Evidence Based Library and Information Practice

A Systematic Review of Library Services Provision in Response to COVID-19 Pandemic

Philips O. Ayeni, Blessed O. Agbaje and Maria Tippler

Cite this article

Ayeni, P., Agbaje, B. & Tippler, M. (2021). A Systematic Review of Library Services Provision in Response to COVID-19 Pandemic. *Evidence Based Library and Information Practice*, *16*(3), 67–104. https://doi.org/10.18438/eblip29902

Article abstract

Objective – Libraries have had to temporarily shut their doors because of the COVID-19 pandemic, resulting in the provision of online and remote services. This review analyzed services offered by libraries, the technological tools used, and the challenges facing libraries during the pandemic.

Methods – This study employed a systematic literature review, following the PRISMA checklist (Moher at al., 2009). The Building Blocks search strategy was employed to search for keywords of concepts in Library and Information Science Abstract (LISA), Library and Information Science Technology Abstract (LISTA), Library Science Database, Web of Science (WoS) core collections, and Google Scholar. A set of inclusion and exclusion criteria was pre-determined by the authors prior to database searching. Quality assessment of included studies was performed using the Mixed Methods Appraisal Tool (Hong et al., 2018). A tabular approach was used to provide a summary of each article allowing the synthesis of results, which led to the identification of eight broad categories of services provided by libraries in included studies.

Results – The first set of searches from the 5 databases produced 3,499 results. After we removed duplicates and applied the inclusion and exclusion criteria based on titles and abstracts, 37 potentially relevant articles were identified. Further screening of the full-text led to the final inclusion of 23 articles used for the qualitative synthesis. The majority of the studies were conducted in the United States of America (n= 6, 26.1%), followed by India (n=4, 17%), and China (n=2, 8.7%). The remaining studies were carried out in United Kingdom, Ireland, Canada, Mexico, Romania, Czech Republic, Indonesia, Pakistan, Nigeria, Lesotho, and Zimbabwe. The most common method used in selected studies was the case study (n= 11, 48%), followed by survey (n=7, 30.4%), content analysis (n=4, 17.4%), and mixed methods (n=1, 4.3%). The majority of the studies were carried out in academic libraries (74%), while the rest were based on medical, public, and special libraries. Findings show that the majority of academic libraries in the included studies are providing and expanding access to electronic resources (n=16, 69.6%) and increasing open access resources and services (n=11, 47.8%). More so, most academic libraries are assisting in virtual education and teaching endeavors of faculty and students (n=13, 56.5%). In addition, some medical and public libraries are bolstering public health safety through health literacy (n=12, 52.2%), supporting research efforts, and engaging in virtual reference services, among others. In order to carry out these services, libraries are harnessing several educational, social networking, communication, and makerspaces technologies. Most of the libraries in the included studies reported budgetary challenges, and the need for new ICT infrastructure and Internet service as they move their services online.

Conclusion – This review found that libraries are adapting in a number of ways to continue their roles in meeting patrons' needs in spite of the growing challenges posed by COVID-19 restrictions and lockdown. For libraries to thrive in these trying times, there must be a well-structured approach to ensuring continuity of services. Libraries should prioritize the acquisition of electronic resources as well as increase their efforts to digitize resources that are only available in printed copies. As library services have predominantly shifted online, there should be concerted effort and support from government and funding agencies to equip libraries with the technological facilities needed to provide cutting-edge services. The quality assessment of the included studies shows that there is need for rigor and transparency in the methodological description of studies investigating library services provision in a pandemic. This review provides an overview of the ways libraries have responded to the challenges posed by a global pandemic, and hence will be of use and interest to all librarians especially those in health and academic sectors.

This article is disseminated and preserved by Érudit.

Érudit is a non-profit inter-university consortium of the Université de Montréal, Université Laval, and the Université du Québec à Montréal. Its mission is to promote and disseminate research.

https://www.erudit.org/en/

Evidence Based Library and Information Practice

Review Article

A Systematic Review of Library Services Provision in Response to COVID-19 Pandemic

Philips O. Ayeni
PhD Candidate, School of Information Studies
McGill University
Montreal, Quebec, Canada
Email: philipsayeni@gmail.com

Blessed O. Agbaje
Email: agbajeblessed@gmail.com

Maria Tippler
Graduate, Master of Information Studies
School of Information Studies
McGill University
Montreal, Quebec, Canada
Email: maria.tippler@mail.mcgill.ca

Abstract

Objective – Libraries have had to temporarily shut their doors because of the COVID-19 pandemic, resulting in the provision of online and remote services. This review analyzed services offered by libraries, the technological tools used, and the challenges facing libraries during the pandemic.

Methods – This study employed a systematic literature review, following the PRISMA checklist (Moher at al., 2009). The Building Blocks search strategy was employed to search for keywords of concepts in Library and Information Science Abstract (LISA), Library and Information Science

Technology Abstract (LISTA), Library Science Database, Web of Science (WoS) core collections, and Google Scholar. A set of inclusion and exclusion criteria was pre-determined by the authors prior to database searching. Quality assessment of included studies was performed using the Mixed Methods Appraisal Tool (Hong et al., 2018). A tabular approach was used to provide a summary of each article allowing the synthesis of results, which led to the identification of eight broad categories of services provided by libraries in included studies.

Results – The first set of searches from the 5 databases produced 3,499 results. After we removed duplicates and applied the inclusion and exclusion criteria based on titles and abstracts, 37 potentially relevant articles were identified. Further screening of the full-text led to the final inclusion of 23 articles used for the qualitative synthesis. The majority of the studies were conducted in the United States of America (n= 6, 26.1%), followed by India (n=4, 17%), and China (n=2, 8.7%). The remaining studies were carried out in United Kingdom, Ireland, Canada, Mexico, Romania, Czech Republic, Indonesia, Pakistan, Nigeria, Lesotho, and Zimbabwe. The most common method used in selected studies was the case study (n= 11, 48%), followed by survey (n=7, 30.4%), content analysis (n=4, 17.4%), and mixed methods (n=1, 4.3%). The majority of the studies were carried out in academic libraries (74%), while the rest were based on medical, public, and special libraries. Findings show that the majority of academic libraries in the included studies are providing and expanding access to electronic resources (n=16, 69.6%) and increasing open access resources and services (n=11, 47.8%). More so, most academic libraries are assisting in virtual education and teaching endeavors of faculty and students (n=13, 56.5%). In addition, some medical and public libraries are bolstering public health safety through health literacy (n=12, 52.2%), supporting research efforts, and engaging in virtual reference services, among others. In order to carry out these services, libraries are harnessing several educational, social networking, communication, and makerspaces technologies. Most of the libraries in the included studies reported budgetary challenges, and the need for new ICT infrastructure and Internet service as they move their services online.

Conclusion – This review found that libraries are adapting in a number of ways to continue their roles in meeting patrons' needs in spite of the growing challenges posed by COVID-19 restrictions and lockdown. For libraries to thrive in these trying times, there must be a well-structured approach to ensuring continuity of services. Libraries should prioritize the acquisition of electronic resources as well as increase their efforts to digitize resources that are only available in printed copies. As library services have predominantly shifted online, there should be concerted effort and support from government and funding agencies to equip libraries with the technological facilities needed to provide cutting-edge services. The quality assessment of the included studies shows that there is need for rigor and transparency in the methodological description of studies investigating library services provision in a pandemic. This review provides an overview of the ways libraries have responded to the challenges posed by a global pandemic, and hence will be of use and interest to all librarians especially those in health and academic sectors.

Introduction

The year 2020 started off with the novel Coronavirus disease (hereafter referred to as COVID-19), which was first discovered in Wuhan, China in 2019. COVID-19, caused by SARS-CoV-2 virus, was declared a pandemic on March 11, 2020, because it is a highly infectious virus that can permanently damage the entire body – from the heart, lungs, nervous system, musculoskeletal structures, and others (World Health Organization [WHO], 2020a). Transmission happens primarily by being in close contact with an infected individual when sneezing, coughing, talking, or touching one's face after handling contaminated surfaces (WHO, 2020b). As of July 18, 2021, over 188 million cases and over 4 million deaths have been reported globally since the start of the pandemic (WHO, 2021). The COVID-19 pandemic has caused global socioeconomic disruption, leading to shutdowns, quarantines, curfews, closures, cancellations, and other restrictive controls to constrain and prevent its spread (Kosciejew, 2021).

Libraries around the world have been negatively impacted by the pandemic as many libraries have either closed their buildings or restricted physical access to library facilities (Yu & Mani, 2020) and yet have adapted in various ways. Libraries have a pressing need to acclimatize to an ever-changing environment quickly and efficiently, as services have shifted predominantly online. Understanding the current challenges and highlighting the various strategies libraries have undertaken around the world can help provide a cohesive vision of how to best move forward in these difficult times.

Aims

This systematic review aims to provide an understanding of how different types of libraries have responded to sudden closure because of the COVID-19 pandemic and what services they are providing to meet the needs of users. This review also aims to determine the technological tools used in carrying out these services and the challenges hindering library services provision amid a global pandemic. The findings of this review will provide libraries guidance as regards to how to approach library services provision in a pandemic, as well as the tool and technologies that can be harnessed in carrying out these services, and the challenges to overcome.

Methods

We chose the systematic review method of literature review because it has a potential to produce a reliable knowledge base through the accumulation of findings from a range of studies in a systematic and reproducible way (Briner & Denyer, 2012). According to Moher et al. (2009), a systematic review is a "review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review" (p. 1). It follows a clear, easy-to-follow, and replicable process in identifying, analyzing, and reporting what has been published on a particular topic. Conducting a systematic review will help synergize previous studies that met certain criteria which are not necessarily considered in other types of review such as a traditional narrative review. Hence, we included academic and scholarly journals articles that discussed and researched on library services provision in response to the COVID-19 pandemic in different types of libraries.

Eligibility Criteria

Before the search was conducted, the authors clarified and agreed on inclusion and exclusion criteria employed for the systematic review. The review focused on articles published in peer-reviewed journals in English journals, with search limits set between January 2020 and March 2021 in order to retrieve articles published during the pandemic. The inclusion and exclusion assessment are in two stages. The first stage involved the preliminary assessment

of whether or not the articles met the objectives of the study before an in-depth analysis of each article to see if they were thorough and could be included for final analysis and synthesis. At the first stage, articles were excluded if: i) they were not published in scholarly journals; ii) full-text of articles was not available; iii) they were short memos, magazines, and news report; iv) they were trade journals since majority of the articles published therein focused more on monetary and budgetary implications of the pandemic with less focus of services; and v) were not written in the English language. At the second stage of the inclusion/exclusion, the assessment of the full-text of articles that met the first criteria was carried out to find out if the articles met the objectives of the study. Articles were excluded if: i) there was no discussion about the library services provided in response to COVID-19 in the article; ii) they were anecdotal reports from researchers without any methodological evidence or approach and iii) articles discussed more about general library services without emphasis on response to the COVID-19 pandemic.

Approach to Systematic Literature Review

The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) protocol for was adopted in this study. PRISMA is mainly used for reporting systematic reviews and meta-analysis of medical interventions and randomized trials (Moher et al., 2009; Liberati et al., 2009). It was created by an international network of health-based collaborators to provide the framework for systematic literature review (SLR) to ensure methodological rigor and quality (Pati & Lorusso, 2018). Since our study focuses on library services provision in response to the COVID-19 pandemic, we found it a useful protocol for reporting our approach for systematic literature review. The PRISMA protocol for systematic review has four stages, which are identification, screening, eligibility, and inclusion.

The first stage of the PRISMA protocol is identification, as potential articles in core databases in library and information science and other sources were identified. At the second stage, the articles were screened, applying the first stage of inclusion and exclusion criteria to the search results. The title and abstract of articles were screened. If articles seem potentially fit for the study, they were saved to an EndNote library where duplicates were removed. At the third stage, full-text of articles were further screened for eligibility using the second stage of eligibility criteria. The full-text of selected articles were critically evaluated to check whether library services in response to COVID-19 were discussed by the authors. The last stage is the final stage of the process which shows the articles finally included for systematic review and analysis. For the included articles, we created an Excel spreadsheet, where two of the authors (POA and BOA) individually noted the findings from the selected articles, including titles, authors, methods, country, library services, tools, and technology used for carrying out those services and the challenges faced by libraries. This was done to ensure rigor and avoid bias in analysing selected articles. Authors met virtually via Zoom to compare notes to clarify any conflicting issues. We resolved our differing opinions on the selected articles and created a table which summarized the included articles.

Sources and Search Technique

The literature search was conducted in five databases; Library and Information Science Abstract (LISA) (1966-Week 51, 2020), Library and Information Science Technology Abstract (LISTA) (1960-Week 51, 2020), Library Science Databases (1970-Weeek 51, 2020), and Web of Science (WoS) Core Collection. The literature search was first conducted on September 16, 2020, and updated on December 13, 2020. As this is a rapidly growing area of research, a final Google Scholar search was additionally conducted on March 22, 2021, to account for the latest articles that have been published. We also

Table 1
Search Plan

Concept 1 Library services	Concept 2 COVID-19
"library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*"	COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19

aimed at capturing articles published in open access journals or outlets such as repositories through Google Scholar which may not be captured in proprietary databases. Please see Appendices A – D for the search strategies and results for each database.

To develop the search technique, we created a search plan (See Table 1). We began with preliminary keyword searching of the two main concepts of our review, which are "Library services" and COVID-19. Hence, we developed a list of alternative terms that have been used to represent these concepts in the literature. This is important because if an article did not mention library service but discussed services specific to libraries, it potentially would not be caught by our search. Keyword searching was imperative to retrieve relevant articles that focused on library services and COVID-19. We used quotation marks for key words that are in phrases so databases can recognize them as such and not crawl them as individual words.

As shown in Figure 1 below, the full-text of 37 potentially eligible articles were assessed for final inclusion. Out of the 37 articles, 23 articles were found eligible and finally included for systematic qualitative analysis. We excluded articles that did not discuss library services provision in response to the COVID-19 pandemic, and we prioritized articles that had rigorous methodological approaches rather than personal views, reflections, and reviews. We excluded one article because it only focused on

the use of social media by library and information professionals in disseminating COVID-19 information, and no other library services were discussed. Similarly, we excluded eight articles because their contents did not relate to the focus of our study even though they discussed COVID-19. For example, seven of these articles focused on mis-information, tools for marketing library services, Open Education Resources (OERs) and student access, OERs consortium and academic libraries, literacy models for stay-home parents, using social annotation in online classes, preventative measures, and strategies for curbing the spread of COVID-19. Similarly, one article was excluded because the content was not substantial. Four articles were excluded because they were anecdotal reports or authors' perspectives without established methodological approaches. We wanted to make sure included studies were methodologically sound, and that authors collected data in one way or another, either through document analysis, survey, interview, observation, case study, and others. After applying our criteria, we included 23 articles for qualitative systematic analysis.

Quality Assessment of Included Studies

Quality assessment is important to weighting studies in terms of quality and relevance to answering the research question (Gough, 2007). The assessment of quality and relevance of the included studies was done later in the review because it was after mapping and data
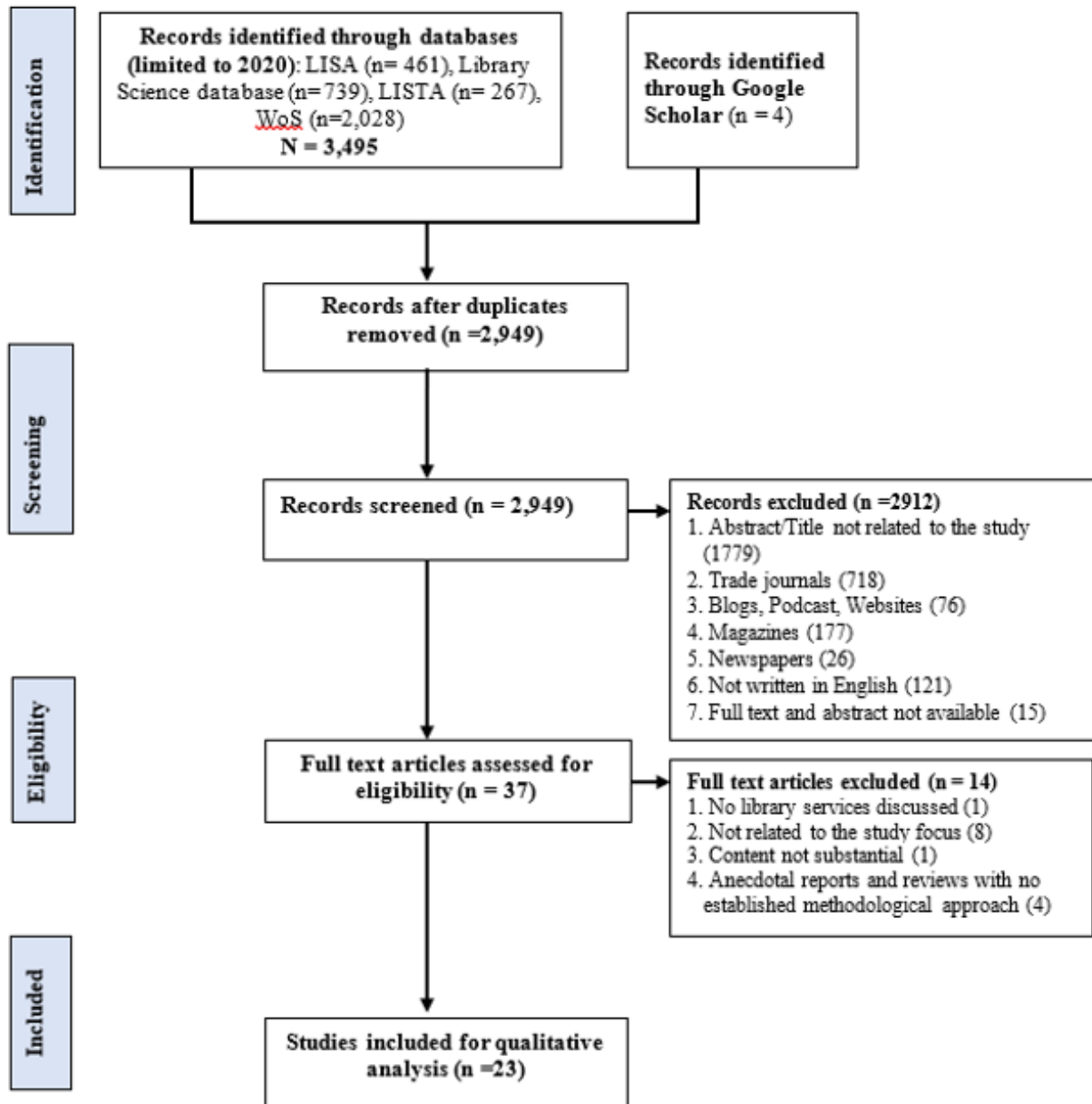
Figure 1
PRISMA flow diagram

extraction that there was sufficient information to make the assessment (Gough, 2007). The assessment of the methodological quality of the included studies were based on the independent evaluation of two reviewers (BOA and POA) and active discussion until consensus was reached in the case of discrepancies. We assessed the methodological quality of the included studies using the Mixed Methods Appraisal Tool (MMAT) version 2018 (Hong et al., 2018).

MMAT was chosen because it provides customized questions that can be used for assessing different study designs. These are qualitative, quantitative randomized controlled trials, quantitative non-randomized, quantitative

descriptive and mixed methods studies (Hong et al., 2018). The tool is not intended to score the studies based on their quality; hence we did not include scores in the quality assessment. However, we provided comments in instances where studies could not answer all the quality assessment questions to aid in interpreting findings of this review. The eligible studies (n=23) were categorized, with reference to MMAT, into three types of study design: qualitative case studies (n=14), quantitative descriptive studies (n=8), and mixed-methods study (n=1). The categories on quantitative randomized controlled trials and quantitative non-randomized were excluded as none of the included articles used such study designs.

Results

This section presents the results of the quality assessment and a synthesis of themes derived from the included studies to meet the aims of this review. Our results examine library services provided, technologies used for providing those services, and the challenges facing libraries in the pandemic.

Quality Appraisal

All studies were subjected to two screening questions: (**S1**) Are there clear research questions? and (**S2**) Do the collected data address the research questions? As stipulated in MMAT, if any study cannot answer yes to these questions, they cannot be assessed with MMAT (Hong et al., 2018). All included studies, except one, answered 'yes' to the first two screening questions of the MMAT. Studies that answered yes to these questions were then assessed using the specific questions relating to their design categories.

For the eligible qualitative studies (n=14), 11 of the studies are judged to be of high quality. Two studies were judged to be of medium quality as there were no sufficient description of the methodological approach, which makes it difficult to ascertain if their research questions were properly addressed. One study (i.e.,

Howes et al., 2021) did not have clear research questions, hence could not be assessed. For the eligible quantitative descriptive studies (n=8), there were concerns related to sampling, including issues around sampling technique and lack of clarity on the population to justify the selected sample. Out of the eight quantitative studies, three were judged to be of low quality, while four were deemed to be of medium quality and only one study was judged to be of high quality. The only mixed-method study in the included studies was judged to be of low quality as it does not answer three of the five appraisal questions related to integration and interpretation of data and findings from both quantitative and qualitative data. No studies were excluded from the study based on the quality assessment outcome. However, the quality appraisal shows that there is need for rigorous methodological approaches to provide more transparent, measurable, and replicable research focusing on library services provided in response to the COVID-19 pandemic. See Appendix E for details of the quality assessment of each study.

Study Characteristics

The majority of the studies were conducted in the United States of America (n= 6, 26.1%), followed by India (n=4, 17%), and China (n=2, 8.7%). The remaining studies were carried out in United Kingdom, Ireland, Canada, Mexico, Romania, Czech Republic, Indonesia, Pakistan, Nigeria, Lesotho, and Zimbabwe. The most common method used in selected studies was the case study (n= 11, 48%), followed by survey (n=7, 30.4%), content analysis (n=4, 17.4%), and mixed methods (n=1, 4.3%). The majority of the studies were carried out in academic libraries (n=17, 74%), while the rest were based on medical, public, and special libraries. This may indicate that academic librarians are most likely to publish, and higher institutions are assiduously seeking ways to ensure library services provision continues to meet the needs of their patrons.

Table 2
Summary of Included Articles for Qualitative Synthesis

S/N	Authors	Country	Type of Library	Methods	Services offered	Tools and Technologies used	Challenges
1.	Howes et al. (2021)	USA	Medical Library	Case study	1. Virtual reference services. 2. Instructional workshops 3. Literature search services 4. Document delivery services through interlibrary loan 5. Online tutorials and e-learning through GoSkills 6. COVID-19 LibGuide 6. Expanding access to electronic resources	WebEx, Zoom, EndNote Microsoft Teams Camtasia ConnectWise	1. Disruption of normal operations procedures 2. Rapidly changing protocols and administrative directives
2.	Mehta & Wang (2020)	USA	Academic library	Case study	1.Digital references services 2.Bibliographic instructions (BI) 3.Providing electronic resources 4.Digital repositories services	Zoom, Blackboard, Microsoft Teams, LibChat and LibAnswers	1.Challenging digitization process for non-born digital resources 2. Library staff's lack of access to a computer 3. Difficulty conducting reference services and BI online 4. Difficulty with collaboration among academics and administrative units
3.	See (2020)	USA	Academic library	Case study	1. Circulation services 2. Equipment/laptop lending 3. Research support 4. Document delivery services 5. Course materials reserve. 6. Inter-library loan	MarkerLab, 3D Printer Laptops, and media (DVDs & CDs)	Check-out was eliminated for all production equipment because of difficulty in disinfecting

4.	Tolppanen (2021)	USA	Academic libraries	Survey	1. Virtual services 2. Inter-library loan 3. Circulation services and book drop through courier services 4. Document delivery through sending scanned copies	Telephone, Email, Chat tools, DVDs, CDs	Providing access services in a pandemic
5.	Weeks et al. (2020)	USA	Academic Health Sciences Library	Case study	1. Health Literacy 2. Research and Scholarship support 3. User query services through LibAnswers 4. Resources provision for teaching and learning support 5. Access to free remote services 6. Community and healthcare support and outreach 7. Public health information 8. Collaboration and partnerships 9. 3D prototype printing of PPE (face masks, shields and visors) and donation to Student Wellness	Google Hangout and WebEx for online meetings. YouTube, Facebook, Email, LibAnswers	Budget tightening was predicted for the next few years
6.	Yu & Mani (2020)	USA	Academic Medical/Health Sciences Libraries	Observational study, using content analysis	1. Remote access to library resources 2. Interlibrary loan 3. Checking out laptops and other hardware for remote learning 4. Virtual workshop and instruction session 5. Access to open resources from publishers. 6. COVID research publication search strategies to preprint publications 7 Health literacy	Library Website, 3D Printer COVID-19 Open Research Dataset ("CORD-19")	None reported

7.	Chakraborty, et al. (2020)	India	All libraries	Content analysis	1. Providing list of all Union territories, state-wise, national and international and help lines, and websites for authentic source of information about COVID-19	Websites	None reported
8.	Dadhe & Dubey, 2020	India	Special Libraries	Content analysis	1. Remote access to e-resources 2. Free and expanded access to e-resources 3. Open access to resources, including COVID-19 materials 4. Information searching and scholarly writing 5. Organizing online activities for user engagement 6. Access to print materials through scanning and online delivery of documents 7. Virtual reference services 8. Research support 9. Information literacy on COVID-19	Plagiarism checking tools, Email, Repositories, Websites.	None reported
9.	Kaur & Mahajan (2020).	India	Academic library	Mixed method	1. Disseminating information about information sources and services 2 Providing access to databases	WhatsApp, Gmail	None reported
10.	Neog (2020).	India	Academic library	Survey	1. Reference services 2. Open Access services 3. Access to COVID19 resources 4. Access to Web OPAC	Facebook, Twitter, Blog, WhatsApp	1. Users' low response to library services 2. Lack of policy guidelines 3. Lack of high speed Internet

11.	Guo et al. (2020)	China	Academic library	Survey	1. Providing timely Covid-19 information 2. Providing open-access resources 3. Virtual reference services 4. Online research support services 5. Providing out of library disaster relief 6. Replacing paper reports with electronic stamped reports when carrying out citation search services	WeChat, Microblog Mobile library app, Chaoxing Learning Link Telephone, Email	None reported
12.	Ma (2020)	China	Academic library	Case study	1. Health and well-being services 2. Access to library collections and e-resources 3. Instruction and teaching support 4. Circulation services through self-checkout 5. Research support through bibliographic management training 6. Virtual reference services through Zoom-with-a-librarian	Zoom, EndNote, RefWorks, Repository	None reported

| 13. | Cox & Brewster (2020) | United Kingdom | Academic libraries | Survey | 1. Giving students access to additional learning materials online 2. Reassuring messages via social media 3. Reorganizing website to emphasize digital support options 4. Suspension of fines 5. Linking to home university well-being related services 6. Recommending leisure reading and content streaming sources 7. Listing remotely-available well-being related books 8. Highlighting lighthearted and/or distracting content via social media 9. Offering webinars on topics students are concerned about and well-being related topics | Social media | None reported |

14.	Carbery et al. (2020)	Ireland	Medical libraries, Public libraries, Academic libraries	Case studies	1. Teaching information literacy and instructional sessions online 2. Providing temporary access to library classroom for health executives to train healthcare professionals 3. 3D printing of face shields, mask clips and Personal protective equipment (PPE) 4. Creation of online study room – a virtual mediated reading room 5. Creation of digital assets and resources addressing mindfulness during the pandemic 6. Online educational, cultural, parenting events, online exercise and yoga classes, story time sessions in Irish and English, arts and crafts workshop 7. Free book delivery service to homes 8. Lending 3D printer to SurfBox and laptops to essential service workers 9. Open access services	Zoom, Microsoft Teams, 3D printer	1. Moving academic libraries services online 2. Providing online service for academic staff
15.	Walsh & Rana (2020)	Canada	Academic library	Case study	1. Instructional services support for remote teaching and learning 2. Research Support 3. Institutional Collaborations 4. Promoting COVID-19 research resources 5. Promoting open scholarship through Institutional repositories 6. Remote and reference information service	Digital repositories, Synchronous Chat system	Budgetary challenges

16.	Saavedra-Alamillas et al. (2020)	Mexico	Academic libraries	Document and content analysis	1. Document Delivery Services (DDS) 2. Inter Library Loans (ILL)	WhatsApp, Google Drive	1. Problems with remote access to digital library 2. Information search problems 3. Problems with downloading documents
17.	Erich (2020)	Romania	Several Libraries	Case study	1. Providing COVID-19 information 2. Providing access to library's digital resources 3. Suspension of fines 4. Organizing online activities	Facebook	None reported
18.	Pokorna et al. (2020)	Czech Republic	Academic libraries	Case Study	1. Digital Library model with open remote access 2. Enabling licence agreements to provide access to digital copies 3. Adopting an open-source DL system 4. Restriction-free access to monograph	Kramerius and Fedora repository	1. A wide spectrum of documents are not available digitally 2. Inaccessibility of copyright-protected literature 3. Piracy of copyright-protected documents 4. The digital library fell short at replacing loan services or reference reading rooms
19.	Winata et al. (2020)	Indonesia	Academic libraries	Case study	1. Book delivery and circulation services in the drive-through 2. Provision of e-resources for research support 3. Virtual references services using "Ask Librarians" form 4. Transforming final paper project services into online	Drobox, a computer circulation desk, Smartphone, Twitter, Instagram, YouTube, Facebook	1. Internet and network problems 2. Adjusting to online mode of information provision 3. Service limitation in working hours 4. Budget challenges as a result of converting services to online mode

20.	Ishtiaq et al. (2020)	Pakistan	Academic libraries	Survey	1. VPN access 2. Email management 3. Live chat 4. Mobile application services 5. Literacy sessions 6. Webinar on crisis 7. Virtual reference services	Gmail, Facebook, YouTube, LinkedIn, Instagram, Facebook messenger, Google plus	None reported
21.	Kasa & Yusuf (2020)	Nigeria	Academic library	Survey	1. Dissemination of E-books, videos, and sending of links to resources	Telegram	1. Poor internet service 2. Collaboration challenges 3. Lack of private working space at home
22.	Mbambo-Thata (2021)	Lesotho	Academic library	Case study	1. Providing off-campus access to digital library 2. Online information literacy program 3. Online reference service on Facebook and email chat 4. Bearing data cost	Facebook, Gmail, Websites	None reported
23.	Tsekea & Chigwada (2020)	Zimbabwe	Academic libraries	Survey	1. Research support 2. Teaching support through learning Management System 3. Information literacy 4. Collaboration with publishers for free resources 5. Virtual references services 6. Remote access to e-resources	Facebook, WhatsApp, Skype, Twitter, YouTube	1. Lack of internet connection at home 2. Negative attitude by the community in using technology 3. Lack of technical knowhow on using digital libraries 4. Challenges with servers' connectivity

Table 2 provides the summary of library services provided in the included articles, technologies used, and challenges libraries faced in response to the COVID-19 pandemic. Overall, we identified eight broad library services in the included studies. The most frequently offered library service is remote digital access to library resources (n=16, 69.6%), followed by virtual education and teaching support (n=13, 56.5%), public health safety information provision and literacy (n=12, 52.2%), open access services through collaborative efforts (n=11, 47.8%), and virtual reference services (n=10, 43.5%). Others include circulation and lending services (n=9, 39.1%). research support services (n=7, 30.4%), and welfare and outreach services (n=6, 26.1%). We grouped the results by sorting the table by countries (e.g., putting all USA results together).

Synthesis of Themes

Library Services Provision in a Pandemic

We identified eight broad categories of services provided by libraries in the included studies. These are 1) Virtual education and teaching support, 2) Research support, 3) Open access services through collaborative efforts, 4) Public health safety, information provision and literacy, 5) Virtual reference services, 6) Remote digital access to library resources, 7) Welfare and outreach, and 8) Circulation and lending services.

Virtual Education and Teaching Support

Despite library closure, findings show that libraries have continued one of their core missions – supporting the educational objectives of their institutions. Results show that the majority of academic libraries in the included studies are supporting and facilitating remote access to digital contents in support of teaching and learning in universities (Carbery et al., 2020; Tsekea & Chigwada, 2020; Ishtiaq, Sehar & Shahid, 2020). More specifically, academic librarians are assisting teaching staff to upload contents on learning management systems

(Tsekea & Chigwada, 2020) and providing digital services to teaching faculty and students through digital library and institutional repositories (Mehta & Wang, 2020). Copyright has been an ongoing concern for many libraries. However, since there is an increasing demand for digital contents in the pandemic, several academic libraries are obtaining permissions from publishers and providing students and academic staff with access to digital contents including copyright-protected works for the period of the lockdown (e.g., Ma, 2020; Pokorna et al., 2020). Within universities, libraries are making course readings accessible by linking to digital resource equivalents that are copyright-compliant (e.g., Walsh & Rana, 2020).

Other efforts to support teaching and online education include sitting on curriculum committees, helping with curriculum development through instruction support, collaborating with academic faculty and providing strong liaison supports for both students and staff (Weeks et al., 2020). As schools close, school libraries now promote the use of other online course platforms for autonomous learning, examination resources, vocational training, and self-improvement (Guo et al., 2020), as well the use of open educational resources (Mehta & Wang, 2020). In addition, academic libraries are granting students additional access to online resources (Cox & Brewster, 2020), engaging them in virtual consultations via Google Hangout meetings and email communications (Carbery et al., 2020; Weeks et al., 2020), as well as compiling lists of virtual tours to museums, operas, aquariums, zoos and national parks (Yu & Mani, 2020). This is to ensure students adhere to government lockdown restrictions by studying at home while having the opportunities to virtually visit places they might have visited in-person. In addition, libraries are offering online training modules through GoSkills (e.g., Howes et al., 2021), as well as webinars on topics of concern for students, including accessing resources remotely, well-being and mental health (Cox & Brewster, 2020).

Research Support

One of the prominent services discussed in the included articles is research support services. Despite the lockdown, the majority of the libraries in the included studies have continued to provide many vital services such as reference services, document deliveries, literature searching and syntheses in support of the research efforts of students, faculty, and other user categories (Guo et al. 2020; Howes et al., 2021; Mehta & Wang, 2020; Tsekea & Chigwada, 2020; Walsh & Rana, 2020; Weeks et al., 2020; Winata, Fadelina & Basuki, 2020). Librarians provide vital information services to support students, researchers, academics, medical and paramedical professionals with recent relevant studies, new developments in vaccine production, diagnosing procedures, and intellectual property (Guo et al., 2020; Walsh & Rana, 2020). Furthermore, librarians at the medical libraries in included studies are providing COVID-19 information and literature in support of the researchers, faculty and medical researchers (Dadhe & Dubey, 2020; Tsekea & Chigwada, 2020; Weeks et al., 2020). For example, librarians with health sciences expertise at the Health Sciences Library of the University of Nevada, Las Vegas, created a Coronavirus guide containing several pages including information for the public, information for heath care providers, crisis support, and also addressing issues of racism and xenophobia during COVID-19 (Weeks et al., 2020).

Other efforts include providing user-tailored support to research ranging from advanced workshops to information sessions, networking events, customised personal assistance, research data management, synchronous online chatting services, and publishing support (Walsh & Rana, 2020). Some academic libraries are engaging in bibliographic management using tools such as EndNote and RefWorks (Ma, 2020) and plagiarism checking in research papers (Dadhe & Dubey, 2020). In some cases, librarians are providing researchers with access to electronic resources containing e-journals, e-books, as well as links of journal publishers and supported databases (Winata et al., 2020). Academic libraries have witnessed an increase in request for literature searches via email and webform as librarians provide training on literature searching through WebEx conferences (e.g., Howes et al., 2021). Some libraries have developed unified certification and resource sharing infrastructures to facilitate online research for college teachers and students (Guo et al., 2020; Pokorna et al., 2020).

Open Access Through Collaboration Efforts

Findings show that libraries are increasing their effort in providing open access services by increasing partnerships with publishers and databases providers (Pokorna et al., 2020; Walsh & Rana, 2020; Weeks et al., 2020). Libraries and the society at large have come to better understand the benefits of open access in which research is made open and available for reading and reuse (Walsh & Rana, 2020). For example, in Canada, the University of Toronto is enhancing open access to medical research in fighting the spread of COVID-19 and helping researchers make their research open through the Libraries' Scholarly Communications and Copyright Office. Other academic libraries in the included studies are providing open access services through temporary access to resources provided through the library consortium and collaboration, and access to free COVID-19 resources (Guo et al., 2020; Howes et al., 2021; Weeks et al., 2020; Yu & Mani, 2020).

The current situation has improved libraries' collaboration effort with publishers and database providers to create emergency temporary access services to allow in-copyright physical items to remain accessible (Carbery et al., 2020; Walsh & Rana, 2020). Librarians are helping to distribute articles, papers, case reports, and other resources from free or open access initiatives by database providers, publishers, and internet companies (Walsh & Rana, 2020). Other efforts include ensuring that

open access collections and resources were accessible and visible to end-users (Carbery et al., 2020; Dadhe & Dubey, 2020) and that open access journals are evaluated for credibility and quality (Mbambo-Thata, 2021). The current situation has echoed the importance of collaboration - usually referred to as a consortium - among libraries. Beyond library-to-library collaborations, librarians are now collaborating with government and health institutions for increased access to COVID-19 resources (Walsh & Rana, 2020). This is particularly beneficial, as collaborating with other countries who have already developed valuable informational webpages will help those with less resources to do so.

Public Health Safety, Information Provision and Literacy

Public health is largely dependent on the acceptance of changes to social norms, which span from individual actions to bigger shifts in socioeconomic institutions. Findings show that librarians – especially in medical and public libraries – can help this process by facilitating awareness campaigns and disseminating information to prevent transmission of the virus. This include respecting and supporting governing regulations for remote learning, working from home, quarantining, and library closures (Chakraborty et al., 2020; Erich, 2020; Guo et al., 2020; Neog, 2020). Libraries are advocating for and promoting the importance of wearing masks, hand washing, use of sanitizers, and social distancing (Dadhe & Dubey, 2020; Guo et al., 2020; Weeks et al., 2020), as well as promoting health literacy by providing guidance on evaluating information and fact-checking (Yu & Mani, 2020). Other types of libraries, especially medical and health sciences libraries have promoted public health literacy by creating LibGuides, lectures, tailored information sessions, and workshops, both on COVID-19 and general health recommendations (Guo et al., 2020; Howes et al., 2021; Walsh & Rana, 2020; Weeks et al., 2020). Libraries now play a significant role in raising awareness and

preventing the spread of misinformation through social media channels (i.e., Twitter, WhatsApp, Instagram, Facebook, WeChat, and others) by sharing reliable information with patrons through institutional and online media accounts (Guo et al., 2020).

Findings show that several medical libraries are striving to provide access to resources targeted toward improving public health and safety. For example, several libraries are using their makerspaces for 3D printing of face masks and personal protective equipment (PPEs) to be used by medical practitioners and staff (Carbery et al., 2020; Dadhe & Dubey, 2020; See, 2020; Weeks et al., 2020; Yu & Mani, 2020). Some libraries have responded to national needs by 3D printing a range of kit and tools for frontline workers, including visor shields, mask clips, and other 3D objects to support the needs of community healthcare workers and student wellness centers (Carbery et al., 2020; Weeks, 2020). The increasing need for PPEs has made some libraries continue opening of makerspaces for 3D printing despite closing other sections such as production studios, photography studio, and the Virtual Reality Learning Studio (See, 2020). This shows that libraries are important in ensuring that the right health information is provided to users, and also helping to fill the gap in health resources shortages through the printing of PPEs.

Virtual Reference Services

One vital service provided by libraries in selected articles is virtual reference services. As a result of the lockdown, there has been a significant increase in virtual reference desk use (Ishtiaq et al., 2020; Mbambo-Thata, 2021; Mehta & Wang, 2020; See, 2020). Virtual references services were provided in the form of literacy sessions, live chat, and email communication (Dadhe & Dubey, 2020; Ishtiaq et al., 2020; See, 2020). Academic libraries are providing reference services through chat facility on their websites, while subject-specific queries were answered by subject librarians (Mbambo-Thata,

2021). For example, at the University of Lesotho library, special effort was made to include staff phone numbers, Facebook, and e-mail contact in subject LibGuides so users can interact with humans when writing with subject-specific queries (Mbambo-Thata, 2021). Similarly, at Bridgewater State University (BSU), virtual references were provided to cater for users' research consultations through LibChat and LibAnswers with the use of email, short messaging service (SMS), instant messaging (IM). and frequently asked questions (FAQ) (Mehta & Wang, 2020). This is similar to the virtual reference service provided at the University of Toronto Libraries through the Ask/Chat with librarians, a synchronous online information support to researchers (Walsh & Rana, 2020).

At the Health Sciences Library of the University of Nevada, Las Vegas, reference service was primarily provided by booking online consultations using Springshare's LibCal, while library staff use LibAnswers to collect, monitor, and distribute online reference requests (Weeks et al. 2020). Other libraries have provided virtual reference services through social media platforms such as WhatsApp, Facebook, and Twitter (Neog, 2020; Tsekea & Chigwada, 2020), remote system troubleshooting through ConnectWise (Howes et al., 2021) and a service such as Zoom-with-a-librarian (Ma, 2020). To be effective in attending to multiple virtual reference queries at Maxwell Library of BSU, reference librarians created a schedule of two hours slot between 8:00 a.m. and 4:00 p.m., signing on to LibChat and answering questions (Mehta & Wang, 2020). Virtual reference services have remained pivotal and librarians have responded very well while working remotely to provide this important service to their users.

Remote Digital Access to Library Resources

As there has been a significant increase in the demand for online resources, findings show that libraries have also increased their digitization efforts by scanning articles and book chapters, as well as retrieving DVDs and CDs from physical collection for digitization purposes (Tolppanen, 2021). Some libraries are using existing software for registered users and demanding amendments to the Copyright Act to allow for licence agreements so more digital resources can be utilized for non-profit purposes and research (Pokorna et al., 2020). In the Czech Republic, libraries are granting users remote access to copyrighted documents including monographs and periodicals (Pokorna et al., 2020). Some libraries have enhanced the level of access to online materials by putting temporary database and other electronic resource trials in place (Carbery et al., 2020; Cox & Brewster, 2020). Libraries are making special efforts to manage all the digital infrastructure, library management systems, institutional repositories, and websites to ensure users have access to open access collections and resources being provided by multiple suppliers (Carberry et al., 2020). This includes re-organizing library websites to emphasize digital support for accessing online resources, ensuring the digital well-being of patrons (Cox & Brewster 2020). Findings show that libraries are helping users effectively access digital library resources and other subscription databases (Erich, 2020; Guo et al., 2020), leveraging and expanding access to electronic resources and services (Dadhe & Dubey, 2020; Howes et al., 2021). More so, libraries are making an effort to negotiate and cooperate with database providers to strive for preferential policies for access and expanding digital resource services (Guo et al., 2020; Mbambo-Thata, 2021).

To ensure continued access to digital library resources, suggestions have emerged to make access more user-friendly, as well as making more online and digital sources available (Howes et al., 2021; Kaur & Mahajan, 2020). Libraries are making a concerted effort to facilitate off-campus access to digital library and resources. This includes subscribing to Remotex, a system that enables off-campus library access (Mbambo-Thata, 2021), and the use of a virtual private network (VPN) login for remote

databases access (Ishtiaq et al., 2020; Guo et al., 2020). Digital resources have been used to support the teaching, learning and research needs of faculty and students, made possible by ensuring remote digital access to libraries resources, databases, and archives (Mehta & Wang, 2020; Neog, 2020; Tsekea & Chigwada, 2020; Winata et al., 2020; Yu & Mani, 2020), scanning pages of print materials and making them available through online delivery of documents (Dadhe & Dubey, 2020)

Welfare and Outreach Services

Findings from the selected articles show that the mental health and well-being of library users are being prioritized by some libraries. Welfare services and activities were carried out in libraries in the form of linking students to home university well-being related services, providing out-of-library disaster relief, providing community healthcare support and outreach (Carbery et al., 2020; Cox & Brewster, 2020; Guo et al., 2020; Weeks et al., 2020). In some cases, libraries support students' well-being by acquiring new collections, provision of information, the creation of dedicated spaces or spatial redesign. Imaginative approaches, such as animal petting were relatively rare (Cox & Brewster, 2020). Other efforts include using social platforms such as Facebook, Twitter, and Instagram to promote social welfare entitlements, community, and well-being support. In addition, libraries are providing relief support through volunteer services, donating materials and money, providing reading therapy services (Guo et al., 2020), as well as providing hand sanitizer at service counters and book sterilizers at circulation points (Ma, 2020) For example, Wuhan University library provided special collections to centralized isolated zones for medical staff and isolated population to read, and established a reading station for a mobile "cabin hospital" that treated coronavirus infected patients with mild symptoms (Guo et al., 2020).

Circulation and Lending Services

The circulation services of libraries have continued despite the lockdown. Findings show that libraries are providing inter-library loans and document delivery services through DOCLINE and OCLC (Howes et al., 2021; Saavedra-Alamillas et al., 2020), while some are lending e-books, videos, and providing access links to e-resources (e.g., Kasa & Yusuf, 2020). The lockdown has prompted a shift to online lending services. In exceptional cases, some libraries have managed to stay partially open to provide services to a large number of international students who live on Campus (See, 2020; Tolppanen, 2021). For instance, Cline Library of Northern Arizona University has managed to stay open by reducing opening hours, and by providing a modified, self-mediated check-out station with two return carts (See, 2020). Some libraries have provided drive-through book delivery services (Winata et al., 2020), checking out laptops, media (DVDs & CDs), and other hardware in a socially distanced library space (Carbery et al. 2020; See, 2020; Yu & Mani, 2020). To return borrowed books, laptops and other media equipment, some libraries have made special provisions such as external book drop through courier service (Tolppanen, 2021). Others have provided drop boxes and return carts where users can drop borrowed items placed along the service point area without having to physically be in contact with librarians (See, 2020; Winata et al., 2020). Some libraries have employed book sterilizers for returned books (Ma, 2020) and designated a period of time to quarantine returned items (Tolppanen, 2021). These efforts have ensured continued access to libraries' educational and hardware resources. Many libraries have suspended overdue fines of borrowed books and physical resources (Cox & Brewster, 2020; Dadhe & Dubey, 2020; Ma, 2020; Tolppanen, 2021). Owing to increasing need for 3D printing of PPEs, some libraries have been lending 3D objects (See, 2020) and 3D printers, virtual reality tools, and a Google JamBoard (Carbery et al., 2020; Weeks et al., 2020).

Technological Tools Used for Library Services Provision

There are several technological tools used for providing library services in response to the COVID-19 restrictions in the included studies. We categorized them into four broad areas: i) social networking tools; ii) video conferencing tools; iii) educational technologies, and iv) makerspaces technologies.

Social Networking Tools

Social media platforms were used heavily for promoting library services, live streaming, storytelling, and reaching out to patrons. Examples of social networks tools used in the selected articles include Facebook, Facebook Messenger, Twitter, WeChat, WhatsApp, Instagram, LinkedIn, Telegram, and Google Plus (Carbery et al., 2020; Ishtiaq et al., 2020; Kasa & Yusuf, 2020; Guo et al., 2020; Winata et al., 2020)**.** With the use of social networking sites, patrons can engage in social tagging to contribute to folksonomies (Pokorna et al., 2020). Social networking tools have enabled libraries to remain connected with their patrons, offering services, attending to their needs and keeping them abreast of the latest developments regarding research, COVID-19 restrictions, and library openings and other related information.

Videoconferencing Tools

Findings show that several videoconferencing tools and technologies are harnessed for virtual meetings, teaching, and presentations. The common videoconferencing tools used in the selected studies include Skype, Zoom, WebEx, Google Hangouts, and Microsoft Teams (Carbery et al., 2020; Howes et al., 2021; Ma, 2020; Mehta & Wang, 2020; Tsekea & Chigwada, 2020; Weeks et al., 2020). Zoom and WebEx appear more popular among the libraries in the selected articles. These tools are useful for conducting virtual reference, supported by telephone, email, social media messaging, and other methods of contact (Guo et al., 2020).

Educational Technologies

Educational technologies include those promoting e-reading, video presentations, educational programs and learning management systems, particularly in academic libraries, and include mobile library applications such as Chaoxing Learning Link (Guo et al., 2020), YouTube, Camtasia for screen recording and Blackboard (Howe et al., 2021; Ishtiaq et al., 2020; Tsekea & Chigwada, 2020; Weeks et al., 2020). Blackboard was primarily used as learning management system, and most academic libraries in the included studies use Canvas to embed e-resources such as databases, e-books, and online research guides (Mehta & Wang, 2020). Networking tools such as VPNs, off-campus direct access, remote access to databases, and servers protected by Shibboleth authentication were used to help patrons' access to online electronic resources and to meet their information needs (Guo et al., 2020; Pokorna et al., 2020). Due to the online and digital nature of resources, there has been an increasing use of CD and DVDs from printed books to aid the digitization efforts of libraries (e.g. Tolppanen, 2021). To enhance the research activities of students and faculty, libraries are engaging in research data and reference management with the use of tools such as EndNote and RefWorks (Howes et al., 2021; Ma, 2020). Some libraries are harnessing plagiarism checking tools to help researchers check for and prevent plagiarism in their research (Dadhe & Dubey, 2020). These technologies are imperative to ensure continued access to library resources irrespective of patrons' geographic location.

Makerspaces Technologies

Makerspaces technologies were used to provide library services in medical libraries in the included articles in the form of 3D printers. These were used for 3D printing of a range of kit and tools for frontline workers, including facemasks, visor shields, mask clips, and other 3D objects to support the needs of community healthcare (Carbery et al., 2020; See, 2020; Yu &

Mani, 2020). This shows that libraries have remained relevant in meeting the health needs of community with the inventions from makerspaces.

Challenges Facing Libraries in the Pandemic

There are several challenges facing libraries because of the global pandemic. As there were sudden shifts in operation, libraries have had to change or adapt existing policies on physical items by extending loan time or suspending fines (Mehta & Wang, 2020; Erich, 2020; Cox & Brewster, 2020). In instances where libraries could remain partially open, librarians and library staff experienced increased anxiety of being exposed to the virus (Mehta & Wang, 2020; See, 2020). Most concerns centred around disruption of normal operation procedures (Dadhe & Dubey, 2020), and shifting services to digital environment as physical spaces were closed (Mehta & Wang, 2020). Even when resources were made available online, there were difficulties with some library staff and patrons not knowing how to download and use e-resources, ICT platforms, and digital libraries (Mehta & Wang, 2020; Saavedra-Alamillas et al., 2020; Tsekea & Chigwada, 2020). This led to difficulties in conducting reference services online – especially for collaboration among research and administrative units (Mehta & Wang, 2020).

Some academic and public libraries have expressed a need for new ICT structures and Internet service to better support reference desks and streaming activities as demand for virtual services increases (Mehta & Wang, 2020; Neog, 2020; Kasa & Yusuf, 2020; Tsekea & Chigwada, 2020; Winata et al., 2020). In moving academic libraries' services online and providing online service for academic staff, libraries have faced additional challenges such as budgetary challenges (Carbery et al., 2020; Winata et al., 2020). Several studies reported budgetary and logistics-related challenges in the cost of training and maintaining open library spaces (Mehta & Wang, 2020; Walsh & Rana, 2020; Weeks et al.,

2020; Winata et al., 2020), as well as a prediction of budget tightening for the next few years (Weeks et al., 2020). More so, some mandates required elimination of check-out for all production equipment because of the difficulty in disinfecting them upon return (See, 2020). In some cases, students were not able to access course reserves that were in high demand because they were only available in physical copies (Mehta & Wang, 2020).

Discussion

This review found that libraries are providing several services in response to the COVID-19 pandemic to meet the changing needs of their users. One of the prominent services provided by almost all the libraries in the included studies is remote digital access to library resources. Libraries are providing digital support in terms of instruction, webinars, and off-campus access to electronic resources, databases, and archives, as well as negotiating and collaborating with publishers and database vendors to increase access to electronic databases and resources. Before the pandemic, several efforts have been made to increase collaboration and partnership among libraries to solve problems that are beyond the ability of a single institution (Maurer, Gammon, & Pollock, 2013; Patterson, 2009; Simpson, 1997). This perhaps owes to declining financial support, coupled with the ever-increasing need to incorporate new technology into library services (Burich, Casey, Devlin, & Ivanitskaya, 2006). In the current milieu, institutional collaboration is particularly important as most libraries, schools, and universities have closed their doors, leading to increasing demand for access to electronic resources by students, researchers, and faculty. This lends support to Klucevsek and Brungard's (2020) submisssion that libraries are increasing the provision of e-books, electronic journals, and enhancing access to online databases as physical access is limited or restricted in most cases. This is also beneficial to publishers as digital distribution of resources via publisher websites has greatly reduced the costs of dissemination –

although the cost of copyediting, marketing and peer-review remains (Tavernier, 2020).

Another prominent service provided by libraries is virtual education and teaching support. This review found that academic libraries in particular are supporting and facilitating remote access to digital content in support of teaching and learning in universities. Librarians and library staff are assisting faculty by uploading teaching content on learning management systems, sitting on curriculum committees, and advising on curriculum development and copyright issues around digital access to electronic resources. Libraries have an inseparable connection with education and are considered a place for transfer of knowledge and information. Results show that library staff are working with instructors to make course materials accessible electronically by creating or linking to digital, copyright-compliant equivalents of textual and audiovisual materials. This is in support with Soleymani, Mojiri and Zadeh (2017) who posit that the library acts as a powerful support for education by providing information resources and the necessary resources for students without the limitation of time and geographic location. This also supports the recommendation by Santos (2020) that libraries can host continued education in-house, which includes offering language lessons, reading clubs, and learning programs.

The virtual education support provided by libraries has been bolstered by an increasing need for open access. This review found that more libraries are engaging in open access services in response to the COVID-19 pandemic. This is made possible as publishers are removing the paywall for COVID-19 information and published articles. Database providers and publishers, including leading publishers such as Oxford, Elsevier, BMJ, Nature, Wiley, Emerald, and Cambridge are now helping to make more resources available via open access. Open access, which advocates that the outcome of scholarly research be made open and freely accessible to everyone with

access to the Internet (Bjork, 2004; Suber, 2003) has seen an increasing uptake during the pandemic. This is in line with a recent study by Homolak, Kodvanj and Virag (2020) which echoes the need to adopt open science principles to accelerate the discovery of COVID-19-related data for more efficient solutions. As such, the commitment by big publishers including The Lancet and Cell Press in 2020 to share research data and findings relevant to the novel coronavirus has demonstrated the value of open access (Tavernier, 2020). However, researchers need to be careful in their quest to use and publish in open access platforms as there is a growing influx of predatory journals with qestionable practices and dubious quality (Ayeni & Adetoro, 2017; Burggren, Madasu, Hawkins, & Halbert, 2018; Frederick, 2020; Zhao, 2014). Researchers have to constantly sieve disinformation and misinformation in research results relating to the COVID-19 pandemic (Baines & Elliott, 2020), which are usually spread through platforms that are open and easily accessible to the public.

In addition, there is an increasing effort from libraries to support the research endeavors of researchers and students, particularly those related to COVID-19. Findings show that librarians are providing vital information services to support students, researchers, academics, medical and paramedical professionals with recent relevant studies, new developments in vaccine production, diagnostic procedures, and issues around intellectual property. Similarly, user-tailored support to research such as advanced workshops to information sessions have been increasingly provided to support research activities. This is in support with the findings of Pauwels et al. (2020) that libraries are synthesizing research on treatments, diagnostic testing, specimen testing procedures, personal protection equipment, measures taken in nursing homes, the effect of the virus during pregnancy, and containing hospital spread. As research related to COVID-19 has received increasing support and attention from government and funding agencies with

over $205.4 billion as of December 20, 2020 (Cornish, 2020), the place of libraries as the research hub of higher institutions cannot be overlooked.

This review also found that the circulation and lending efforts of libraries have continued despite the lockdown. This was made possible through inter-library loan, document delivery services, scanning of print collections, e-book and media technology loans such as laptops and DVDs. This corroborates the submission by Christenson (2011) that libraries are able to ensure their users have access to educational resources by using platforms such as HathiTrust, a "shared digital repository owned and operated by a partnership of more than forty major research libraries" (p. 93). HathiTrust has seen an upsurge in usage during the pandemic, as more resources are made accessible in digital formats. HathiTrust currently enables free online access to full-text of millions of articles which used to be locked to only partner institutions when it was first launched (Eden & Beaubien, 2012). These innovations are helping libraries provide access to electronic resources needed by students and researchers amidst an elongated lockdown.

Results reveal that libraries are providing public health information and ensuring safety of frontline workers through the 3D printing of facemasks, visor shields, and provisions of PPE. This has been helpful in supporting the ongoing efforts by governments to prevent and curb the spread of the COVID-19 pandemic. Most libraries in the included studies have been respecting and supporting government regulations by providing remote learning, working from home, and quarantining. Many libraries have helped advocate the importance of wearing masks, hand washing, the use of sanitizers, and social distancing by providing online platforms and restricting access to physical spaces. Efforts have been made to disseminate public health information within individual libraries, as well as through larger affiliated associations. For example, The

International Coalition of Library Consortia (2020) issued a collective statement on the global effects of COVID-19 and how libraries can collectively approach the pandemic while adjusting services and resources. The Australian Library and Information Association (2020), The Association of Research Libraries (2020), The International Federation of Library Association and Institutions (2020) and The Institute of Museum and Library Services in the USA (2020) have compiled library services provision since the pandemic while regularly updating their website (Ali & Gatiti, 2020).

Beyond their traditional functions, this review found that libraries are now engaging in welfare services and reaching out to their patrons as well as providing resources that will help sustain the mental health and wellbeing of library users. This is done by providing relief support through volunteer services, donating materials and money, and providing reading therapy services. As the pandemic has brought about travel restrictions and lockdown in most countries, the mental health of library users may be declining. Mental health and wellbeing support services from libraries are invaluable. This corroborates the findings of Ramsey and Aagard (2018) that academic libraries can contribute to students' mental health and well-being through the creation of leisure reading collections and designation of spaces for contemplation or napping, and dog petting sessions. Since most of these services are better provided in-person, it may be challenging to do so in an online space, which explains why there are few libraries with such services in the included articles.

Limitations and Recommendations for Further Study

Since the focus of this study is a new area of literature, we recognize that this review may not provide an overarching overview of library services provision in all types of libraries all over the world, as the majority of the studies included focused on academic libraries. This

may be because academic librarians tend to publish more than other librarians. Further study is needed to identify services provided in specific libraries to cater for different user categories. Limitation to English only may have introduced bias in this study as articles not written in the English language were not included. Similarly, by not including the thesaurus terms for COVID-19 through subject heading, we may have missed some alternative terms that have been used in the literature. Our search may also be limited in scope as we did not search educational-related and other scientific databases that may have published studies related to the pandemic. Nevertheless, we expected that our search in WoS core collections and Google Scholar would have filled this gap.

Furthermore, since the world-wide pandemic is still ongoing, new articles are likely to appear in the literature as time goes by. The studies included in this review show a general trend in library services provision, technological tools used in providing those services and challenges facing libraries in the pandemic from several countries of the world. This will help librarians – especially those in the academic and health sectors – in their strategic planning and quest for information services provision during and after the COVID-19 pandemic. As shown in the quality assessment section, most of the included studies are case studies with few empirical studies which may weaken the weight of evidence of the included studies. Since empirical studies investigating library services provision are currently sparce in the literature, further study is needed to fill this gap as the pandemic moves to an end. Other studies could also focus on post-pandemic experiences of different types of libraries, accounting for varying geographical location and languages. This will help libraries navigate the new challenges they may face while ramping up their services in meeting the ever changing and complex user needs.

Conclusion

This review analyzed the various services provided by libraries in response to the COVID-19 pandemic. Whereas eight broad categories of library services were identified in the selected articles, remote digital access, virtual education support, open access services and research support services were provided more by academic libraries. This review found that libraries are adapting to the remote nature of schooling and research as a result of lockdown, and they are providing relevant services to meet the information, research, and well-being needs of patrons. Libraries also increased the provision of virtual services ranging from instructional and teaching services to reference services, digital access to e-resources, literature searching, and others. Libraries are increasing their collaborative efforts with publishers, government agencies, local hospitals, and communities to ensure that necessary resources are made available to patrons without the barrier of access or geographic location. More resources are being made open access, enabling the continuation of research endeavors of students, researchers, faculty, and health researchers.

In some cases, medical libraries are lending out 3D printers and printing personal protective equipment to facilitate the safety of frontline workers who are short of these provisions. Due to the online nature of most library services provided, several technological tools were used, ranging from videoconferencing applications to educational technologies, social networking applications, and makerspaces. Some libraries are facing enormous challenges due to the pandemic. This owes largely to technological barriers as the majority of the included studies reported Internet connectivity and bandwidth issues. For some libraries that have partially remained open, they reported budgetary restrictions which limited them from getting the necessary tools needed to keep safe (e.g., face masks, hand sanitizers, sanitizing returned items), as well as coping with the changing nature of librarians' jobs and increased demands for digital services from patrons.

For libraries to thrive in these trying times, there must be a well-structured approach to ensuring continuity of services provision while obeying government regulations towards containing the COVID-19 pandemic. Regardless of the opening date, it is important for libraries to improve on efforts to provide online digital services, which may see an upsurge in usage even when the pandemic is over. Libraries should prioritize the acquisition of electronic resources as well as increase their efforts to digitize resources that are only available in print. This is especially important in meeting the needs of students and researchers in the humanities who may have many sources only available in print. As library services have predominantly shifted online, there should be concerted effort and support from government and funding agencies to equip libraries with the technological facilities needed to provide cutting-edge services. There should also be adequate provision of facilities and the equipment needed to keep librarians, library staff, and patrons safe.

Libraries should provide a safe environment for circulation services by providing automated return carts or boxes, and self-check-out facilities which should be properly sanitized after every user activity. This has serious implications on increasing budgetary allocations needed to ensure safe and secure library operations. As regards libraries that are completely closed, pending the re-opening regulations from government, patrons' needs should be prioritized, and services provision should cater for their particular situations. This may involve personalized library services, document delivery, pop-up libraries, information literacy sessions, instructional videos, webinars on how to access library resources, and off-campus access to selected library services, among others. Libraries should improve their collaborative efforts with other libraries, publishers, database vendors, health, and government agencies to meet the predominantly digital needs of their patrons, supporting their virtual education, research and development, well-being, and safety.

References

Articles included for the systematic review are indicated with asterisk *

Ali, M. Y. & Gatiti, P. (2020). The COVID-19 (Coronavirus) pandemic: Reflections on the roles of librarians and information professionals. *Health Information and Libraries Journal, 37*(2), 158-162. https://doi.org/10.1111/hir.12307

Australian Library and Information Association. (2020). Australian libraries responding to COVID-19. Retrieved from https://www.alia.org.au/australian-libraries-responding-covid-19

Ayeni, P. O., & Adetoro, N. (2017). Growth of predatory open access journals: Implication for quality assurance in library and information science research. *Library Hi Tech News*. *34*(1), 17-22. https://doi.org/10.1108/LHTN-10-2016-0046

Baines, D., & Elliott, R. (2020). Defining misinformation, disinformation and malinformation: An urgent need for clarity during the COVID-19 infodemic. *Discussion Papers,* 20-06 Department of Economics, University of Birmingham. http://www.repec.bham.ac.uk/pdf/20-06.pdf

Bjork, B. C. (2004). Open access to scientific publications - an analysis of the barriers to change? *Information Research: An International Electronic Journal, 9*(2), 15. http://hdl.handle.net/10227/647

Briner, R. B., & Denyer, D. (2012). Systematic review and evidence synthesis as a practice and scholarship tool. In D. Rousseau (Ed.), *The Oxford Handbook of Evidence-Based Management: Companies, Classrooms, and Research* (pp. 112-129). (Oxford Library of Psychology). Oxford University Press.

Burggren, W., Madasu, D. K., Hawkins, K. S., & Halbert, M. (2018). Marketing via email solicitation by predatory (and legitimate) journals: An evaluation of quality, frequency and relevance. *Journal of Librarianship and Scholarly Communication, 6(1).* http://dx.doi.org/10.7710/2162-3309.2246

Burich, N. J., Casey, A. M., Devlin, F. A., & Ivanitskaya, L. (2006). Project management and institutional collaboration in libraries. *Technical Services Quarterly, 24*(1), 17-36. https://doi.org/10.1300/J124v24n01_02

*Carbery, A., Fallon, H., Higgins, M., Kennedy, E., Lawton, A., & McCauley, C. (2020). Irish libraries and COVID-19: First reflections. *Insights, 33*, 1-19. http://doi.org/10.1629/uksg.522

*Chakraborty, K., Kureshi, P. S. L., Gajbe, S. B., Upadhyay, N., & Devi, D. (2020). Role of LIS professionals to provide authentic information sources during COVID-19 a pandemic crisis. *Library Philosophy and Practice*, 1-19. https://digitalcommons.unl.edu/libphilprac/4180

Christenson, H. (2011). HathiTrust: A research library at webscale. *Library Resources & Technical Services, 55*(2), 93-102. https://journals.ala.org/index.php/lrts/article/view/5226/6352

Cornish, L. (2020). Interactive: Who's funding the COVID-19 response and what are the priorities? *Devex.* https://www.devex.com/news/interactive-who-s-funding-the-covid-19-response-and-what-are-the-priorities-96833

*Cox, A., & Brewster, L. (2020). Library support for student mental health and well-being in the UK: Before and during the COVID-19 pandemic. *Journal of Academic Librarianship, 46*(6), 102256. https://doi.org/10.1016/j.acalib.2020.102256

*Dadhe, P. P., & Dubey, M. N. (2020). Library services provided during COVID-19 pandemic: Content analysis of websites of Premier Technological Institutions of India. https://digitalcommons.unl.edu/libphilprac/4445/

Eden, K., & Beaubien, A. K. (2012). HathiTrust: Digital access at the intersection of interlibrary lending potential and the protection of intellectual property rights. *Interlending & Document Supply*, *40*(2), 94-99. https://doi.org/10.1108/02641611211239560

*Erich, A. T. (2020). Libraries reaction of Romania to the crisis caused by COVID 19. *Postmodern Openings, 11*(3), 332-343. https://doi.org/10.18662/po/11.3/218

Frederick, D. E. (2020). Scholarly communications, predatory publishers and publish or perish culture in the 2020s. *Library Hi Tech News, 37*(5), 1-11. https://doi.org/10.1108/LHTN-01-2020-0007

*Guo, Y. J., Yang, Z. N., Yang, Z. S., Liu, Y. Q., Bielefield, A., & Tharp, G. (2020). The provision of patron services in Chinese academic libraries responding to the COVID-19 pandemic. *Library Hi Tech*. *39*(2), 533-648. https://doi.org/10.1108/LHT-04-2020-0098

Gough, D. (2007). Weight of evidence: A framework for the appraisal of the quality and relevance of evidence. *Research papers in education, 22*(2), 213-228. https://doi.org/10.1080/02671520701296189

Homolak, J., Kodvanj, I., & Virag, D. (2020). Preliminary analysis of COVID-19 academic information patterns: A call for open science in the times of closed borders. *Scientometrics, 124*(3), 2687-2701. https://doi.org/10.1007/s11192-020-03587-2

Hong, Q. N. et al. (2018). Mixed Methods Appraisal Tool (MMAT) Version 2018. Registration of Copyright (#1148552), Canadian Intellectual Property Office, Industry, Canada.

*Howes, L., Ferrell, L., Pettys, G., & Roloff, A. (2021). Adapting to remote library services during COVID-19. *Medical

Reference Services Quarterly, 40(1), 35-47. https://doi.org/10.1080/02763869.2021.1873616

Institute of Museum and Library Services. (2020). COVID-19 resources for librarians and museums. https://www.imls.gov/coronavirus-covid-19-updates/covid-19-resources-libraries-and-museums

International Coalition of Library Consortia. (2020). Statement on the GLOBAL COVID-19 pandemic and its impact on library services and resources. https://icolc.net/statement/statement-global-covid-19-pandemic-and-its-impact-library-services-and-resources

International Federation of Library Association and Federation. (2020). COVID-19 and the global library field. https://www.ifla.org/covid-19-and-libraries

*Ishtiaq, S. M., Sehar, N., & Shahid, A. (2020). Information dissemination during Covid-19 and lockdown: The role of university libraries of Sindh, Pakistan. *Library Philosophy and Practice*. https://digitalcommons.unl.edu/libphilprac/4280/

*Kasa, M., & Yusuf, A. (2020). Experience of an academic library during the COVID-19 pandemic. *Library Philosophy and Practice*. https://digitalcommons.unl.edu/libphilprac/4456/

*Kaur, H., & Mahajan, P. (2020). Library and information services of A.C. Joshi library during COVID–19 pandemic: A study of faculty satisfaction. *Library Philosophy and Practice*, 1-20. https://digitalcommons.unl.edu/libphilprac/4464/

Klucevsek, K. M., & Brungard, A. B. (2020). Digital resources for students: Navigating scholarship in a changing terrain. *Portal : Libraries and the Academy, 20*(4), 597-619. https://doi.org/10.1353/pla.2020.0040

Kosciejew, M. (2021). The coronavirus pandemic, libraries and information: A thematic analysis of initial international responses to COVID-19. *Global Knowledge, Memory and Communication, 70*(4/5), 304-324. https://doi.org/10.1108/GKMC-04-2020-0041

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *Research Methods and Reporting.* https://doi.org/10.1136/bmj.b2700

*Ma, L. F. (2020). Academic library services during COVID-19: The experience of CUHK library. *International Information & Library Review, 52*(4), 321-324. https://doi.org/10.1080/10572317.2020.1834251

Maurer, M. B., Gammon, J. A., & Pollock, B. M. (2013). Developing best practices for technical services cross-institutional collaboration. *Cataloging & Classification Quarterly, 51*(1-3), 179-193. https://doi.org/10.1080/01639374.2012.733795

*Mbambo-Thata, B. (2021). Responding to COVID-19 in an African university: The case the National University of Lesotho library. *Digital Library Perspectives, 37*(1), 28-38. https://doi.org/10.1108/DLP-07-2020-0061

*Mehta, D., & Wang, X. C. (2020). COVID-19 and digital library services - A case study of a university's library. *Digital Library Perspectives*. *36*(4), 351-363. https://doi.org/10.1108/DLP-05-2020-0030

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Plos Medicine 6*(7), e1000100. https://doi.org/10.1136/bmj.b2535

*Neog, S. (2020). Library services through social media during lockdown due to COVID-19 with special reference to university libraries of Assam. *Library Philosophy and Practice*, 1-12. https://digitalcommons.unl.edu/libphilprac/4262/

Paez, A. (2017). Grey literature: An important resource in systematic reviews. *Journal of Evidence Based Medicine, 10*(3), 233-240. https://doi.org/10.1111/jebm.12265

Pati, D., & Lorusso, L. N. (2018). How to write a systematic review of the literature. *HERD: Health Environments Research & Design Journal, 11*(1), 15-30. https://doi.org/10.1177/1937586717747384

Patterson, A. (2009). Research support through resource sharing: Challenges and opportunities for Irish academic libraries. *Interlending & Document Supply*. *37*(2), 87-93. https://doi.org/10.1108/02641610910962328

Pauwels, S. N., De Meulemeester, A., Romagnoli, A., Buysse, H., & Peleman, R. (2020). Medical and health informatics services during and after the COVID-19 pandemic should be virtual, tailored, responsive and interactive: A case study

in Belgium. *Health Information & Libraries Journal, 38*(1), 66-71. https://doi.org/10.1111/hir.12330

*Pokorna, L., Indrak, M., Grman, M., Stepanovsky, F., & Smetankova, M. (2020). Silver lining of the COVID-19 crisis for digital libraries in terms of remote access. *Digital Library Perspectives*. *36*(4), 389-401. https://doi.org/10.1108/DLP-05-2020-0026

Ramsey, E., & Aagard, M. C. (2018). Academic libraries as active contributors to student wellness. *College & Undergraduate Libraries, 25*(4), 328–334. https://doi.org/10.1080/10691316.2018.1517433

*Saavedra-Alamillas, C., Pacheco-Mendoza, J., Garcia-Melendez, H. E., Lopez, A. V., Martinez-Camacho, H., Ortiz-Diaz, E. M., & Ortega-Martinez, E. (2020). Document delivering services: A strategy to support research in Mexican universities in the pandemic by COVID-19. *Digital Library Perspectives*. *36*(4), 337-349. https://doi.org/10.1108/DLP-0505-2020-0031

Santos, M. C. (2020). Libraries respond to COVID-19. *Texas Library Journal, 96*(2), 64-72. https://www.webjunction.org/content/dam/WebJunction/Documents/webJunction/2020-08/TLJ-summer-2020-innovation-leads-to-virtual-success.pdf

*See, A. (2020). Weathering the storm: Continuing essential services at an academic library during a global pandemic. *Against the Grain, 32*(4), 24-27. https://www.charleston-hub.com/2020/09/v324-weathering-the-storm-continuing-essential-services-at-an-academic-library-during-a-global-pandemic/

Simpson, D. B. (1997). Solving the challenges presented by electronic resources: Creating opportunities through inter-institutional collaboration. *Journal of Library Administration, 24*(4), 49-60. https://doi.org/10.1300/J111v24n04_06

Soleymani, M., Mojiri, S., & Zadeh, M. (2017). The supporting roles of academic librarians in virtual education. *Int J Educ Psychol Res, 3*, 213-218. https://doi.org/10.4103/2395-2296.225095

Suber, P. (2003). Scholarly communication: Removing barriers to research: An introduction to open access for librarians. *College & Research Libraries News, 64*(2), 92-113. https://doi.org/10.5860/crln.64.2.92

Tavernier, W. (2020). COVID-19 demonstrates the value of open access: What happens next? *College & Research Libraries News, 81*(5), 226. https://doi.org/10.5860/crln.81.5.226

*Tolppanen, B. P. (2021). A survey of response of access services in academic libraries to COVID-19. *Journal of Access Services*, 1-11. https://doi.org/10.1080/15367967.2021.1871619

*Tsekea, S., & Chigwada, J. P. (2020). COVID-19: strategies for positioning the university library in support of e-learning. *Digital Library Perspectives*. *36(*1), 54-64. https://doi.org/10.1108/DLP-06-2020-0058

*Walsh, B., & Rana, H. (2020). Continuity of academic library services during the pandemic: The University of Toronto libraries' response. *Journal of Scholarly Publishing, 51*(4), 237-245. https://doi.org/10.3138/jsp.51.4.04

*Weeks, A., Houk, K. M., Nugent, R. L., Corn, M., & Lackey, M. (2020). UNLV Health Sciences library's initial response to the COVID-19 pandemic: How a versatile environment, online technologies, and liaison expertise prepared library faculty in supporting its user communities. *Medical Reference Services Quarterly, 39*(4), 344-358. https://doi.org/10.1080/02763869.2020.1826197

WHO. (2020a). What we know about the long-term effects of COVID-19. https://www.who.int/docs/default-source/coronaviruse/risk-comms-updates/update-36-long-term-symptoms.pdf?sfvrsn=5d3789a6_2

WHO. (2020b). Transmission of SARS-CoV-2: Implications for infection prevention precautions. https://www.who.int/news-room/commentaries/detail/transmission-of-sars-cov-2-implications-for-infection-prevention-precautions

WHO. (2021). WHO Coronavirus (COVID-19) dahsboard – 18 July, 2021. https://covid19.who.int/

*Winata, A., & Fadelina, R. (2020). New normal and library services in Indonesia: A case study of university libraries. *Digital Library Perspectives*, 1-9. https://doi.org/10.1108/DLP-07-2020-0059

*Yu, F., & Mani, N. (2020). How American academic medical/health sciences libraries responded to the COVID-19 health crisis: An observational study. *Data and Information Management, 4*(3), 200-208. https://doi.org/10.2478/dim-2020-0013

Zhao, L. (2014). Riding the wave of open access: Providing library research support for scholarly publishing literacy. *Australian Academic & Research Libraries, 45*(1), 3-18. https://doi.org/10.1080/00048623.2014.882873

Appendix A

LISA Search Strategy Using Building Blocks Approach

Set#	Searched for	Databases	Results
S1	"library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*"	Library & Information Science Abstracts (LISA)	298492
S2	COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19	Library & Information Science Abstracts (LISA)	1521
S3	("library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*") AND (COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19)	Library & Information Science Abstracts (LISA) These databases are searched for part of your query.	773
S4	("library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*") AND (COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19) AND yr(2020)	Library & Information Science Abstracts (LISA) These databases are searched for part of your query.	461
S5	("library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*") AND (COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19) AND (stype.exact("Scholarly Journals" NOT ("Trade Journals" OR "Magazines")) AND yr(2020))	Library & Information Science Abstracts (LISA) These databases are searched for part of your query.	194

Appendix B

Library Science Database Search Strategy Using Building Blocks Approach

Set#	Searched for	Databases	Results
S1	"library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*"	Library Science Database, Library Science Database	368218
S2	COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19	Library Science Database, Library Science Database	3986
S3	("library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*") AND (COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19)	Library Science Database, Library Science Database These databases are searched for part of your query.	1278
S4	("library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*") AND (COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19) AND pd(20200101-20201231)	Library Science Database, Library Science Database These databases are searched for part of your query.	739
S5	("library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*") AND (COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19) AND (stype.exact("Scholarly Journals" NOT ("Trade Journals" OR "Blogs, Podcasts, & Websites" OR "Magazines")) AND pd(20200101-20201231))	Library Science Database, Library Science Database These databases are searched for part of your query.	158

Appendix C

LISTA Search Strategy Using Building Blocks Approach

Set#	Searched for	Databases	Results
S1	("library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*") AND (COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19)	**Expanders** - Apply related words; Apply equivalent subjects **Search modes** - Boolean/Phrase	297
S2	("library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*") AND (COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19	**Limiters** - Publication Date: 20200101-20201231 **Expanders** - Apply related words; Apply equivalent subjects **Search modes** - Boolean/Phrase Database	267
S3	("library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*") AND (COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19)	**Limiters** - Publication Date: 20200101-20201231 **Expanders** - Apply related words; Apply equivalent subjects **Narrow by Language:** - english **Search modes** - Boolean/Phrase	109

Appendix D

Web of Science Core Collections Search Strategy Using Building Blocks Approach

Set#	Results	Save/Search History
#4	2,028	#2 AND #1 **Refined by: PUBLICATION YEARS:** (2020) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years*
#3	3,164	#2 AND #1 *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years*
#2	107,419	TS=(COVID-19 OR pandemic* OR Coronavirus* OR 2019-ncov-2 OR Cov-19) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years*
#1	404,081	TS=("library service*" OR "information service*" OR "Bibliographic instruction*" OR "book drop" OR "reference service*" OR "Reading promotion" OR "Research support" OR "Citation guide*" OR "Systematic review service*" OR "Digital scholarship" OR "open access" OR "Inter-library loan" OR ILL OR "teaching support" OR Literacy OR "institutional repositor*" OR "User service*") *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years*

Appendix E
Critical Appraisal of Methodological Quality of Included Studies.

1. Qualitative Studies

First Author	Year	Q 1.1	Q 1.2	Q 1.3	Q 1.4	Q 1.5	Comments
Howes	2021	-	-	-	-	-	Cannot answer the general questions (S.1 and S.2), hence cannot be assessed.
Mehta	2020	Yes	Yes	Yes	Yes	Yes	
See	2020	Yes	Yes	Yes	Yes	Yes	
Weeks	2020	Yes	Yes	Yes	Yes	Yes	
Yu	2020	Yes	Yes	Yes	Yes	Yes	
Chakraborty	2020	Yes	Yes	Yes	Yes	Yes	
Dadhe	2020	Yes	Yes	Yes	Yes	Yes	
Ma	2020	No	No	Yes	Yes	Yes	No sufficient description of the methodological approach.
Carbery	2020	Yes	Yes	Yes	Yes	Yes	
Walsh	2020	No	No	Yes	Yes	Yes	No sufficient description of the methodological approach.
Erich	2020	Yes	Yes	Yes	Yes	Yes	
Pokorna	2020	Yes	Yes	Yes	Yes	Yes	
Winata	2020	Yes	Yes	Yes	Yes	Yes	
Mbambo-Thata	2021	Yes	Yes	Yes	Yes	Yes	

Q 1.1. Is the qualitative approach appropriate to answer the research question?
Q 1.2. Are the qualitative data collection methods adequate to address the research question?
Q 1.3. Are the findings adequately derived from the data?
Q 1.4. Is the interpretation of results sufficiently substantiated by data?
Q 1.5. Is there coherence between qualitative data sources, collection, analysis, and interpretation?

4. Quantitative descriptive studies

First Author	Year	Q 4.1	Q 4.2	Q 4.3	Q 4.4	Q 4.5	Comments
Tolppanen	2021	No	Can't tell	Yes	Can't tell	Yes	No mention of sampling strategy, nor the total population of the study. Hence, we cannot tell if the sample is representative or not.
Neog	2020	No	Can't tell	Yes	Can't tell	Yes	No mention of sampling strategy, nor the total population of the study. Hence, we cannot tell if the sample is representative or not.
Guo	2020	Yes	Yes	Yes	NA	Yes	This study did not use human participants, but used content analysis. Hence, risk of non-response bias is not applicable.
Cox	2020	Yes	Yes	Yes	No	Yes	With response rate of 31%, the risk of non-response bias is low.
Saavedra-Alamillas	2020	NA	Can't tell	Yes	NA	Yes	This study did not use human participants, but used content analysis. Hence, risk of non-response bias is not applicable.
Ishtiaq	2020	Yes	Yes	Yes	Yes	Yes	
Kasa	2020	Yes	Yes	Yes	NA	Yes	This study did not use human participants, but used content analysis. Hence, risk of non-response bias is not applicable.
Tsekea	2020	Yes	Can't tell	Yes	Yes	Yes	This study did not include the total number of the unit of analysis. Hence, we cannot tell if sample was representative or not.

Q 4.1. Is the sampling strategy relevant to address the research question?
Q 4.2. Is the sample representative of the target population?
Q 4.3. Are the measurements appropriate?
Q 4.4. Is the risk of nonresponse bias low?
Q 4.5. Is the statistical analysis appropriate to answer the research question?

5. Mixed methods studies

First Author	Year	Q 5.1	Q 5.2	Q 5.3	Q 5.4	Q 5.5	Comments
Kaur	2020	Yes	No	No	No	Yes	The outputs of the qualitative and quantitative components of this study were interpreted separately. There was no integration of data. Data from the qualitative component were insufficiently interpreted and discussed.

Q 5.1. Is there an adequate rationale for using a mixed methods design to address the research question?

Q 5.2. Are the different components of the study effectively integrated to answer the research question?

Q 5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?

Q 5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?

Q 5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?