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UNIVERSITY LIBRARIES IN RESEARCH AND INNOVATION: AN ANALYTICAL REVIEW

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ABSTRACT

A paradigm shift is taking place in which the role of libraries at universities is changing towards being more than mere guardians of information and becomes more of a participant in the research and innovation process. In a digital scholarly age, with data heavy research and open science, libraries are crucial in underpinning the entire research pathway and developing an ecosystem of innovation in universities. This paper contains a more thorough review and study of the changing role of university libraries in the supporting research and innovation process. The study is based on a rich amount of global literature, policy frameworks, and best practices and explores the role of the library in contributing to research productivity, scholarly communication, research data management, interdisciplinary collaboration, and knowledge dissemination of innovation. The paper also recognises structural, financial, and professional issues that affect university libraries and gives future plans of how they can enhance their place in institutional research and innovation agenda. The review states that the re-branding of university libraries as active research and innovation partners is the key to improving the quality of academics, international presence, and influence on society.

KEYWORDS: University libraries, research support services, innovation, scholarly communication, open science, digital scholarship, higher education.

1. INTRODUCTION

The mission of contemporary universities is based on the research and innovation which is generally seen as one of the most important factors of economic growth, social development, and international competitiveness. The institutional frameworks of research have to change in tandem with increased complexity, interdisciplinary and technologically based knowledge

production. In this scenario, university libraries have become important facilitators of research excellence and research innovation capacity (Pinfield, Cox, and Smith, 2014).

In the traditional sense, the university libraries were mainly charged with the responsibility of acquiring, organizing and preservation of information resources in the form of print material. But the blistering development of digital technologies, electronic publishing, and information environment networked has radically altered the roles and services of libraries (Borgman, 2007). Modern university libraries are now offering support to the researchers not only through access to information but also in terms of data handling, spreading research, evaluating its impact, and transferring knowledge to the innovation.

Besides, such international trends like open access, open data and open science have positioned libraries at the center of institutional democratization of knowledge and speeding up innovation (Suber, 2012; UNESCO, 2021). The purpose of this paper is to critically review and discuss the complex role of university libraries in aiding research and innovation, and how they can be relevant in terms of their strategic role in institutions of higher learning.

2. Objectives of the Study

The specific objectives of this study are:

1. To critically discuss how universities libraries are changing to support academic research.
2. To examine the role played by university libraries in terms of innovation and knowledge creation.
3. To overview major research support services provided by contemporary university libraries.
4. To evaluate issues that restrain the performance of libraries in research and innovation.
5. To recommend the future strategies and policy directions in enhancing library-led research support.

3. Research Methodology

This research paper is a qualitative systematic review and analytical research study to find out the role of university libraries in supporting research and innovation. The qualitative review method is especially suitable when it comes to synthesizing the conceptual, theoretical, and empirical knowledge on a broad range of literature and deriving patterns, trends, and gaps within the current research (Creswell, 2013; Creswell, 2018).

It is founded on the secondary research, which consists of the collection of the numerous authoritative and peer-reviewed sources. These comprise the scholarly journal articles,

academic books, conference proceedings, international policy reports and institutional documents on university libraries, research support services, innovation ecosystems and scholarly communication. Major bibliographic databases like Scopus, Web of Science, Google Scholar, ERIC, and selected institutional repositories were searched systematically to be as comprehensive and academic as possible.

Thematic analysis methodology was used in the analysis of the selected literature, which is a systemic method of coding, categorizing, and interpreting qualitative data (Braun and Clarke, 2006). They were then identified in themes that centered on such key dimensions as access to scholarly resources, research data management, scholarly communication, innovation support, digital scholarship, and the research impact assessment.

The methodology helped to synthesize the results of various studies and critically assess the role of university libraries in the productivity of research and the ability to meet the requirements of research and innovation. The thematic synthesis has also contributed to the emergence of trends, best practices and challenges that persist in affecting university libraries in various institutional and geographical settings (Booth et al., 2016).

4. Conceptual Linkages Between Libraries, Research, and Innovation

Research and innovation are inter-linked processes that involve the processes of creating, validating, sharing, and putting knowledge into practice. Research creates novel ideas and facts whereas innovation transforms this knowledge into practice, technology, social or policy-based results. University libraries are the most significant sources of knowledge in this ecosystem, which operate as a source of transfer of information between various phases of the research and innovation process (Lankes, 2016; Borgman, 2015).

Conceptually, libraries lie at the point of knowledge infrastructure, research systems and innovation ecosystems. Through curating, organizing and availing scholarly materials, libraries create less obstacles to access to information and allow researchers to interact effectively with the current knowledge repositories (Borgman, 2007). This mediating role is especially important in the age of information overload wherein the skill of recognizing credible, relevant, and high-impact research is strongly important in an inquiry-based innovation.

Based on the systems theory and the studies in innovation, university libraries may be considered as key actors in national and institutional innovative systems, which focus on relations between knowledge producers, users and intermediaries (Lundvall, 1992; Etzkowitz

and Leydesdorff, 2000). Here, libraries play a role in enhancing interconnection among researchers, disciplines, institutions and external stakeholders thus leading to innovation.

In particular, libraries contribute to innovations by:

1. Lessening information asymmetry and transaction expenses by leveling the playing field based on the equitable access to scholarly publications, data, patents, and grey literature. This also helps researchers to avoid uninformed decisions and duplication of research (Arrow, 1962; Borgman, 2015).
2. Increasing the efficiency and quality of research through facilitating the use of advanced information retrieval, conducting systematic reviews, research data management and scholarly communication services. Such interventions enhance methodological soundness and enhance the generation of knowledge (Tenopir et al., 2017).
3. Enabling the knowledge spill-over and interdisciplinary teamwork through offering mutually supporting information platforms, study areas, and cross-disciplinary research. The most common example of such spillovers is commonly known as the key driver of innovation and creativity (Lankes, 2016).
4. Facilitating open, transparent and reproducible research via institutional repositories, open access publication and open data infrastructure. Such measures increase the confidence in the results of research and facilitate the reuse of knowledge to generate additional innovation (Borgman, 2015; Suber, 2012).

Libraries and the Research Lifecycle

Theoretically, the library role is very similar to the research lifecycle model consisting of the idea generation, literature review, data collection, analysis, dissemination, and impact assessment. Libraries offer specific assistance at every stage of this lifecycle, which makes them the participants of the workflow of research instead of serving as an independent service provider (Pinfield, Cox, and Smith, 2014).

Libraries contribute to the continuity and consistency of research undertaking by supporting the discovery at an early stage, management of data during its middle phase, and dissemination and impact measurement at its late stage. This support, based on lifecycle is especially essential to innovation since it will guarantee that knowledge flows effectively between fundamental research and practical results.

The Libraries as the Agents of Innovation

The changing conceptualization of libraries indicates a transformation in the service-based model to the partnership-based model. Modern scholarship is progressively defined as librarians working as collaborators, consultants, and co-creators of knowledge, particularly in digital scholarship, data-intensive research, and interdisciplinary projects (Corrall, 2014; Lankes, 2016).

Libraries also play a role in innovation ecosystems by facilitating experimentation, digital literacy, and technology adoption with makerspaces and digital laboratories and innovation hubs located within libraries. Such initiatives make libraries places of innovation whereby knowledge is not only consumed but also produced and transformed.

On the whole, the idea of the conceptual connections between libraries, research, and innovation serves as an indicator of strategic significance of the university libraries as the proactive actors in knowledge-based economies. Libraries facilitate the basis of research-led innovation by medating access to information, facilitating the possibilities of collaboration, and ensuring the setting of open and reproducible research practices. Therefore, libraries are not regarded as passive stores anymore, but as active institutional agents that influence the direction, quality, and effects of the research and innovation systems.

5. Role of University Libraries in Supporting Research

University libraries are significant in aiding research through availing research resources, building research skills, and disseminating knowledge. Libraries within the modern research ecosystem facilitate the whole research cycle (discovery and data management), publication, and impact evaluation, which increases the quality, productivity, and the ability to innovate and produce research.

Availability of Scholarly Information Resources: Availability of academic and high-quality scholarly literature is the basis of academic research. University libraries provide access to many print and electronic materials, such as journals, books, databases, datasets and grey literature. Libraries manage the increases in journal prices and make more research products available worldwide through their investments in consortia-based subscriptions and licensing deals (Tenopir et al., 2017).

Literature retrieval has also been augmented by the digital libraries and discovery tools which have allowed the researcher to carry out thorough and systematic reviews with ease (Borgman, 2007). The research has always identified a positive correlation between the availability of library resources and research productivity (Liu and Cox, 2019).

Development of Information Literacy and Research Skills: Information literacy has become one of the fundamental research skills in the digital era. University libraries are also essential in preparing the researchers to discover, assess, and utilize information sources in an ethical manner (ACRL, 2016). Workshops on advanced database searching, citation management tools, plagiarism detector, and academic writing led by the library contribute to improving the research quality and integrity considerably (Corrall, 2014).

The interventions are especially important to postgraduate students and young-career researchers to develop the required research skills and encourage responsible research behavior.

Research Data management and Curation: The burgeoning research data has made data management to become a core research support activity. It is becoming a requirement of funding agencies that data management plans, open data sharing, and long-term preservation of research outputs are present (OECD, 2015). University libraries are in a good position to offer expertise in metadata standards, data documentation, storage solutions as well as data repositories (Auckland, 2012).

Good data management in research improves transparency, reproducibility, and reuse, and thus improves the research ecosystem overall and data-driven innovation (Borgman, 2015).

Academic Communication and Publication Support: The library in universities have taken a centre stage in redefining the scholarly communication systems. The institutional repositories under library management can promote the open-access to theses, dissertations, articles, and research reports, which make them more visible and contribute to their citation success (Pinfield et al., 2014).

Libraries also assist researchers to find their way through complicated publishing choices, such as journal choice, copyright rules, licensure, and evading predatory journals (Beall, 2015). These services are needed to support quality and ethical publishing of research.

Research Impact Assessment and Metrics: The quantification and demonstration of research impact has gained importance in terms of research funding, promotion and institutional rankings. Bibliometric and altmetric services are also offered within the university libraries, such as citation analysis, h-index calculation, and research profiling (Sugimoto and Lariviere, 2018).

Libraries have a positive role to play by assisting scholars to showcase their academic presence by supporting tools like ORCID, Scopus Author ID, and Google Scholar profiles, which enable them to learn how to improve their presence in society beyond the traditional citations.

6. Role of University Libraries in Encouraging Innovation

University libraries can help in innovation by providing a setting that facilitates innovation, interdisciplinary cooperation as well as use of new technologies. In addition to conventional supporting research services, libraries are now being used to act as centers of innovation contributing to digital scholarship, open science, and knowledge creation, exchange, between academia, industry and society.

Libraries as Innovation and Collaboration Spaces: Modern university libraries are being designed as collaborative and innovation driven spaces. The learning commons, makerspaces, online labs, and co-working spaces encourage creative thinking, interdisciplinary conversations as well as experimentation (Bennett, 2009).

These spaces facilitate innovation through promoting informal sharing of knowledge and collective problem solving, which are both important elements in innovation ecosystems.

Funding Interdisciplinary and Applied Research: Innovation usually happens in the interdisciplinary context. The interdisciplinary research is supported by university libraries, which combine various sources of information and offer consultation services to research in different fields (Lankes, 2016).

Applied research and commercialization is another area where libraries are involved in helping bridge academic research with industry and societal needs by search of patents, intellectual property awareness, and technology landscape analysis (Harris, 2019).

Digital Scholarship and Emerging Technologies: Digital scholarship has increased the approaches of research in the fields especially in the humanities and social sciences. Libraries in universities promote digital humanities projects, data visualization, text mining, GIS applications, and computational methods of research (Borgman, 2015).

Giving libraries technical skills and digital infrastructure facilitates the innovative ways of research and contributes to the increased application of new technologies in the academic sphere.

Open Science and Knowledge Dissemination: Open science is the movement of focusing on the transparency, accessibility, and collaboration in the research. In the context of open access publishing, open data repositories, and open educational resources, university libraries are at the forefront (Suber, 2012; UNESCO, 2021). Open science practices supported by libraries accelerate knowledge diffusion, stimulate innovation, and enhance the societal relevance of academic research.

7. Challenges Faced by University Libraries

Even though university libraries are experiencing growing roles and strategic value in helping research and innovation, they are faced with a spectrum of structural, financial, technological and professional issues that can limit their efficiency. Such issues are especially acute under the conditions of the high pace of digital change and the growth of requirements of researchers and institutional stakeholders.

Skyrocketing prices of Academic Publications and Financial Limitations: The rising cost of electronic publications, databases and other digital materials has been one of the greatest threats facing university libraries. Prices have risen on subscriptions that are more than many times the increase in library budgets, resulting in what has been broadly called a series crisis (Bosch & Henderson, 2017; Fyfe et al., 2017). This is further worsened by shrinking or stagnant budgets, which have caused libraries to forego subscriptions and access to vital research materials. This may adversely impact the quality and competitiveness of research especially in institutions that lack resources.

Quick Technological Change and Skills Gap: The other significant challenge is the rapid technological change. There are new domains of research data management, digital scholarship, artificial intelligence, and bibliometrics that need specialized technical knowledge. The constant challenge faced by many libraries is the lack of training and the available resources to meet these changing demands because they lack the opportunity to train their employees and have limited resources (Corrall, 2014; Tenopir et al., 2019). This has been a skills shortfall that may hamper the delivery of the high-level research and innovation support services by the libraries.

Inadequate appreciation of Librarians as Research Partners: Although librarians have become more and more engaged in the role of support research, they are not always considered as full-fledged partners of the research process. In most institutions, the librarians are viewed as service providers and not as partners or contributors in research work (Lankes, 2016). Such an oversight may restrict the participation of librarians in a variety of grant-supported research, multidisciplinary collaborations, and institutional decision making, thus not accessing their knowledge.

Infrastructure and Staffing Limitations: Insufficiency of physical and digital infrastructure is still a real issue especially in the developing and emerging economy universities. The access to high-speed internet, lack of digital repositories, and the outdated library management systems limits the effectiveness of the delivery of research support services

(Auckland, 2012). Also, the problem of understaffing and excessive workloads limits the ability of libraries to participate proactively in innovation-driven projects.

Striking a Balance between Traditional and Emerging Roles: University libraries are becoming more and more expected to strike a balance between traditional functions including those related to collection development, cataloguing, and circulation and the newer functions of managing data, exploring digital scholarship, assessing impact of research, etc. This change comes with organizational and strategic difficulties of managing it without reducing services (Pinfield et al., 2014). Institutional inertia and resistance to change can make the process of redefining the priorities of the library even more complicated.

All of these issues can potentially constrain the potential of university libraries to become fully research and innovation facilitators. Libraries might not be able to keep up with the changing research environment without a long-term investment, institutional support, and policy recognition. These issues need strategic planning, capacity building, and better incorporation of libraries into institutional research and innovation systems to overcome them.

8. Policy Implications and Future Directions

University libraries need to be able to strategically transform themselves to keep up with the changing times as universities gain greater emphasis on research and innovation as the central purpose of their academic activity. The role of libraries in research and innovation needs to be bolstered through an institutional planning process, long-term investment, and favorable policy frameworks, both at national and institutional levels.

Strategic Coherence to Institutional Research and Innovation Agendas: University libraries must be carefully aligned with institutional strategies of research and innovation, as opposed to being service to an isolated service unit. By aligning library goals with university research priorities, libraries can take the initiative to fund grant-funded projects, interdisciplinary research clusters, and innovation-driven projects. Involvement of library leadership to research governance committees and academic planning committees may guarantee that library experience is instilled in institutional decision-making utilization (Pinfield et al., 2014; Lankes, 2016).

Digital Infrastructure and Data Services Investment: Digital libraries that serve as foundations of future research must have digital infrastructure that supports data-intensive and technology-intensive research. To facilitate open, reproducible, and high-impact research, it is necessary to invest in institutional repositories, research data management

systems, digital preservation systems, and state-of-the-art discovery tools. Libraries ought to also increase services to do with data analytics, visualization and artificial intelligence to address new research requirements within the disciplines.

Empowering Collaboration and External Partnerships: Research and innovation more and more requires working with other parties outside the library. University libraries also need to reinforce their relations with research offices, innovation and incubation cells, technology transfer offices, and industry stakeholders. This type of collaboration can strengthen the assistance of applied research, patent research, intellectual property administration, and knowledge commercialization (Harris, 2019). Access to resources and expertise can be further enhanced at the national and international by library consortia and professional networks.

Evidence-Based Evaluation and Impact Proving: It is imperative to show the importance of library support in the research findings to ensure institutional backing and financial resources to fund the endeavor. Evidence-based practices, such as bibliometric measurements, usage metrics, and qualitative feedback, should be implemented by libraries to measure their role in research productivity, innovation output, and impact on society (Tenopir et al., 2017; Sugimoto and Lariviere, 2018). Systematic assessment does not just enlighten on service improvement but also helps in enhancing advocacy.

Policy Advocacy and Capacity Building: At the policy level, more attention should be paid to the need to treat university libraries as the central elements of the research and innovation systems of the country. Libraries ought to be included in research policy agendas, open science requirements, and even digital infrastructure projects by governments, funding organizations, and regulators of higher education (UNESCO, 2021; OECD, 2015). Institutionalization of capacity-building programs based on digital skills, research data management, and scholarly communication needs to be established to prepare library professionals in changing roles.

Towards Sustainable and Inclusive Research Ecosystems: Lastly, the future policies of libraries need to focus on sustainability and inclusivity. Libraries have potential opportunities to be transformative in reducing digital divides, enabling equal access to knowledge, and enabling inclusive research in both developing countries and resource-limited institutions. Through open science, collaboration-based innovation, and lifelong learning, university libraries can play a major role in creating resilient and inclusive research ecosystems.

9. CONCLUSION

This paper has critically discussed the changing role of university libraries in assisting research and innovation in the modern higher education systems. In the context of universities moving their missions to focus on knowledge creation and innovation, and societal impact, libraries have progressed beyond the traditional role of custodians to be strategic partners in the research venture. It is shown in the review that modern university libraries are thoroughly integrated throughout the research lifecycle in supporting access to scholarly resources, research skill development, data handling and management, scholarly communication, and research impact.

In principle, the paper puts the emphasis on libraries as important knowledge intermediaries in research and innovation environments. Libraries increase the principles of innovation-based inquiry by narrowing the information asymmetry divide, improving the efficiency of research, facilitating interdisciplinary research, and encouraging open and reproducible research strategies. Their increasing activities in the digital scholarship, open science projects as well as applied-research further justifies their relevance in the transfer of academic knowledge into social and economic benefits.

Concurrently, the paper also outlines some key issues that limit the performance of university libraries, such as the rising cost of academic materials, the swift technological innovation, the lapse of skills, the infrastructure restraint, and the lack of appreciation of librarians as research partners. Unaddressed, these challenges threaten to diminish the ability of libraries to contribute to the institutional research and innovation objectives to the fullest.

Future directions and policy implications are analyzed by focusing on the importance of the strategic alignment between libraries and institutional research agendas, continued investment in digital infrastructure and data services, increased cooperation with internal and external stakeholders, and evidence-based systematic evaluation of library impact. The acknowledgment of libraries as a part of national policies of research and innovation is equally important, especially in the framework of open science and digital transformation as well as capacity building.

To sum up, university libraries cease to be marginal support units but active players in the institution that determines the quality, direction and influence research and innovation. It is important to make them stronger by adopting enabling policies, institutional integration, and sustainable and ongoing professional growth to create sustainable, inclusive, and globally competitive research ecosystems. With more challenges facing the higher education systems,

the existence of the empowered and strategically placed university libraries will always be necessary to the development of knowledge and innovation.

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