

The Library as a Digital Scholarship Hub: Opportunities for Leveraging Learning Support

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Abstract: With libraries now expected to be online and clients assuming that academic information resources are available and accessible publicly on the Internet anytime, the digital environment provided opportunities for the libraries to mature in their learning support for their school communities. This had been made even more pronounced when the COVID-19 pandemic affected the world over, moving all services and programs to shift heavily to the digital environment. While advanced libraries have been prominently embedding Library 4.0 in their learning support systems, the pandemic pushed many, if not all, libraries to consider developmental directions involving the heavy use of digital technologies in scholarship. This study aimed at exploring the digital scholarship (DS) service opportunities in libraries by means of benchmarking on the DS services and practices of the top higher education institution libraries in Asia in 2020, which endeavors to serve as baseline in coming up with a proposed DS hub development plan for Philippine academic libraries. The descriptive survey design using website investigation to screen data was employed, drawing up an instrument to contextualize the DS services mined from these websites, then categorized based on the determined and desired DS services environment. A DS services scan of the libraries of top-ranking Asian universities with that of the Philippines' best were mapped to get a perspective of the status of the latter's DS services, providing insights in coming up with a DS program plan. Data revealed that while leading Asian university libraries have moved away from the traditional types of services, content and framework, its Philippine counterparts' services were deemed emerging. Subject expertise upskilling among librarians in the fields of data research management, data services and digital technologies, as well as an intensified librarian engagement in

Received: 24.9.2021 Accepted: 17.12.2021

ISSN 2241-1925

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DS partnerships and projects in the academic community were seen as opportunities for a responsive DS service. The output of this study has potential use in guiding Philippine academic libraries in coming up with their own framework and roadmap towards instituting their own DS services hub, to leverage learning support in their respective communities.

Keywords: Digital scholarship, digital scholarship services, learning support, libraries, librarians

1. Introduction

In a traditional setting, people coming into the library are treated as clients, and clients see the library as a place for printed matter. This mutual expectation has changed, however, with the introduction of digital technologies. Libraries - resources and people - are now expected to be online, and clients assume that academic information resources are available and accessible publicly on the Internet as well, no longer opaque nor static, but interactive and curated (Zhou, Huang, & Zijlstra, 2019). Digital technology also enabled libraries to transcend its role from mere service counters circulating information resources, into becoming boundless, virtual spaces for learning, and a place for scholarly communication.

This digital environment provided opportunities for the libraries to mature in their learning support for their university communities. The current reality is that the research culture is growing, and big data is becoming more and more prevalent. For instance, researchers and scholars in the university community needing funding support for their research studies are being asked to provide data management plans in their application statements (McRostie, 2016). Such a need demonstrates the kind of culture and environment calling the libraries higher, now seen as partners of scholars, and have "...to deliver more varied information services to researchers through digital and networked channels" (Zhou, Huang, & Zijlstra, 2019). Digital scholarship has made the landscape robust for the libraries and are now seen as its incubators (Zhifang & Huifang, 2018).

Digital Scholarship in the academe

In the Times Higher Education (THE) World University Rankings, a definitive list of the top universities globally, one performance indicator to secure a spot in the rankings is on research productivity. With research becoming a prominent indicator in the rankings, academic research takes the spotlight in universities.

This evolving nature of academic research led to initiatives that are grounded on digital scholarship. Mitchem and Rice (2017) explained in their study that such programs and services may be library-centered, or they may develop in information technology (IT) or academic departments. They further emphasized the term “digital scholarship” to also mean that institutions may refine the definition for themselves after considering their own needs. Hence, understanding the needs of the academic community is important if institutions were to design and develop programs associated with digital scholarship.

Furthermore, in developing these spaces and associated services, Hurrell (2019) found out that the most common aspects of a DS service were access to partners, use of technologies, and space. Within these spaces, as highlighted in the study of Li et al. (2020), researchers are interested in utilizing its DS services to 1) formulate research ideas, 2) locate research partners, 3) write research proposals, 4) conduct research, and 5) publish results.

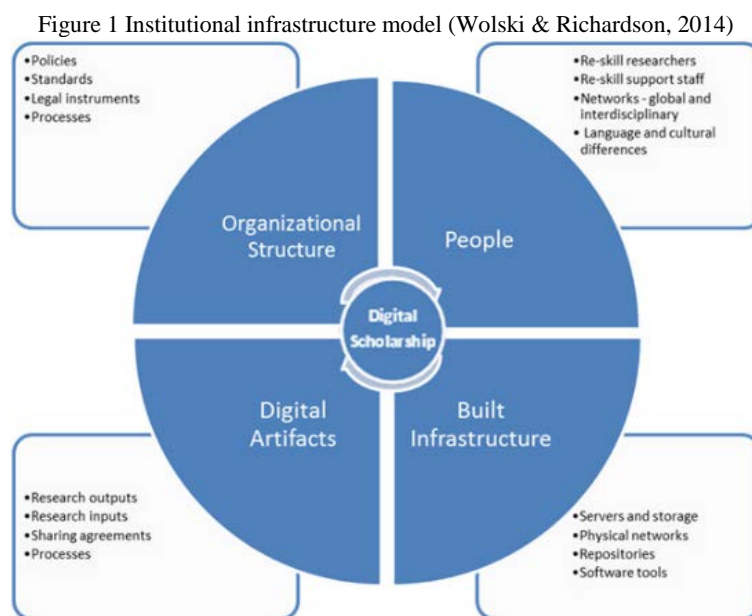
With researchers as target service recipients, close communication and collaboration between DS providers and its community of researchers is needed for a successful digital scholarship program implementation.

Digital Scholarship and its presence in the library community and libraries

Literature has cited existing definitions of digital scholarship (DS), however, that of Been, Bennett, Hilyer, Malizia, & Thompson's (2016) description of DS best fits the context of this study, where DS "...enhances the act of creating and sharing knowledge using digital technology...leveraging digital technology and media to conduct research across disciplines and to disseminate, access, and/or reuse it via primarily electronic methods." It basically describes taking advantage of the digital technology in the proliferation of research, scholarship and knowledge creation.

DS' presence is not new in the library and information science field. A session on digital humanities (DH) and DS was held during the *2018 IFLA World Library and Information Congress*, where papers on both models and best practices channeling the library's transforming role - from being a service provider to becoming an interdisciplinary partner (IFLA Digital Humanities/Digital Scholarship Special Interest Group, 2018) - were presented. DH and DS were identified in IFLA's 2013 trend report as one of the key themes of professional focus. Also, the 30-member *AUNILo: Libraries of the ASEAN University Network* have been discussing digital economy and DS trends within their network and how the library's key role in the process can elevate scholarship further.

Wolski & Richardson (2014) discussed in their paper the key elements required to build a DS institutional infrastructure, where said structure was seen not only to support new DS practices, but also integrates scholarly literature into the process that could generate *true digital scholarship*, as illustrated below:



Given the above model, librarians and allied professionals have painted many pictures of what a DS hub or center looks like, although it could vary from library to library. The general picture, however, is that it is "...a hub for the digital humanities, experts to answer questions about data management, a maker space with 3-D printers, and much more" (Hensley & Bell, 2017).

Digital Scholarship in the pandemic

The COVID-19 pandemic that affected the world over has afforded a benefit for digital scholarship to be even more pronounced, with institutions and libraries moving all services and programs to shift heavily to the digital environment. Digital practices are now redefining academic research for the digital age.

As stated by Rumsey (2011), digital scholarship "is the use of digital evidence and method, digital authoring, digital publishing, digital curation and preservation, and digital use and reuse of scholarship." Now that most schools and institutions are still closed as they grapple and adjust to the pandemic, the unprecedented shift to online services and processes have increased. This has prompted libraries to rethink services and reassess programs that can continue in

the digital environment even with physical closure of spaces. Often, these library-led initiatives are focused on ensuring the integrity and long-term accessibility of the scholarly record. It is with such urgency that libraries must push forth advancing services that are digital-ready with close collaboration and active participation from the academic community.

2. Purpose and Objectives

The main question for this study emanates from the curiosity that, with the prevalence of digital technology, the availability of various digital educational resources and platforms, and the apparent growth in the research activities and engagements of the university community, how are Philippine academic libraries rising to this kind of environment and support its institutions' DS thrusts and direction? Corollary to this:

- Are there DS initiatives in place among the country's libraries, at least among its top academic and research libraries?
- What are the essential DS services Philippine academic libraries should provide, given their DS environment and current capabilities?

Given this curiosity, this study therefore aims to explore the DS service opportunities for said Philippine academic libraries by means of benchmarking on the DS services and practices of the top higher education institution libraries in Asia, which shall potentially serve as its baseline in coming up with a proposed DS hub development plan for Philippine academic libraries. The study specifically endeavors to:

- determine the available DS services offered by the top university libraries in Asia;
- contextualize the essential DS services and programs common to these top Asian university libraries and see the baselines for a DS hub suitable for Philippine academic libraries;
- draw up recommendations for Philippine academic libraries in developing a program plan for a DS services hub, to leverage scholarly communication and research support for their communities.

3. Scope and Limitation

Data for this study encompass the top 50 Asian universities as ranked by *Times Higher Education* (THE) in 2020 only, in relation to the placement of the top 2 Philippine universities (i.e., University of the Philippines and De La Salle University) who entered the top 300 tiers. THE (n.d.) is a data provider behind

the world's most influential university rankings, reporting global university performance.

Data also covers the top 25 Philippine universities based on their research productivity as listed in *Scopus*, Elsevier's abstract and citation database of research literature.

Data screening is based upon the data made available through the university libraries' websites only, although other information about the research reputation and international outlook of Asia's top 50 universities and Philippines' top 25 universities were also screened. Screened data were the websites published in English only, although Google-translated websites for non-English ones were examined, whenever comprehensible.

Content analysis was not employed for this study, since concepts and terminologies were taken as they are, and meanings were not analyzed.

4. Methods

The descriptive design using website investigation to screen data was employed for this study.

4.1 Data collection and analysis from website investigation

Library websites of the top 50 Asian universities listed in the *THE Asia University Rankings 2020* were screened to identify whether DS support services are offered to their university communities and/or the types of DS services made available to them. The *Asian University Rankings* list was used for this study over the *World University Rankings* to level the Philippine comparison at a regional level. The top 50 was determined as a comparable yardstick in terms of DS practices and the high likelihood that DS library services are offered in these universities. A matrix was drawn as a descriptive instrument to contextualize the DS services mined from these websites and were categorized based on the determined DS services environment:

- (1) DS resources, tools/technologies;
- (2) DS projects;
- (3) DS workshops/trainings;
- (4) DS experts pool; and
- (5) DS partnerships

A separate matrix using the same descriptors for the review of the library websites of the top 25 Philippine universities was drawn to record an investigation of their DS services' offering and their universities' DS environment. In the absence of a Philippine rankings list, the top 25 were

identified based on their research productivity using the December 2020 (end of the year) data from *Scopus*. This was done on the assumption that Philippine universities that are research productive are *likely* to make it to the regional or world rankings list, given that research is one of the performance indicators being judged upon by the *THE* in its performance rankings.

The data gathered from both groups were examined; where data from the top 50 Asian university libraries was mapped with the current DS environment of the top 25 Philippine academic libraries using the DS hub concept map, to get a picture of suitability. This benchmark will then be used as a starting point in recommending the development of a potential DS services plan for Philippine libraries.

5. Results and Discussion

5.1 DS Services Environment Scan of Top 50 Asian Universities

The *THE Asia University Rankings 2020* ranked 500 universities from 30 countries/regions using the same performance indicators as the *THE World University Rankings* (THE, n.d.). Out of the 500, the top 50 Asian universities were selected for screening, whose institutional websites were visited to investigate their research outlook, reputation and DS environment.

Based on the websites' screening, it is emergent that given its highly digital teaching and learning environment, said universities' DS environment dynamics is very mature, and emphasis on big data is prevalent. Collaboration/interdisciplinary partnerships within the university in terms of research and scholarly communication is notably strong, with the advancing thrusts toward research and innovation.

Their library websites were then reviewed to examine the DS support services they offer to their universities' learning and research communities, using the descriptors in the matrix for data collection (see Table 1).

Table 1 DS support present to top 50 Asian university libraries

DIGITAL SCHOLARSHIP SERVICES	
Top 50 Universities in Asia, Times Higher Education Asia University Rankings 2020	
Resources, Tools, Technologies	<ul style="list-style-type: none">• Datasets• Digital contents (e-databases, e-reports)• Research guides (RDM, research cycle, digital humanities, open access publishing, altmetrics, copyright, patents)• Research blogs• 3D modelling and printing tools• Artificial intelligence tools• GIS modelling tools• Media production tools• Statistical analysis tool• Visualization tools• Virtual reality (VR) tools
Projects	<ul style="list-style-type: none">• Cooperative research hub• Digital books• Digital exhibits• Digital scholarship project site• Institutional repositories• Open access publishing support project• Student maker projects• VR competitions• VR exhibitions
Services	<ul style="list-style-type: none">• Citation search and certification service• Manuscript editing services• Publication service• Research consultation service• Research data service• Research support request• Support desk (c/o graduate students)

DIGITAL SCHOLARSHIP SERVICES	
Top 50 Universities in Asia, Times Higher Education Asia University Rankings 2020	
Workshops/trainings	<ul style="list-style-type: none">• Reference management training• Research data sharing• Research data management• Research skills• Course packs• Data cleaning• Data storytelling• Data visualizations• Digital technologies manipulation• DS symposium and conferences• MOOC (IL courses)• Oral defense workshop• Project consultation• Publishing workshops• Social network visualizations• Writing workshop (academic writing, academic presentation, research proposal)
Experts Pool	<ul style="list-style-type: none">• Digital Scholarship Librarian• Digital Scholarship and Archives Manager• Digital Technologies Librarian• Media & Emerging Technologies Librarian• Research Data Librarian• Research Support Services Head• Scholarly Communication Librarian• Subject Librarians
Spaces	<ul style="list-style-type: none">• Artificial Intelligence (AI) Commons• Data processing space• Data visualization space• Digital interactive lab• Makerspace• VR space• Workstations• Writing support area

DIGITAL SCHOLARSHIP SERVICES Top 50 Universities in Asia, Times Higher Education Asia University Rankings 2020	
Partnerships	<ul style="list-style-type: none"> • Creative media offices • Data science experts • Graduate schools • Knowledge transfer offices • Research fellows • Research and innovation units • Scientists • Writing departments

Upon consolidation and contextualization of the DS services offered by its libraries, its services and programs are strong in the areas of overall research data management, that includes big data, data curation, research data sharing and data visualization – all of which are aided by appropriate digital technology tools on learning spaces equipped for such purposes, and supported by workshops and consultation sessions jointly offered by data experts (non-librarians) and DS staff in the library and/or librarians in charge of DS.

It is also interesting to note that while these universities are highly research-oriented with a mature DS environment, not all its libraries have a dedicated physical space for DS services hub (as the case in Tsinghua University, ranked 1st overall). DS research support programs and activities, however, are implemented and carried out on available suitable spaces within the library. Meanwhile, the libraries from National University of Singapore (ranked 3rd), University of Hong Kong (ranked 4th) and Chinese University of Hong Kong (ranked 8th) have a dedicated space with advanced tools and targeted services that are suited for supporting digital scholarship research.

Digital scholarship services in these libraries mainly involve the typical reference services such as library orientations and research consultation services while others added a more advanced level of support in research data services that emphasize assistance to researchers and students, in managing their research data all throughout the research life cycle.

On the other hand, while most DS services and programs are independent, library-led initiatives—partnerships, are also seen as an important feature of any DS model. For instance, the Korea Advanced Institute of Science and Technology (ranked 13th) and Ulsan National Institute of Science and Technology (ranked 23rd) joined a library cooperation network of four (4) science and technology specialized universities. The STAR (Science and Technology Advanced Research) Library provides researcher/research results integrated search, analysis service, and advanced reference analysis service

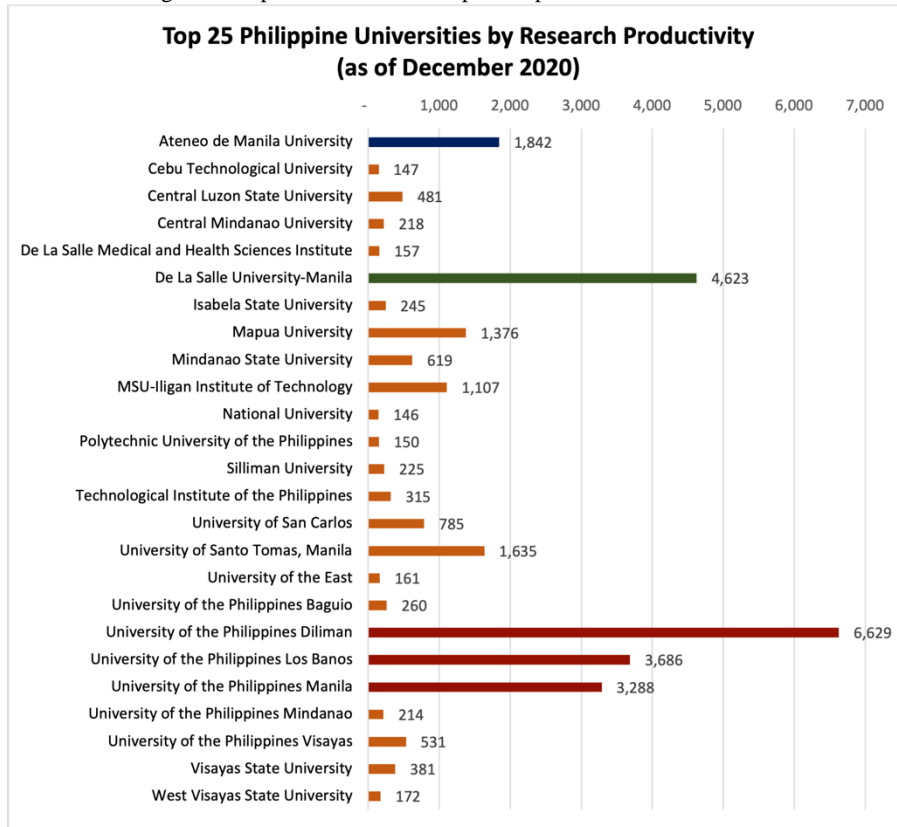
(citation statistics, usage statistics, and presentation statistics) which also allows one to comprehensively search for researchers and research achievements of the partner institutions—integrating researchers and research performance at the four (4) participating institutions: KAIST, GIST, DGIST, UNIST. (STAR Library, n.d.)

Overall, the unifying project and service offered in these universities is the creation and establishment of institutional repositories. This DS service enabled a systematic way of collecting, preserving, and disseminating digital copies of the intellectual output of an institution.

5.2 DS Services Environment Scan of Top 25 Philippine (PH) Universities

As mentioned, the top 25 Philippine universities were identified based upon their latest Scopus research productivity ranking, with 3 University of the Philippines campuses within the top 5 (Diliman, Los Baños and Manila), De La Salle University on rank 2 and Ateneo De Manila University on rank 5 (see Figure 2).

Figure 2. Top 25 PH universities per Scopus' document count



Top 10 Universities:

- 1st - University of the Philippines Diliman
- 2nd - De La Salle University-Manila
- 3rd - University of the Philippines Los Banos
- 4th - University of the Philippines Manila
- 5th - Ateneo De Manila University
- 6th - University of Santo Tomas, Manila
- 7th - Mapua University
- 8th - MSU-Iligan Institute of Technology
- 9th - University of San Carlos
- 10th - Mindanao State University

Upon investigation of these institutions' websites, it was observed that while their teaching and learning environment harmonizes traditional and digital learning platforms, their DS environment is not as comparable with the top 50 Asian universities, which is expected. Given that these are also research universities, the DS practice is apparent although not as mature, in correlation

with its research productivity (i.e., the wider the expanse of DS reach, the higher the number of research outputs there should be).

An environment scan of the library websites to identify DS resources and services being offered by its libraries was conducted (see Table 2). Except for Cebu Technological University and National University – where there were no dedicated websites from its respective institutions, the rest of the libraries’ websites contain pertinent information related to DS.

Table 2 DS resources and services common to top 25 Philippine academic libraries

PH Academic Library	Types of DS Resources	Types of DS-related Services	Staffing/DS Personnel
Ateneo de Manila University	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools) Reference management tools Digital archives	Collaborative learning spaces Information literacy sessions	Librarians
Cebu Technological University	Digital contents (e-databases, e-reports)	Information literacy sessions	Librarians
Central Luzon State University	Digital contents (e-databases, e-reports)	Information literacy sessions	Librarians
Central Mindanao University	Digital contents (e-databases, e-reports)	Information literacy sessions	Librarians
De La Salle Medical and Health Sciences Institute	Digital archives Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools, research productivity) Reference management tools Media production tools	Collaborative learning spaces Media labs Information literacy sessions	Librarians

PH Academic Library	Types of DS Resources	Types of DS-related Services	Staffing/DS Personnel
De La Salle University	Digital archives Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools, research productivity) Reference management tools Learning Management System (integrated resources) Media production tools	Collaborative learning spaces Makerspace Information literacy sessions	Librarians
Isabela State University	Digital contents (e-databases, e-reports)	Information literacy sessions	Librarians
Mapua University	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools, research productivity) Reference management tools	Collaborative learning spaces Information literacy sessions	Librarians
Mindanao State University	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools, research productivity)	Information literacy sessions	Librarians
MSU-Iligan Institute of Technology	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools, research productivity)	Information literacy sessions Fab Lab	Librarians
National University	Digital contents (e-databases, e-reports)	Information literacy sessions	Librarians
Polytechnic University of the Philippines	Digital contents (e-databases, e-reports)	Information literacy sessions	Librarians

PH Academic Library	Types of DS Resources	Types of DS-related Services	Staffing/DS Personnel
Silliman University	Digital contents (e-databases, e-reports)	Information literacy sessions	Librarians
Technological Institute of the Philippines	Digital contents (e-databases, e-reports)	Information literacy sessions	Librarians
University of San Carlos	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools)	Collaborative learning spaces Information literacy sessions	Librarians
University of Santo Tomas	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools) Reference management tools Learning Management System (integrated resources) Digital archives	Collaborative learning spaces Information literacy sessions	Librarians
University of the East	Digital contents (e-databases, e-reports)	Information literacy sessions	Librarians
University of the Philippines Baguio	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools) Reference management tools	Collaborative learning spaces Information literacy sessions	Librarians
University of the Philippines Diliman	Digital archives Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools) Reference management tools Learning Management System (integrated	Collaborative learning spaces Information literacy sessions	Librarians

PH Academic Library	Types of DS Resources	Types of DS-related Services	Staffing/DS Personnel
	resources) Media production tools		
University of the Philippines Los Baños	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools) Reference management tools	Collaborative learning spaces Information literacy sessions	Librarians
University of the Philippines Manila	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools) Reference management tools	Information literacy sessions	Librarians
University of the Philippines Mindanao	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools)	Information literacy sessions	Librarians
University of the Philippines Visayas	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools) Reference management tools	Information literacy sessions	Librarians
Visayas State University	Digital contents (e-databases, e-reports)	Information literacy sessions	Librarians

PH Academic Library	Types of DS Resources	Types of DS-related Services	Staffing/DS Personnel
West Visayas State University	Digital contents (e-databases, e-reports) Learning Management System (integrated resources)	Information literacy sessions	Librarians

Upon consolidation, the PH libraries’ DS-related offering revealed prevalent concentration on digital contents and e-learning resources supported by information literacy trainings and research productivity sessions being handled by librarians. Interestingly, apart from the common services, libraries of the De La Salle Medical and Health Sciences Institute (ranked 22nd), De La Salle University (ranked 2nd), and MSU-Iligan Institute of Technology (ranked 8th), provide media lab, fab lab and makerspace as dedicated hubs, which are characteristic to DS.

5.3 DS Services Mapping: Top 50 Asian University Libraries vs. Top 25 Philippine Academic Libraries

The DS support services of both the Top 50 Asian university libraries were mapped with those offered by the Philippine academic libraries to get a perspective of the status of the latter's DS environment (see Table 3).

Table 3. DS services mapping

Digital Scholarship Services	Top 50 Asian University Libraries	Top 25 Philippine University Libraries
Resources, Tools, Technologies	3D modelling and printing tools Artificial Intelligence tools Datasets Digital contents (e-databases, e-reports) GIS modelling tools Media production tools Research blogs Research guides (RDM, research cycle, digital humanities, open access publishing, altmetrics,	Digital contents (e-databases, e-reports) e-learning resources (subject guides, tutorials/self-help tools) Reference management tools Learning Management System (integrated resources) Media production tools

Digital Scholarship Services	Top 50 Asian University Libraries	Top 25 Philippine University Libraries
	copyright, patents) Statistical analysis tool Visualization tools Virtual Reality tools	
Projects	Digital repositories (Various thematic) Cooperative research hub Digital books Digital exhibits Digital special collections Digital scholarship project site Institutional repositories Open Access Publishing Support project Student maker projects VR competitions VR exhibitions	Digital repositories (institutional archives)
Services	Citation search and certification service Manuscript editing services Publication service Research consultation service Research data service Research support request Support desk (c/o graduate students)	Research support service and consultation

Digital Scholarship Services	Top 50 Asian University Libraries	Top 25 Philippine University Libraries
Workshops/trainings	Reference management training Research data sharing Research data management Research skills Course packs Data cleaning Data storytelling Data visualizations Digital technologies manipulation DS symposium and conferences MOOC (IL courses) Oral defense workshop Project consultation Publishing workshops Social network visualizations Writing workshop (academic writing, academic presentation, research proposal)	IL modules/library research sessions on locating information, navigating e-content databases, using digital tools, citation and originality checking tools
Experts Pool	Digital Scholarship Librarian Digital Scholarship and Archives Manager Digital Technologies Librarian Media & Emerging Technologies Librarian Research Data Librarian Research Support Services Head Scholarly Communication Librarians Subject Librarians	Librarians (teaching pool)
Spaces	Artificial Intelligence (AI) Commons Data processing space Data visualization space Digital interactive lab Makerspace Virtual Reality (VR) Space Workstations Writing support area	Learning Commons (dedicated space) Training rooms Reference section (equipped with PC terminals) Makerspace Media labs Fab labs

Digital Scholarship Services	Top 50 Asian University Libraries	Top 25 Philippine University Libraries
Partnerships	Creative media offices Data Science experts Graduate schools Knowledge transfer offices Research fellows Research and innovation units Scientists Writing departments	Faculty (subject experts) Deans Research Coordination office Innovation labs/Incubators
GREEN – <i>Intersecting DS services</i>		

It can be observed from this mapping that while there are obvious gaps in the orientation of the DS services provision, wherein the Asian university libraries have moved away from the traditional types of services, content and framework, its Philippine counterparts' DS-related services (greens) are emerging. This mapping, however, also highlights the potential capabilities of the Philippine academic libraries to transition their current services to adapt to the DS environment. It is apparent that the top 50 are well into research data management and data science, which focus on highly specialized trainings and research process support.

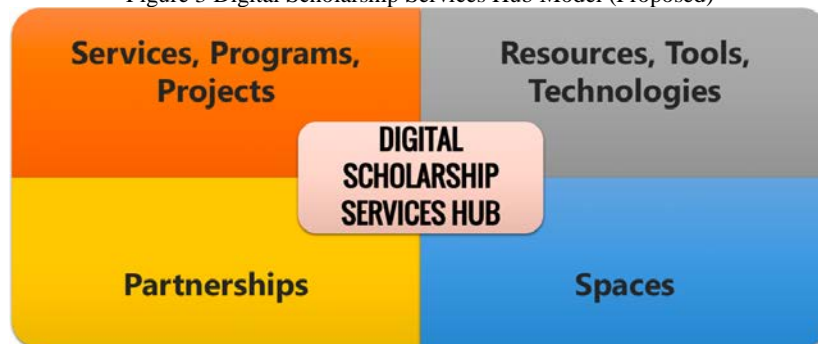
5.4 DS Services (DSS) Hub for Philippine Academic Libraries: Recommendations

With the understanding that Philippine libraries should be responsive and proactive in supporting the DS environment of its academic community and taking into consideration their potential capabilities in providing DS services, developing a DSS Hub within the library is seen to add significant value to its current role in its scholarly community. Establishing a hub should incorporate the facets of the DS institutional infrastructure model (Wolski & Richardson, 2014), ensuring that the hub will foster connection, space, and conversation.

In this proposed model (see Figure 3), gathered from the collected data from the top 50 Asian university libraries' website investigation and with reference to the DS roadmap developed by the University of Houston Libraries (Been, Bennett, Hilyer, Malizia, & Thompson, 2016), four areas are essential in a DSS hub: (1) Services, Programs and Projects; (2) Resources, tools and technologies; (3) Partnerships; and (4) Spaces. These areas should be developed independently and then integrated to form a solid implementation plan; therefore, a team should be constituted to work on each area to lay the groundwork for successful implementation. An environmental scan of the institution and the library should be performed to determine the needs that have to be provided inherently for

each area. It is recommended that the DSS Hub plan be developed in phases, in the order indicated in the model.

Figure 3 Digital Scholarship Services Hub Model (Proposed)



With the results of the preliminary investigation, PH libraries are recommended to reassess their existing programs and services. It is important to identify current projects aligned with digital scholarship and make the necessary adjustments to fit the evolving needs of the research culture prevalent in their academic community. Continued collaboration and partnerships with the key players e.g., academic departments, research units, innovation centers—for specific tools and technologies they need to increase research productivity. Along with the upgrade and anticipated creation of new services, it is essential to take into consideration plans to reskill and upskill librarians with the dynamics of research data management and its role in supporting research-driven universities. The proposed model is essential in the strategic plans of the libraries, who envision advancement and expanding their scope of services to ultimately cover management and the use of data.

6. Conclusion and Way Forward

Digital scholarship is happening in Philippine universities as evidenced by the growing research productivity of the country's leading universities, brought about by their research, scholarship, and innovation thrusts. This kind of scholarship environment has challenged academic libraries in the country to re-orient their role from being a resource clearinghouse into becoming a DS learning commons, a hub where all DS activities could take place. These academic libraries are responding to this emerging environment, gradually repositioning itself in the academic community by initiating services and programs inherent to digital scholarship, for instance, improving their

information literacy modules to accommodate other e-learning tools for training their learning communities.

However, much work is needed to catch up with the DS pace, as this kind of environment demands subject expertise and manipulation of advanced digital tools. These demands can be turned into opportunities, for librarians to begin with, to acquire the necessary skill sets, especially in research support services and digital technologies, as these are emergent in DS. This is a crucial first step in building a DS program, a program which is beyond the usual core functions of the library. This can be achieved by increasing librarian engagements and visibility in the DS activities and projects of the university community, becoming active in partnering with research and data experts within their university to learn with them, given that both partners share a common vision of their institution.

With the upskilling of librarians to become DS conversant, the possibility of establishing a DS program and a DSS hub could not be far behind, albeit this would require time, administrative support and close academic collaboration. The DSS hub proposal presented in this study has potential use in guiding Philippine academic libraries in coming up with their own framework and roadmap towards instituting their own DSS hub, to leverage learning support in the DS community.

Improving the DSS hub model to fit within the current and outlook of DSS environment of the PH academic libraries is recommended. As a next step, an in-depth environment scan survey of all Philippine academic libraries should be conducted to find out their current DS position and plans, if any, in their institutions' DS environment, since information found on the websites is not extensive. This can contribute to the crafting of a more adaptive and responsive DSS hub framework.

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