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Lynn Valetutti
University of Arkansas

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Cultural Heritage Preservation in Digital Repositories: A Bibliometric Analysis

By Lynn Valetutti

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University of Southern Mississippi

Readers: Dr. Elizabeth Haynes
Dr. Matthew Griffis

Introduction

"As cultural heritage institutions, libraries, archives, and museums share common goals to acquire, preserve, and make accessible artifacts and evidences of the world's social, intellectual, artistic, even spiritual achievements" (Dupont, 2007).

The World Wide Web (WWW) has changed the way that we access information. Digital repositories have become the solution for preserving old materials and the venue to allow open access (OA) to the public. On October 17, 2003, UNESCO (United Nations Educational, Scientific, and Cultural Organization) adopted a Charter on the Preservation of Digital Heritage which is still in existence today. They defined the importance of preserving cultural heritage for future generations and preserving the documents of the past. They collaborated with the Memory of the World Programme which promoted the digitization of cultural heritage especially in indigenous populations.

UNESCO's charter defined digital heritage as embracing "cultural, educational, scientific and administrative resources as well as technical, medical, and other kinds of information created digitally or converted into digital form from analogues resources and to include texts, databases, still and moving images, audio, graphics, software and web pages" (De Lusenent, 2007, p. 165). This definition was significant to the digital revolution because it incorporated intangible heritage materials that were traditionally not recognized.

Organizations such as the Association of Research Libraries (ARL) in the United States and the European Commission's "Comte de Sages" promoted the initiative of the digitization of cultural heritage and recommended that "cultural institutions should make public domain materials digitized with public funding

as widely available as possible for access and re-use" (Savenje & Beunen, 2012, p. 80). The Berlin Declaration in 2003 was instrumental in this digitization movement because the focus of the declaration described as "encouraging the holders of cultural heritage to support open access by providing their resources on the Internet" (Berlin Declaration, 2013, p. 82).

The recent events in the Middle East crisis have demonstrated the need to capture and preserve via digital imagery artworks and the digitization of ancient manuscripts. "Destruction of cultural property has been a long tradition among violent Islamists" (He, 2015, p. 179). In 2001, the statue of the Buddha in the Bamiyan Valley in Afghanistan was demolished and the Shrine of Abdel Salam al-Asmar in Libya was also destroyed by the Taliban in 2012. UNESCO had decreed these actions against the cradle of civilization as War Crimes and have accordingly implemented international laws to protect cultural sites from radical militants.

"Revolutionary Digitization: Building a Participatory Archive to Document the January 25th Uprising in Egypt" (Runyon, 2012) is an example of a journal article that will be reviewed in this research paper. This article focuses on a unique archival project that amplifies the importance of "Web" based information and their collection methods. The American University in Cairo (AUC) has built a participatory repository to archive millions of Web documents, digital library assets, and scholarly communications. Their format enabled archivists to reach out to citizens and to capture revolutionary rhetoric from blogs, You-tube, and Twitter for preservation during Egypt's Arab Spring movement in Tahir Square.

Governments have been urged to provide support of this digital initiative and to create infrastructures for computerized public services and technology. This initiative promotes modernity within countries and is extremely important for evolving and threatened third-world countries to insure the protection of cultural heritage (Boahmah, Dorner, & Oliver, 2012).

Digital repositories have encountered ownership challenges, intellectual property rights and control and usage authorization of digital image assets (Savenije & Beunen, 2012). Another important issue concerns English being the predominant language on the Web and in software; this dilemma is being addressed within their respected countries with the assistance of groups such as UNESCO and Open Glam (Ploeger, 2014). That being said, this research paper will not address the legal ramifications affiliated with cultural heritage challenges but will dissect the content of the articles regarding the initiative of preserving artifacts in digital format. The publishers, author's credentials, countries involved with perpetuating through cultural heritage through digitization, and methodology are identified.

This study is important to archivists and librarians because it will examine their function in the digital environment and the current practices necessary for cultural heritage preservation.

Problem Statement

This research paper examined the scholarly library and information science (LIS) literature related to cultural heritage and digital preservation including publication over time, core journals, countries that were the focus of publications, and types of library or cultural repositories that are delineated herein.

Research Questions

R1. In what years have scholarly LIS articles been published about cultural heritage preservation in digital repositories beginning in 2005 and ending in July 2015?

R2-A. In which years were the highest numbers published?

R2-B. Are there any publication patterns or repeated trends?

R3. Are there any noticeable increases or decreases in publication concurrent with key political or world events related to cultural heritage?

R4. In which journals published the most articles in this study? Were there key titles?

R5. Which countries are the focus of the articles?

R6. What types of libraries or cultural repositories are the focus of the articles?

R7. What types of authors are being published? Scholarly or practitioners?

Acronyms/Terms

AUC- American University of Cairo

CIS- Commonwealth of Independent States

ICT- Information and Communication Technology

LIS- Library Information Science

OA- Open Access

Memory of the World Programme- An organization that promotes the preservation and digitization of cultural heritage globally especially in indigenous people

Open Glam – An initiative run by the Open Knowledge Foundation that promotes free and open access to digital cultural heritage held by Galleries, Libraries, Archives, and Museums.

UNESCO - United Nations Educational, Scientific, and Cultural Organization.

Bibliometrics – “the use of mathematical and statistical methods to study and identify patterns in the usage of materials and services within a library or to analyze the historical development of a specific body of literature, especially its authorship, publication, and use” (Reitz, 2014).

Bradford's Law – law which “proposed a formula that described this phenomenon: on any subject, a few group of core journals will provide 1/3 of the articles

on the subject, a moderate number of less than core journals will provide a further 1/3 of the articles, and a large number of peripheral articles will provide the other 1/3" (Reitz, 2014).

Limitations

This study included scholarly peer-reviewed articles published during the last ten years that were indexed in library and information science databases. This study did not include abbreviated or abridged articles with few or no bibliographic references such as editorials, columns, or essays.

Assumptions

It was assumed that the databases used in this study were indexed accurately so that pertinent articles are retrieved. It was further assumed that the articles in this study were representative of the body of scholarly literature pertinent to cultural heritage preservation and digital repositories that were necessary for their control, maintenance, storage, and security

Literature Review

Although the concept of safeguarding cultural heritage predates the adaptation of a new charter by UNESCO in 2003, the charter serves to heighten sensitivity of protection, preservation, and utilization methods by embracing "cultural, educational, scientific and other administrative resources, as well as technical, medical, and other kinds of information created digitally, or converted into digital format from existing analog resources" (De Luesnet, 2007, p. 165). It was a milestone because it deemed that digital materials are a valuable component of recording important social and ancestral history and documenting it to be cataloged into preservation systems. Political revolutions and the inception of newly evolved countries promulgated cultural awareness and caused indigenous populations to recognize the significance of preserving their cultural heritage, religious and social behaviors, traditions, and languages for future generations.

The developments in technology have also fueled preservation techniques from single items to batching entire collections. Digital repositories have become the means for sustaining these collections. The scope of preserving cultural heritage has

expanded well beyond tangible assets but now also includes nontangible objects since innovative tools are available to format these additional entities.

Preservation of Cultural Heritage through Digitization

The article "The Role of the National University in developing Nation's Digital Cultural Heritage Projects" (Dowding, 2014) provides an example of current cultural heritage preservation that occurred within the country of Kazakhstan that recognized the value of securing its ethnicity and history with limited resources. Dowding identified in her study two major challenges the digital project has encountered. The first problem was the technical infrastructure of the country. In 2012, less than 8 percent of the country had Internet capabilities in their homes along with the underdeveloped Information and Communication Technology (ICT) in libraries. This was due to the limited software and Web applications available in the Kazakhstan language. She noted that the technology industry in-country was state owned and that there was evidence of over regulated/restricted legislature that constrained the communication technology market's development. The Library confronted copy right laws since the current laws in Kazakhstan did not adequately restrict "piracy". Legislature was needed to be passed to preserve and protect the digital property.

The other challenge that hindered the focus of digitizing the cultural heritage was ethnic barriers. Kazakhstan literature was generated during the reign of the Soviet Union yet the Kazakhstan government wanted to focus on materials of the nomads and their life style. These clan tribes had existed during Soviet rule and maintained their separate identities. The sovereignty of the Soviet Union introduced other nonindigenous influences such as Russian, German, Korean, Uzbek, and Tatar to the region. These ethnicities played a key role in establishing new socio-political philosophies affecting government, education, and cultural preservation. This caused complications to the heterogeneity of the country and its significant infusion of non-indigenous ethnicities. Dowding noted that the post-Soviet statehood Kazakhstan was the only state with the minority of its indigenous people being at 39.7 percent. This bias of the government was problematic according to Dowd due to their strict

Internet censorship that identified information sharing as criminal activity. Kazakhstan's digital project should be used as model for underdeveloped nations to mimic as they begin to ensure their cultural heritage preservation stated (Dowding, 2014).

Kaye's article "Archiving Justice: Conceptualizing the Archives of the United Nations International Criminal Tribunal for the former Yugoslavia" (2014) presented a humanitarian problem in the preservation of culture heritage in Yugoslavia. The archive collection was contained records of war crimes, crimes against humanity and the genocide in the 1990's in the Balkans. Controversy surrounded the digitization of this collection since it captured the stories of people that suffered in the siege of Sarajevo, the rape camps in Bosnia, and the massacres around Srebrenica and in Vukovar. The indigenous population believed it was an archive of actual events that documented their history. They considered it to be a "living archive" and believe that it could be used to promote peace and for generations to come.

Cultural traditions can impede the digitization of a population's history as demonstrated in "Stakeholders' Attitudes towards the Management and Preservation of Digital Cultural Heritage Resources" (Boahmah, Dorner, & Oliver, 2012). This published research project attempts to understand factors that influence digital cultural heritage resources (DPCH) in Ghana. The country had an emerging economy but lacked the necessary resources to preserve their cultural heritage like most sub-Saharan African countries. The people have an embedded sense of cultural awareness and recognized the importance of preserving their traditions for their children. It is evidenced in their practice of honoring old taboos like not entering forbidden sacred places. Certain Ghanaian traditions, beliefs, and practices prevented the people from tampering with their cultural heritage resources. The authors' research project revealed that attitude, policy development, and management were the main inhibitors in the digitization process not the lack of resources.

Bibliometric Research

Bibliometric analysis is recognized as valid and authoritative investigation in the scientific arena. The usefulness of a discipline is measured by the amount of and quality of research completed in their discipline (Echezona, 2011). The bibliometric method of publication analysis will provide content and publication patterns on our subject of cultural heritage preservation and digital repositories. This quantitative analysis will provide the answers to research questions in this study. Bradford's Law deems that a disproportionate share of significant research results on a given subject is published in a relatively small number of the scholarly journals. Core journals will produce 1/3 of the articles on a subject, a moderate number of less than core journals will produce 1/3 of the articles on a subject and a large number of peripheral articles will provide the remaining 1/3 (Reitz, 2014).

The article "Journal Literature on Digital Libraries: Publishing and Indexing Patterns" by Davis Herring (2000) provides a comparable study that examined publishing and indexing patterns in a digital library. It is an appropriate literature reference because it is related to the research topic and it validates the utilization of analyzing publication patterns. Herring identified in her study that there were no other publication studies in 2000 on digital libraries. She endeavored to identify core journals that were published on the topic but also the terms that organizations used to index articles on digital libraries. She conducted her study by utilizing electronic resource databases to answer her two research questions: (1) What are the leading journals in the area of digital libraries? (2) Which indexing terms return the largest number of and most relevant articles on digital libraries in electronic resources? The study's results produced a 105 core journals that had published on the subject of library digital literature with only 42 percent of the journals had published one article with a six-year period. There was no prominent leader in the core publishing journals. The unique results indicated that 2/3 of the citations were identified through one or two phrases that were inconsistent. Davis Herring's study confirmed "that skill and persistence, and wide reading are required in keeping up with developments in an evolving field" and substantiates

the conduction of publication analysis to identify developments in new and revolutionary subjects.

Ingerwersen presented a published study "Selected Critical Examples of Scientometric Publication Analysis" (2014) that identified factors of primary significance used to calculate and interpret publication analysis from a scientometric perspective. Ingerwersen sought to explain the rationale behind publication analysis growth along with the number of countries, institutions, authors per publications, and country collaborations indexed by the Web of Science database. The methodology behind his study was to review previous peer-reviewed research studies that also included blogs and open access articles to identify the problems with publication patterns, trends, and analytic tool applications within the database. His results were formatted by publication growth, average number of countries, and authors per publication including a breakdown of collaborating countries. His analysis revealed that the top three leading publishing countries were China, the United States, and Europe.

Ingerwersen determined that the following characteristics and elements are crucial to interpretations for making valid analysis results and presentations: data source and quality, expert knowledge, and the format for presenting outcomes. He preferred indexed values over diagrams for data presentations. Ingerwersen concluded "that citation analysis and citation impact can only be done by means of valid publication analysis." The publication analysis products provide insight into productivity, publication patterns, and trends". The article validated the importance and relevance of publication analysis as a methodology to review subject content.

Gupta, Kumbar, and Gupta conducted a scientific analysis of publications in order to identify India's publications output, growth of citation impact, and its global publications share and rank. The article "Social Science Research in India: A Scientometric Analysis of Publications" (2013) is the methodology and comprehensive results of the publication analysis. The study spanned over ten years and used Scopus database with specific parameters to extract data on Social Science Research. The formula was

written so that countries could be identified along with a ranking for India. In Ingerwersen's article published in June 2014 he noted that China ranked number one for their influx of publications of peer-reviewed publications while India was not mentioned.

The results of the study indicated that India was ranked number twelve in the world and that they had great potential for growth and publication's in the Social-Science field. The listings were presented in tables based on global publication outputs and the rank of the top fifteen countries that published in Social Sciences between the years 2001-2010. The study validated that publication analysis can be used to identify core countries publishing on a given subject.

Yang and Lee published "Analysis of Publication Patterns in Korean Libraries and Information Science Research" in 2012 based upon a study that they conducted doing a publication analysis on 2,401 peer-reviewed articles by 159 Korean professors. The authors acknowledged the recent popularity in citation analysis in bibliometric research however they also believe that publication counting is effective for assessing scholarly productivity. Publication analysis would provide the identification of data needed for isolating trends in collaboration, publication patterns, the escalating number of international publications, and the internationalization of LIS in Korea. They collected data from 2001 to 2010 from the following categories; year, author, affiliation, and journal in scholarly publications. In addition, the 159 LIS professors were examined to validate their age, their affiliated institution, and the institution that issued their doctorate degree as components of the study.

The scholarly publications printed in Korea were approximately 1.5 per person per year which annually produced 223 domestic journal articles in Korea. This increased number compared to previous study results was attributed to major LIS publications increasing circulation to quarterly publications. In addition, single and multiple authorships were classified and the quantity of publications per PhD. Their results were presented through indexing, tables, and diagrams. Yang and Lee used a multi-

faceted publication analysis to collect the information for their research because it provided qualitative data rather than quantitative.

Methodology

The methodology for conducting this study was a bibliometric analysis of publication patterns and content. Scholarly, peer-reviewed journal articles that were published during the last ten years starting in 2005 and ending in July 2015 were accessed through the following electronic databases: *Library, Information & Technology Abstracts, Information Science & Technology Abstracts and Library & Information Science Sources*.

A search of the databases for “cultural heritage preservation” AND “digital repository” as search terms was conducted in the default keyword fields and limited to peer-reviewed and academic journals. Articles that were non-English or short articles with inconsequential bibliographic references were not addressed.

Data were collected that delineated publication year, article title, journal title, countries that were the focus of the articles, and types of libraries or repositories that were the focus of the articles, quantitative and qualitative content analysis, and author affiliations. The types of libraries and cultural repositories actively engaged in digital cultural heritage preservation were compiled and classified. The nature and sophistication of the countries played a significant role in the outcome of the study because reflected either established or developing systems and methods affecting their repositories. Capturing the number of articles published per year indicated when the subject became noteworthy to the discipline and how the interest escalated.

Data were compiled in Excel and Word format; the software was utilized to illustrate the findings in coherent and empirical tables and diagrams that reflect the publication (trend over time), core journals, countries, and types of institutions committed to the preservation of their cultural heritage in a simplistic analysis.

Results

Thirty-three articles were identified that met the parameters for this study. Peaks were revealed in publication years which indicated that there was more activity taking place and there was a rise in interest on this topic. In order to obtain a more comprehensive and representing set of articles the first search was expanded to include eight years prior to 2005 (Table 1). Accordingly, the data were compiled and the findings of the research questions were computed and identified in tables.

Table 1. Overview

Total Articles	33
Number of Journals	27
Number of Countries	23
Authors Professional Categories	5
Time Span	2005-2015 First Search 1997-2015 Second Search

R1. In what years have scholarly LIS articles been published about cultural heritage preservation in digital repositories?

In this study, this subject debuted in 1997 and did not show increase until 2007. The amount of publications remained constant until 2012 when interested doubled and there was a significant increase in publications for three years (Table 2).

Table 2. Publication Trends

YEAR	PUBLICATIONS
1997	2
1998	1
1991	1
1998	1
2006	1
2007	2
2008	2
2010	2
2011	3
2012	6
2013	7
2014	4
2015	1

R2-A. In which years are were the highest numbers published?

The publications height peaked in 2012 and 2013 and then started to decline.

R2-B. Are there any publication patterns or trends?

2012, 2013, and 2014 yielded the most publications.

R3. Are there any noticeable increases or decreases in publication concurrent with key political or world events related to cultural heritage?

The year 2013 had the most publications. Rayman (Time, 2013) had included the international events of Africa’s ring of terror: Islamists raiding Mali, the end of the Egyptian revolution: the fall of President Mohammed Morsi, and Syria’s Civil War in his 2013 top ten world events article. These events were destructive in nature and their national cultural heritage was vulnerable to compromise.

R4. In which journals published the most articles in this study? Were there key titles?

Slavic & European Information Services and Journal of the Society of Archivists had printed the most journal articles (18%) on this topic (although not the exact percentage of 33%, this follows the general principle of Bradford’s Law that a disproportionate share of articles on a given subject will be published in a relatively small number of core scholarly journals). It is important to note although there was no single major publisher for the library science field there were several library science publishers identified in the study (Table 3)

Table 3. Publications

PUBLICATION	Articles Published
<i>Journal of the Society of Archivists</i>	3
<i>Slavic & European Information Services</i>	3
<i>Archival Science</i>	2
<i>Art Libraries Journal</i>	2
<i>Liber Quarterly</i>	2
<i>Library Trends</i>	2
<i>Microform and Digitization Review</i>	2
<i>American Archivist</i>	1
<i>Australian Academic and Research Libraries</i>	1

<i>Electronic Library & Information Systems</i>	1
<i>IFLA Journal</i>	1
<i>INFO theca</i>	1
<i>Journal of Information Management</i>	1
<i>Journal of Librarianship and Information Science</i>	1
<i>Journal of Library and Information Technology</i>	1
<i>Journal of the Society of South African Archivists</i>	1
<i>Library and Information Science Research</i>	1
<i>Library Philosophy & Practice</i>	1
<i>Library Review</i>	1
<i>Maryland Journal of International Law</i>	1
<i>New Review of Information Networking</i>	1
<i>OCLC Systems and Services</i>	1
<i>Preservation, Digital Technology and Culture</i>	1
<i>Scientometrics</i>	1

R5. Which countries are the focus of the articles?

Europe had the most articles published since it encompasses several countries that had formed collaborative initiatives for cultural heritage (Table 4). Many of the countries identified were in the midst of government reform.

Table 4. Countries

COUNTRY	# Articles Published
India	3
Romania	3
Europe	3
China	2
England	2
Germany	2
Nigeria	2
Russia	2
Asia	1
Czech Republic	1
Ghana	1
Iran	1
Italy	1
Kazakstan	1

Malian	1
Netherlands	1
Philippines	1
Poland	1
Serbia	1
Sub-Saharan Africa	1
USA	1
Vietnam	1
Yugoslavia	1

R6. What types of libraries or cultural repositories are the focus of the articles?

In table five, national libraries were the main focus of articles publishing on cultural heritage—at 36%—and were followed by university libraries (21%) and national archives (15%).

Table 5. Repository Genre

TYPE OF REPOSITORY	Quantity
National Library	12
University Library	7
National Archive	5
Archive	3
European Archive	3
Museum	2
Science Foundation	1

R7. What types of authors are being published? Scholarly or practitioners?

As seen in table six, professors were the main producers on this topic followed by archivists and librarians. Scholarly article publications were dominant followed by practitioners writing on preservations techniques.

Table 6. Professions

PROFESSION	Scholarly or Practitioner	QUANTITY
Professor/Faculty	S	14
Archivist	P	9
Librarian	S	6
Law Student	P	1
PhD	S	1
PhD Student	S	1
Scientist	P	1

Conclusion

This study was conducted following the specifications outlined in the research methodology. The electronic library databases: *Library, Information & Technology Abstracts, Information Science & Technology Abstracts* and *Library & Information Science Sources* were accessed to identify articles that were appropriate for the conduction of this bibliometric analysis on publication patterns and content on the research topic. The search terms “cultural heritage preservation” and digital repository” were inscribed in the Boolean fields. Search parameters were established to identify only scholarly based publications. The publication date range had been set to span ten years starting in 2005. The initial search produced 28 articles in English that had met the requirements for the study. It also identified just as many articles that were not published in English and publications that argued the importance of cultural heritage preservation and digital repositories. The search inquiry was repeated with a publication range increase of 8 years to start in 1997. This publication year was selected because it was just prior to 2000 (Y2K), the year society believed that there would be a world digital catastrophic event. The second inquiry only generated 5 additional articles in English that met the criteria along with several articles concentrating on the value of digital repositories. The study did not generate a vast number of articles to analyze for the bibliometric study; a process that usually involves greater amounts of data. The 33 articles that were retrieved were then analyzed for content and publication specifications.

Research question R1 sought to identify scholarly articles published. The publication average had remained consistent until 2011 when it began to increase and then doubled in 2012. The increased publication rate lasted for three years. R2 had expanded on question R1 and had asked for the highest publication years in years 2012 and 2013. R3 deliberated on the correlation of the publication peaks and concurrent world events. The plateau year for publications was 2013. I searched *Time Magazine’s* online publication and located an article by Rayman that listed the top ten international news studies according to their research. There were natural disasters listed but the top three political events that could compromise the integrity of

cultural heritage were: the fall of the President of Egypt the final thread of political organization, Syria's civil war that had reached large numbers of destruction and attracted the attention of the international community, and Iran's new president's inauguration which should have rendered stability to a war torn nation. During 2013 there was also an increase of insurgency by extreme Islamists. The destruction of countries priceless relics that record/validate the inception of civilization was a serious concern to archivists. This could be the reason for the increase of publications but to ratify this hypothesis further investigation would be warranted.

The second section in the research study focused on content review of the content publications. Question R4 inquired about the specific key publishing journals. *Slavic & European Information Services* and *The Journal of the Society Archivist* had the highest number of publications. Both publications had generated 3 articles. It was not surprising that *Slavic & European Information Services* was a lead publisher contender since the study generated a significant amount of non-English articles published by European countries. The other top publisher *The Journal of the Society Archivist* validated the rise and concern of archivists on this subject matter. It is important to note that there were approximately 10 library publishers identified in the study but they did not have multiple publications.

R5 focused on the countries that were the center of the articles. There were 23 countries that were the subject matter of the publications. India, Europe, and Romania were the top three with three publications each. The articles written about Europe included several countries since they had formed a coalition of collaborative efforts. Romania being noted in the top three supports the research identifying *Slavic & European Information Services* as a top publisher. R6 required the classification of the types of institutions that were the focus of the articles. There were 12 National libraries that were the main concentration of the articles that had an emphasis on cultural heritage preservation and digital repositories. University libraries followed with 7 publications and national archives came in third with five publications. The study revealed that national institutions steer

head cultural heritage preservation efforts and the implementation of digital repositories are a national endeavor. The final question R7, sought to identify the genre of authors and if they were scholars or practitioners. Based on the results of the data from R6 which identified national libraries as the primary institution, the researcher would expect librarians or archivists to the highest ranked publishing profession but the study revealed scholarly professors were number one. Archivists came in second and librarians were third which reflect the findings of R6. The study concluded that the top repositories involved with cultural heritage preservation and digitization were national library institutions. University professors were the lead profession that published on this subject. Although library publishers were not the top segment generating publications collectively the field had a strong showing. The year 2013 had peaked with 7 publications but 2014 saw only 4. The year 2013 needs further examining to see if world events such as the end of the Arab Spring or the rise of Islamic extremists had fueled the publications.

In order to further the study, it could include the non-English journal articles. In addition, research articles that amplified the need of cultural heritage preservation, digitizing relics, and the importance of digital repositories could be included. These parameters would underscore the importance of preserving heritage and the implementation of electronic databases. These data would extend the scope of the study to make it more comprehensive.

The number of publications generated from the databases as delineated in results that met the research study criteria represented a limited number of articles. The study was expected to have generated more data for the bibliometric analysis and thus this study lends itself to be subjective as a more qualitative analysis than quantitative.

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