provide information appliances and communications systems as well as networks with problem-solving capacity. Particularly, they can enhance the performance of a traditional telephone through the provision of new features like modems, screens, and smart card readers. The new appliance referred to as smartphone allows users to check e-mail, text-messaging, do mobile shopping and mobile banking, screen calls, surf the Internet for information while some have in-built personal organizer.
**Ubiquity.** A critical characteristic of digital technologies is pervasiveness. The new technologies are everywhere from home to offices and in business premises and other service activities like travel, finance, banking, and insurance. A computer for example, manufacturers want to create computers so unobtrusive that they virtually disappear.

**Pros and Cons of Library Digitalization**

**Main Advantages.** Advanced digital libraries provide ways where various books, data files, and pictures are easily and rapidly accessed by users with commercial interests as well as public bodies (Europa, European Commission, 2008; Saini, 2017). Based on Saini (2017), conventional libraries are limited to storage space while digital libraries eliminate the need to own physical space. Researchers like Bamgbade, *et al.*, (2015) and Saini (2017) also noted that the cost of maintaining a digital library is far much lower as compared with that of a conventional library. Besides, there is increased access and availability of information to users who lack access to a conventional library due to reasons not limited to geographical location or affiliation to organizations. That is, the digital library allows users' electronic access to materials at any place including offices, home, at school or even in their car.

**Distinct advantages.** The distinct advantages of digital libraries are as follows (Bamgbade *et al.*, 2015; Saini, 2017):

- Fast performance due to advent of the computer technology results in time-saving for both library professionals and the common user also. Larger management of library resources without any confusion and complication of missing the particular documents in the library, less storage for keeping the non-book materials like CD, DVD in RDBMS databases, Clear and conducive rapport between the librarians and service users. Updating, editing, modification, and deletion of particular documents from databases are made extremely easy. Entries of new arrivals of the books in the library could be initial documentation work but later, other library techniques like classification, cataloguing and codification is possible accordingly. Information retrieval and document management software have been retagged and promoted as knowledge management tools. Visual observation on the computer screen exposes the nature of the work of the librarian instantly. The
traditional books could be documented digitally and reduce dead-end user searches and patron confusion.

**General advantage.** Based on the literature, a number of advantages have been documented (e.g., Bamgbade *et al.*, 2015; Saini, 2017).

**No physical boundary.** Digital library users need not visit a library physically; as such, users with internet connections have access to similar information.

**Round the clock availability.** Digital libraries have an added advantage as information is accessible at any time with no time limitation.

**Multiple users.** Resources are accessible to multiple users simultaneously and it also allows real-time discussions

**Information retrieval.** Digital libraries preserve user-friendly interfaces where it gives clickable access to its different resources. As such, users can access metadata by using the caption of words, titles phrases, names, or subjects to search for information in databases.

**Preservation and conservation.** Though digitization does not provide a long-term conservation solution, it provides access to duplication of materials that in one way may get defaced due to repeated use.

**Space.** Digital libraries require almost no physical space for storage and maintenance. Besides, data storage technologies have become increasingly more reasonably priced than ever before.

**Added value.** Digitization can improve legibility and eliminate visible flaws like discoloration and staining (Gertz, 2000).

**Disadvantages of digital library**

A number of issues have been identified by researchers in relation to digital libraries (Bamgbade *et al.*, 2015; Breeding, 2002; Cain, 2003).

**Data migration.** In the current technological era, technology updates and data migration is an issue for every library (Cain, 2003). Data migration provides a way to retrieve digital objects that could become extinct. However, it is argued that data migration is normally short-lived taking into consideration the ever-changing nature of computer software. Data migration requires a constant transfer of digital objects to newer stable formats. Besides, other issues may come up in the transfer
A process where newer platforms may fail to capture the full original format of the object or material being transferred (Breeding, 2002).

**Copyrights.** In the digital world, copyright laws require digital libraries to comply with copyright and cyber legal issues as a way to deal with plagiarism. Republication of materials in the web by digital libraries may, therefore, involve a need to acquire permission from rightful holders. Besides, conflict of interest may arise between digital libraries and publishers who may want to create online versions of contents acquired before 1923 that may be out of copyright (Christopher, 2010).

**Authenticity.** It is argued that in the preservation of digital material, any attempt made to transform any item or materials into the digital form will always alter and bring about some form of value loss of the original item.

**Effect of technological change.** Digital libraries are wholly dependent on computers and telecommunication. Any advancement in technology software and hardware requires an update of the digital system in line with the new technology.

**Security issues.** The digital system requires Internet connectivity which creates a major security problem to deter unauthorized access. A major task with the digital system is to prevent information from virus attack.

**Skilled personnel.** In comparison with the conventional library, a digital system requires a skilled person to work and maintain a digital library. The ability of personnel to handle and transfer data with the ever-changing technology is a major concern for digital libraries.

**Conclusion**

The world is moving from printed documents into electronic resources which are a great challenge to the librarians to keep abreast of the knowledge in the selection, acquisition, and retrieval of electronic resources. With the growing need for information, it has become laborious for the librarians to maintain printed documents and books in the traditional library setup. However, modern libraries are encouraging usage of Electronic Resource Management Software for effective organization and preservation of electronic resources like E-books, E-Journals, and E-Databases in the libraries.

Knowledge management is vital in libraries that have rich experience in information management. Knowledge and skills of librarianship and professionals could be applied in
knowledge management. The success of modern libraries needs professional with appropriate knowledge management together with strong leadership that is capable of managing the library administration on a successful endeavor. In the current technological and knowledge age, librarians can work with IT professionals to effectively support the implementation of knowledge management. In the process of knowledge creation and management, every library should strive to enable and facilitate mobilization of all its efforts and resources. More so, academic institutions like universities should be knowledge creators that empower their libraries to develop a campus knowledge management system.

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