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Transformation Of Librarian As Knowledge Manager In Big Data Era

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ABSTRACT
Processing big data is complicated caused by its complexity like the quantity of data, the various data format in various representations, and very fast data changes. Librarians are challenged to be able to exploit the potential of big data, they are challenged to analyze and extract knowledge from the data to easily understood and used by users because knowledge is the most important asset and greatest competitive advantage of many organizations. So, the librarian should to improve their skills and be creative to keep up with the new environment. One of the things that can be done by librarians is to strengthen its function as a knowledge manager. This study aims to know how the role of librarians as knowledge managers in the era of big data and what skills needed to be a knowledge manager in the big data era. The study was conducted by a literature review from various sources. The analysis was done descriptively qualitatively based on the sources of literature obtained. The results of the study show the skills that must be possessed as follows: IT skills, literacy, technical and analytical skills, extract, filter and disseminate vital external knowledge, communication skills, advocacy, create, record and store information effectively -strategic planning ability and use information tools effectively.

Keywords: Big data, librarian, knowledge management, digital ecology.

1. INTRODUCTION

The era of Big Data, Industrial Revolution 4.0 and Society 5.0, is closely related to data in the whole process. Big Data has 3 (three) V as the main characteristics: Volume, Variety, and Velocity [9]. In Big Data, the data that is processed is large, so many data types variant, and the growth is very fast. So that data cannot be processed in conventional ways, we must apply artificial intelligence technology, like machine learning and data mining. Industrial Revolution 4.0 and Society 5.0 utilize information technology infrastructure and networks, so interconnection and exchange of data between systems are vital. So, data management becomes very important. We should manage to become knowledge to become insight for the decision-maker.

Librarians have been increasingly entering into the realm of data management as “data librarian” roles are becoming more and more common. This role includes the gathering,

organization, and validation of data as well as the ability to evaluate and explain data to others. Librarians have historically been the key players in the information layer. The catalog information resources to allow people to find it using various access points. They verify its quality, accuracy, and authority. They condense it through abstracts, annotated bibliographies, reviews, pathfinders, and other reference tools. knowledge is generally seen as information that has been given meaning by an individual [5].

The role of librarians in the big data era is to retrieve valuable information from the data, this process is often known as data mining. Data mining services become a necessity in the era of big data, a variety of knowledge processing companies such as Uber as the largest taxi company in the world, Google, Alibaba, Gojek, Groceria, Teacher's room, Tokopedia, Traveloka, and many other start-ups. With the information we get from data mining, we can: estimate and predict what happens in the future, analyze the correlation between data and attributes, help decision-makers and policymakers. That shows digital ecology has become an energetic enabler of the economy, including Indonesia, and plays an important role to provide fast, easy and inexpensive public services.

Harvard Business Review calls the work of data scientist as "The Sexiest Job of 21st Century". Also according to the McKinsey Global Institute, 140,000-190,000 people do not have good analytical skills and as many as 1.5 million managers do not have the ability to use big data. This is a great potential for the librarian to become a data scientist and information analyst, where the tasks and functions of librarians are collecting, organizing, storing, curating, managing, analyzing, reporting, visualizing, and securing collections of information. It needs a lot of special abilities to be improved, like explore statistics, the latest information technology knowledge (cloud computing, smart computing, etc.), then librarians can be referred to as data analysts [1].

In this era, librarians are challenged to be able to exploit the potential of big data from non-technical aspects, including using existing tools, conducting local research data, using the data to advocate for themselves and the community around handling content or information is the scope of library work. Librarians are challenged to analyze and extract knowledge from the data, convert the data from semi and/or unstructured data to structured data, and represent the data in a scheme so that it is easily understood and used by users. Another challenge faced by librarians in dealing with big data is the complexity of big data caused by the quantity of data, the various data format in various representations, and very fast data changes. We can use certain analytical methods to big data, the resulting knowledge is specific and specific viewpoints. The point of view changes, either by the method of collection or by the method of analysis, so the results of analysis depends on the method [9]. Related to the management of big data in libraries, where the role of librarians and librarian functions as knowledge managers is mentioned by several authors such as; [4][8][7]. Libraries are strongly influenced by data management as part of the information service process. Information services have now made a data explosion in which libraries are required to fix four main areas: (1) library organizations, (2) fixing internal data sets, (3) aware of the

power of external data sources for libraries and (4) improvements to sources human resources with certain skills especially in librarians [11].

This paper aims to find out what abilities librarians need to have as knowledge managers in the era of big data in managing knowledge.

2. LITERATURE REVIEW

a. Big data

"Big data is like teenage sex: everyone talks about it, nobody really knows how to do it, everyone thinks everyone else is doing it, so everyone claims they are doing it…"– Dan Ariely, 2013. Posting photos, purchasing groceries, location pings on cellular devices –it is almost impossible to go through daily life in 2017 without data about our information behaviors being collected and examined. People may be aware this data is being collected, but most do not understand its actual or intended uses (even when detailed in Terms of Use agreements). Researchers argue that it is one thing for purchasing, posting or searching behaviors to be shared across companies, but inferences based on the obtained data should be a concern as our technology continues to be enhanced in the future [6].
The term 'Big data', defines three dimensions or 'three V' large data: Volume, Velocity, and Variety: - Volume refers to the amount of data created. McAfee and Brynjolfsson noted in 2012, "about 2.5 exabytes of data are created every day, and that number is doubling every 40 months or more." 5 one exabyte is roughly equivalent to 4,000 times the amount of data in the Library of Congress. - Velocity refers to the speed of data that is being created. Variety refers both to the type of data collected and the lack of uniform data structures [9].
Big data is a term describing the storage and analysis of large and or complex data sets using a series of techniques including, but not limited to: NoSQL, MapReduce and machine learning.[15].

b. Big data impact on libraries

In today's digital era, many people are sharing data both personal and public, unfortunately, the data is not well protected. Big data has an impact on all service throughout the world, this should be a serious concern for all professions, especially those relating to services. The massive variety of digital-based services is a challenge for libraries to be able to accommodate these changes. The digital age is the forerunner to the emergence of big data where there are four characteristics of big data that are very influential in services, namely: volume, where the content/volume of data is very large; velocity, frequency of occurring and changing data very quickly; variety, the variety of data types, and the fourth is veracity, inconclusive data.
Library and information professionals have a potential role to play here to help patrons and clients protect their privacy. Protecting the privacy of patrons has been one of the guiding

principles of librarianship since 1970. The American Library Association's (ALA) Code of Ethics, section three, emphasizes the importance of maintaining a sense of privacy for patrons utilizing the library's services [6].
Four characteristics of big data that are very influential on library services are:

1. very large data volumes, with electronic-based literature trends with e-book collections, e-journals, e-newspapers, e-magazines, and others;
2. uncertain data veracity, this is caused by chaos or validity / trust of the available data, because with various forms of large data, the quality and accuracy of the data is less controlled;
3. velocity, the speed of data production, so that it requires the ability to analyze the flow of data that flows quickly;
4. variety, various format data, from structured data, unstructured data, semi structured data like web page, web log, search index, social media forum, email, etc.

The era of big data requires strong data analysis capabilities with deep logic capabilities and persistence to continue learning and mastering existing business processes. The data becomes a very important resource in the library. Librarian should be able to interpret those data. In the future, librarians will be able to stand in the middle of programmers, statisticians and scientists, where librarians have skills in reference data and data accuracy. Some librarian jobs that evolved from the basic work of librarians include [1]:

- Data Management Consultant
- Data Mining Consultant
- Data Research Scientist
- Data Services Librarian
- Design Data Librarian
- Digital Archivist
- Digital Collections
- Strategist and Architecture Librarian
- Digital Humanities Design Consultant
- Digital Records Archivist Manager
- Data Management Services
- Research Data Librarian
- Research Data Management Coordinator
- Scientific Data Curation

c. Understanding Knowledge

Knowledge management may be defined as the set of processes that create and share knowledge across an organization to optimize the use of judgment in the attainment of mission and goals. Knowledge management (KM) refers to a set of practices or processes that facilitate the creation, capture, organization, and dissemination of knowledge, The reason for KM's popularity, particularly in management practice, is the list of benefits that it can bring to an organization.

Therefore, to understand knowledge management and librarians' ability to transition into this activity is to examine the hierarchy model of knowledge first developed by Ackoff in 1989.

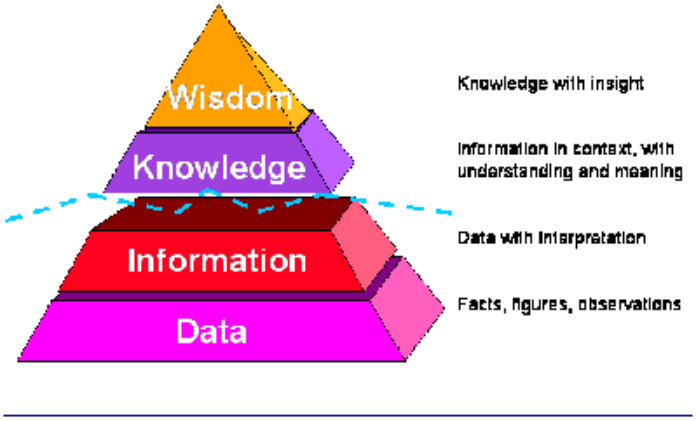

Figure 1: Hierarchy of knowledge

The hierarchy model is a common way of describing and understanding knowledge through its hierarchical relationships with other shareable elements such as data and information. Data is described as a set of facts, writings, numbers, or symbols that are directly observable or verifiable but generally unorganized or unanalyzed.

Given the wide range of benefits that KM can bring to an organization, moving into KM can be an excellent way for a special or corporate library to prove its value to its parent organization or for a librarian to utilize his or her skill set in a variety of work settings.

d. Knowledge Management Competencies

The knowledge manager should have enough knowledge of information storage and retrieval systems, including document management systems, electronic collaboration systems, and case management systems, to be able to find information in them with ease and to be able to assist other employees in their use, but they are not required to have the skills to design, implement or maintain these systems.

Interpersonal competencies are vital to a knowledge manager because knowledge management is fundamentally about connecting people with knowledge they need to do their jobs. In order to do this, a knowledge manager needs to understand both how people work and how the organization works. Obtaining this insight requires the knowledge manager to be able to communicate well with others, to build trust, and to promote collaboration. The information that the knowledge manager needs to do his or her job is sometimes hidden inside employees' minds, so the ability to talk to people and ask the right questions to reveal that information is of vital importance.

Knowledge management requires an organization to harness its knowledge resources for strategic purposes. As such, knowledge managers must therefore possess strong analytical and strategic thinking skills to be able to recognize information and knowledge of strategic value. They must have a strong understanding of the organization's overall strategic

priorities as well as the priorities and values of each of the teams with whom they are working. They must be able to understand the opportunities and risks involved in a project. Library managers an early adopter of a new technology puts library staff in an excellent position either to become trainers and help other groups adopt the tools as well or to have an influence on the rollout of the tool to the larger organization based on their experiences. library managers should encourage him or her to learn how they work and how they can be used by the organization. The traits of a successful knowledge manager include technical, interpersonal, and analytical skills. Table 1 lists these competencies which are described in detail below [4].

Table 1: Knowledge manager competencies

Technical Competences	1. Document Management 2. Classification 3. Codification 4. Database Management 5. Indexing & Abstracting 6. Information Architecture 7. Information Technology Literacy 8. Metadata 9. Records Management 10.Taxonomies / Thesaurus / Controlled Vocabulary Building
Interpersonal Competencies	1. Change Management 2. Coaching 3. Collaboration 4. Communication 5. Leadership 6. Mentoring 7. Negotiation 8. Networking 9. People Skills 10. Teaching & Training 11. Teamwork
Analytical Competencies	1. Analytical Thinking 2. Business Judgment 3. Business Intelligence 4. Innovation 5. Judgment 6. Strategic Thinking
Knowledge	1. The organization's business processes 2. The organization's strategy and goals 3. The organization's culture 4. Trends and developments in the organization's sector 5. Organizational learning principles and procedures 6. Knowledge management principles and practice 7. Knowledge sharing tools and techniques

There can be an assumption that strong managerial, communication, analytical, and IT skills are the primary requirement for a knowledge manager.

3 METHOD

The study was conducted using the narrative review method, which is review some articles related to the role of librarians as knowledge managers in the era of big data. Big data has an impact on library management activities where data becomes something that needs to be managed well in order to become useful knowledge and can improve people's welfare. Narrative review is conducted to answer the question of what abilities the librarian needs to have as a knowledge manager.

Literature search was conducted in November 2019 using online journal references. Search was carried out to find relevant material using key phrases: Knowledge Manager, Data Management, big data in the library. The search results obtained were selected according to the library's role as a knowledge manager. From the selected articles the results and discussion are arranged in accordance with the questions raised using a narrative review.

4 RESULT AND DISCUSSION

Based on search results through online journals about the role of libraries as knowledge managers in the era of big data, as many as 10 articles were obtained that were relevant to the topic to be analyzed using narrative review as shown in Table 1.

Table 1: Literature source

No	Title	Author	Published Year	Source
1	Knowledge Management Competencies Required for Library and Information Professionals in 21ST Century Nigerian Libraries	Chioma Euriel Uzohue1 , Japheth Abdulazeez Yaya2, *	2016	American Journal of Business and Society Vol. 1, No. 3, 2016, pp. 90-97 http://www.aiscience.org/journal/ajbs
2	Data Management: Knowledge and skills required in research, scientific and technical organisations	Mary Anne Kennan	2016	License: http://creativecommons.org/licenses/by/4.0
3	Moving from Librarian to Knowledge Manager	Melissa Fraser-Arnott	2014	The canadian journal of library and information practice and research, vol. 9, no. 2 (2014)
4	Are librarians the ultimate knowledge managers? A study of knowledge, skills,	Stuart Ferguson , Philip Hider & Anne Lloyd	2013	The Australian Library Journal 57:1, 39-62, DOI: 10.1080/00049670.2008.10722440

	practice and mindset			
5	Multimodal roles of library and information science professionals in present era	Sambhu Nath Halder	2009	International Journal of Library and Information Science Vol. 1(6) pp. 092-099 November, 2009 Available online http://www.academicjournals.org/ijlis
6	Knowledge management practices in academic libraries: a case study of the University of Natal, Pietermaritzburg Libraries	Pearl M. Maponya	2004	http://mapule276883.pbworks.com/f/Knowledge+management+practices+in+academic+libraries.pdf
7	Librarians are the ultimate knowledge managers?	Cathie Koina	2003	The Australian Library Journal, 52:3, 269-272, https://doi.org/10.1080/00049670.2003.10721554
8	Role of Libraries in Knowledge Management	Appasaheb. Naikal; Ramesh Paloti	2003	Proceedings og 24th IASLIC 2003, survey of India Dehra Dun, Dec 15-18. https://www.academia.edu/3308329/Role_of_Libraries_in_Knowledge_Management
9	the information audit as a first step towards effective knowledge management: an opportunity for the special librarian	Susan Henczel	2000	INSPEL 34(2000)3/4, pp. 210-226
10	The expanding roles of librarians for the new millennium	Jinhong Tang *	1998	http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.198.2520&rep=rep1&type=pdf

Knowledge management (KM) refers to a set of practices or processes that facilitate the creation, capture, organization, and dissemination of knowledge. In the present information and knowledge era, knowledge has become a key resource. Following are some statements regarding the role and competence of librarians as knowledge managers.

Table 2: Literature review result

Mary Anne Kennan, 2016	Willingness to learn about knowledge, in the data domain and related data skills, understand the variety of data from flat textual, to relational, numerical, instrument generated data, archival and cultural heritage data.facilitate data sharing, linked data, the data management lifecycle, data management processes such as quality control, data processing, data management planning, and an ability to understand and support data storage requests.
Chioma Euriel Uzohue1 , Japheth Abdulazeez Yaya2, *(2016)	The creation of databases, knowledge-based system, digitalization/electronic document management, creation of virtual libraries, Meta data and development of intranet, information packaging and delivery, in order to meet with demands of Information era as well as being relevant in today's knowledge-based environment. Libraries perform an intermediary function between information producers and end-

	users.
Melissa Fraser-Arnott (2014)	IT skills, literacy, technical, interpersonal, and analytical skills
Sambhu Nath Halder, 2009	The prospects and opportunities to cope with the changes in library world from traditional to digital environment. Library and information professional communities are being affected by a range of ICT developments and so find their roles changing worldwide. The container of information is not only the print materials but this is the age we are living where a huge rate of information born in digital format. Technology alone cannot help bring about the required changes. Attitudes, practices, and policies need to change if libraries in India are to truly benefit themselves and their community of users by the application of new technologies. librarians are expected to work as pathfinders by assisting all users with varied backgrounds and abilities through information supportive environment and multiple strategies.
Stuart Ferguson, Philip Hider and Anne Lloyd, 2007	Content analysis of the literature that explicitly addresses opportunities for LIS professionals in KM (Rooi & Snyman 2006) suggests five broad roles for librarians in KM: facilitating an environment conducive to knowledge sharing; managing the corporate memory; transfer of IM and related skills to a new context, linked to business processes and core operations; development of corporate information literacy; and finally, management of information in a digital/electronic environment
Pearl M. Maponya, 2004	Evolving information and knowledge has impacted all organisations, including academic libraries. This has made knowledge management become important. The basic goal of knowledge management within libraries is to leverage the available knowledge that may help academic librarians to carry out their tasks more efficiently and effectively. Knowledge management activities are aimed at facilitating the creation, capturing and acquisition, sharing and utilization of knowledge. Most critical and important skills that were needed are: • Building knowledge taxonomies (for organising knowledge resources on Websites and Portals) • Understanding of information and knowledge needs of users • Ability to map internal and external knowledge • Understanding of the library's information and knowledge flows
Cathie Koina, 2003	Some librarians will go forth, gain new skills, and become leaders of knowledege management in their organisations, while others will move towards the important supporting roles of managing and retrieving information in using the power of such phenomena as metadata. What skills are needed by an effective knowledge manager? May currently have: Flexibility, Team skills, People skills, Communication skills, The ability to assess and evaluate information, How to create, record and store information effectively, How to use information tools effectively, How to train and educate the client, and Are client service oriented May not necessarily have: Lateral thinking, The ability to think in terms of the enterprise rather than the professional function, The power to persuade, to 'sell' themselves and their skills in an organisational context, The capacity to manage, rather than merely endure, change, Advocacy, Strategic planning ability, Marketing capacity, Able to analyse their roles and identify areas for improvement, and Project management capacity.

Appasaheb. Naikal; Ramesh Paloti, 2003	Library database management, competitive intelligence, marketing research, inter knowledge sharing
Susan Henczel, 2000	Information audit is a process that will effectively determine the current information environment by identifying what information is required to meet the needs of the organisation. It establishes what information is currently supplied, and allows a matching of the two to identify gaps, inconsistencies and duplications. The process will also facilitate the mapping of information flows throughout the organisation and between the organisation and its external environment to enable the identification of bottlenecks and inefficiencies. It establishes what information is currently supplied, and allows a matching of the two to identify gaps, inconsistencies and duplications. The process will also facilitate the mapping of information flows throughout the organisation and between the organisation and its external environment to enable the identification of bottlenecks and inefficiencies.
Jinhong Tang, 1998	Libraries seem to have lost their clarity of definition. Where a library exists is no longer important, but what a librarian performs counts. Their roles have been changing with social advances. From the bookkeeper and custodian in ancient times to the reference librarian and the Chief information Officer in late 20th century, the scope and meaning of the term librarian is expanded. such as information navigator, information broker, information engineer, etc. Three major roles are waiting for librarians to assume with the coming of the new millennium: global information provider, educator and trainer, knowledge manager.

Knowledge Manager: Increased recognition of knowledge as valuable strategic resource could heighten the importance of information professionals. As a result all information functions (library database management, competitive intelligence, marketing research, inter knowledge sharing) needs to change into a single department or function [2].

5 CONCLUSIONS

The era of big data requires strong data analysis capabilities with deep logic capabilities and persistence to continue learning and mastering existing business processes. In this digital era, the container of information is not only the print materials but this is the age we are living where a huge rate of information born in digital format. So, the librarian should ready to transform from the conventional method to digital. Academic librarians are in need of skills and competencies that could help them engage in knowledge management activities. Librarians as knowledge managers need to possess some knowledge such as IT skills, literacy, technical and analytical skills, extract, filter and disseminate vital external knowledge, Communication skills, Advocacy, create, record and store information effectively Strategic planning ability and use information tools effectively.

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