

Christopher Nkiko

Elizade University

e-mail: ul@elizadeuniversity.edu.ng

ORCID: 0000-0001-9993-9090

Omorodion Okuonghae

Samuel Adegboyega University. University Library

e-mail: okuonghaeo@yahoo.com

ORCID: 0000-0002-6552-8127



Achieving the 4IR University Library in Sub-Saharan Africa: Trends, Opportunities, and Challenges

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Christopher Nkiko is the University Librarian of Elizade University, Ilara-Mokin, Ondo State, Nigeria. He holds B.Sc. in Political Science from the University of Benin, M.Sc. in Political Science, MLS and PhD. in Library and Information Science from the University of Ibadan. Christopher has published extensively in numerous reputable local and international outlets in the field of Library and Information Science. He is a recipient of numerous awards, including the Covenant University 2014/2015 awards and of recognition for an effective archival system and a valid contribution to scholarship at the university. Christopher is a member of different professional groups including the Chartered Institutes of Library and Information Professionals (CILIP) UK and the Nigerian Library Association (further: NLA).

Omorodion Okuonghae is the Head of E-library Services at Samuel Adegboyega University, Ogwa, Edo State, Nigeria. He has Bachelors and Masters Degrees in Library and Information Science from Delta State University, Abraka, Nigeria. He has published numerous scholarly publications in reputable local and international outlets in the field of Library and information science. He has also presented papers at many local and national conferences. Omorodion has received several awards and recognitions including the 'Best Paper Presenter' award at the 57th Conference and Annual General Meeting of the Nigerian Library Association, and the overall best graduating student recognition in the Department of Library and Information Science, Delta State University, Abraka, Nigeria. Omorodion is highly passionate about Librarianship, Emerging Technologies in Library, Information Literacy, and Scholarly Communication. He is a member of NLA.

Keywords: Library Trends; University Library; Artificial Intelligence; Research Data Management; Open Scholarly communication

Abstract. **Aim:** The paper examined the university library in the Fourth Industrial Revolution (4IR) and the preconditions for achieving and sustaining the same in Nigeria. 4IR is characterized by a level of automation, deployment of emerging technologies and artificial intelligence, internet connectivity and accessibility to the global information network, subscription to reputable online databases, quality and comprehensive collection in diverse formats, preponderance of digital natives among patrons, increased demand for seamless access to online resources and virtual operations, new library spaces (learning commons, research commons and makerspace), open scholarly communication, research data management, social mediation applications, digital curation and preservation. The challenges militating against effective crystallization of 4IR university libraries include: financial constraints, inadequate infrastructure, resistance to change, inadequate skills and competencies, security and intrusion issues, lack of exposure to international standards.

Conclusions: The paper recommended the following as requisite panacea: leadership, demonstrating and justifying returns on investment, benchmarking practices, anti-intrusion and back-up systems, adequate power supply and bandwidth, endowment and corporate social responsibility, indigenous library management software, and capacity building initiatives.

Introduction

The library is the heart and life-line of any citadel of learning. The quality of scholarship is predicated on the robustness, availability, and utilization of library resources. A robust university library is central to birthing astute graduates and ensuring global competitiveness in scholarship and research. Libraries represent man's most successful attempt at democratizing knowledge; hence, it is said "any people that is starved with knowledge will suffer intellectual malnutrition, stagnation and atrophy". The latent potential/possibility is such that the perspective and culture of a people can be altered by the activities of libraries.

The moment we persuade the students to cross the threshold into a library, we have changed their lives forever, and for the better¹. It is the realization of the foregoing that made Sheldon (2013) opine that libraries store the energy that fuels the imagination and they open up windows to the world and inspire us to explore and achieve, thus contributing to improving the quality of our lives². Dewane (2010) noted that libraries are invaluable resources for individuals committed to advancement through self-education³. It was the recognition of this incontrovertible fact that prompted Andrew Carnegie to invest massively in library development across the globe. Carnegie described the library as providing access to "the precious treasures

¹ B. Obama, *Quotable Quote*, [in:] *GoodReads* [online], [available 18 V 2021]. Available on the World Wide Web: <https://goodreads.com/quotes/200568-at-the-moment-that-we-persuade-a-child-any-child>.

² S. Sheldon, *Quotable Quote*, [in:] *GoodReads* [online], [available 18 V 2021]. Available on the World Wide Web: <https://www.goodreads.com/quotes/339370-libraries-store-the-energy-that-fuels-the-imagination-they-open>.

³ D. Dewane, *Libraries Across Africa: Information Access for the Largest Number, at the least cost. A plan Action for social Innovation submitted to Grain further support from the Evoke Network and The world Bank Institute*, [in:] *GlobalGiving* [online], [available 18 V 2021]. Available on the World Wide Web: <https://www.globalgiving.org/pfil/5993/projdoc.pdf>.

of knowledge and imagination through which youth may ascend” as well as alluding to it as foundational in his rise out of poverty⁴. The extent to which people will be creative, informed, knowledgeable, and instrumental to national development “will be determined by the availability and the content of the library services in their immediate locality”⁵.

Professor Toye (1985), a one-time Vice-Chancellor of the University of Ilorin, once remarked, “if we have no laboratories and we lack the funds to recruit lecturers, the enterprise of teaching and learning in universities could continue if we had a well-stocked and up-to-date library”⁶. This is not to make light of the usefulness of the other arms of the university system, but to underscore the utility and omnibus nature of the university library. It was when the Nigerian universities started playing semantics and paying lip service to library development that mediocrity and “banking education” became the order of the day leading to the emergence of unemployable graduates. It is gratifying, however, to note that the introduction of the Tertiary Education Trust Fund (TETFUND) is revitalizing the lost glory. Modern ICT-driven (ITC – information and communication technologies) and well-stocked libraries with adequate space and conduciveness are a non-negotiable imperative for outstanding teaching, learning, and research.

The National Universities Commission understands the indispensability of a university library to quality education and thus places high premium on its adequacy in content and requisite facilities as well as the conduciveness of the general ambience. The criteria for the evaluation or accreditation of programs in the Nigerian universities revolve around the following parameters: staffing (32%), academic content (18%), physical facilities (27%), library (18%), funding (3%), and employer’s rating (2%). For a full accreditation status, a program is required to score 70% and above in the library component⁷. University libraries are, therefore, pivotal to learning and research. The university library ensures that the entire university community has unfettered access to comprehensive and current learning resources in various formats.

The quality of a university library should be measured on the basis of how well it contributes to the achievement of “the vision, mission and values of the university, in developing and supporting information literate learners to discover, access and use information effectively for academic success and lifelong learning”⁸.

Momodu (2015), citing Oyegunle (2013), posited that university libraries exist primarily to support the mission of their parent institutions by generating knowledge and empowering the patrons with such a knowledge in order to serve the society

⁴ T. Augst, Thomas, *American libraries and Agencies of Culture*, [in:] *The libraries as Agencies of culture*, ed. T. Augst and W. Wilgand, Madison 2001, p. 5.

⁵ C. Nkiko, *Running and Maintaining an ICT-Based library in a Developing Economy: The Covenant University Experience*, *Journal of Library and Information Science*, vol. 6: 2008, no. 2, pp. 22-34.

⁶ R. Olorunsola, *Library Development In a Private University: The First Seven Years*, [in:] *Change and Choice: The Development of Private Universities in Nigeria*, ed. A. U. Osagie, Benin City 2009.

⁷ National University Commission, *Manual of Accreditation procedures for Academic programmes in Nigerian Universities* [online], 2012, [available 18 V 2021]. Available on the World Wide Web: <https://docplayer.net/17891671-Manual-for-accreditation-procedures-of-academic-programmes-in-nigerian-universities-map.html>.

⁸ Commission for Higher Education, *Standards and Guidelines for University libraries in Kenya* [online], 2012, [available 17 V 2021]. Available on the World Wide Web: <https://dokumen.tips/documents/standards-and-guidelines-for-university-libraries-in-kenya-standards-and-guidelines.html>.

and advance the wellbeing of mankind⁹. It serves complementary purposes of supporting the curriculum of the university and the research of its faculty and students. Libraries are not only repositories of knowledge but also dispensers of such a knowledge. A robust university library provides a platform to concretize issues raised in the lecture rooms resulting in the development of the virtue of self-enquiry, exploration, and experimentation. It provides a mechanism that facilitates the flow of information from its sources to any point where it can be utilized. The virtual library component mitigates the challenge of the digital divide, thus providing equitable access to the global information network for outstanding scholarship irrespective of the geographical location and the socio-economic status. World-class university library facilitates the attraction and retention of international scholars and students as they are assured of availability of comparable metropolitan learning ambience for effective scholarship.

The Fourth Industrial Revolution (4IR) era is characterized by digital revolution, knowledge-economy, heightened globalization, internationalization of higher education, information explosion, and emerging labor markets. This era has revolutionized all professions, institutions, operations, cultures. "Digital technologies are now regarded as critical catalyst for improving, supporting, extending teaching and creative learning in higher education across the globe"¹⁰. The resultant new digital modes of teaching and learning have given birth to a blended classroom model. This is a combination of learning in the form of watching video lectures, listening to podcasts, perusing enhanced e-book contents, online collaboration with peers, and face-to-face classroom lectures. The 4IR and its ever evolving intricacies and environment have altered the landscape of the university system including the university library.

The 4IR university library is a hybrid library that brings together the best of the physical and the digital to create learning hubs. Some of the distinctive features include: preponderance of digital natives among patrons, increased demand for seamless access to online resources, virtual operations, e-library services, online scholarly communication, mobile technologies, social mediation application, digital curation and preservation¹¹.

In view of the pervasiveness of technology, the limitless scope of the Internet and World Wide Web for retrieving information for researchers who hitherto relied on the traditional library catalogue, the information seeking behavior of an average person has changed. The usual first point of call for information seekers in the 4IR

⁹ O. Momodu, *Academic Library in Nigeria: Yesterday, Today and Tomorrow*, American Journal of Social Sciences, vol. 3: 2018, no. 4, pp. 115-119.

¹⁰ S. Bell, L. Dempsey, B. Fister, *New Roles for the Road Ahead: Essays commissioned for the ACRL's 75th Anniversary*, [in:] American Library Association [online], 2015, [available 17 V 2021]. Available on the World Wide Web: http://www.ala.org/acrl/sites/ala.org.acrl/files/content/publications/whitepapers/new_roles_75th.pdf; K. Brown, K. Malenfant, Academic library contribution to student success: Document practices form the field, [in:] Association of College and Research Libraries [online], 2015, [available 17 V 2021]. Available on the World Wide Web: http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/value/contributions_report.pdf; L. Johnson, B. S. Adams, V. Estrada, A. Freeman, *NMC Horizon Report: 2015 Higher Education Edition*, Austin 2015; R. M. Mabweazara, *The 21st century Academic Library. The case of three state universities in Zimbabwe*, Unpublished PhD Thesis, University of the Western Cape, Bellville, South Africa [online], [available 17 V 2021]. Available on the World Wide Web: <https://etd.uwc.ac.za/handle/11394/6466>.

¹¹ M. Regalado, M. A. Smale, "I Am More Productive in the Library Because It's Quiet": *Commuter Students in the College Library*, *College & Research Libraries*, vol. 76: 2015, no. 7, pp. 899-913.

is the Internet¹². The perceived threat of the Internet to the physical library and the heightened demand for meeting the expectations of the digital natives (ICT-savvy clientele) who expect services that favorably competes with Google, Amazon, and other retrieval systems necessitate the urgent need to leverage on the trends and opportunities provided by the 4IR university library system.

Current Trends and Opportunities

It would amount to backwardness, obsolescence, and stagnation for any university library not to be in a haste to mainstream to current trends and opportunities fostered by the dynamic forces of emerging technologies and other compelling characteristics of the 4IR. The discussion of current trends and opportunities includes the following:

Artificial Intelligence and Robotics

The 4IR university is witnessing a tremendous deployment of Artificial Intelligence (AI) technologies to facilitate an extensive and wide variety of services and resources to meet the need of service excellence and user satisfaction of the sophisticated library patrons of the century. The adoption of artificial intelligence applications helps the university library to mitigate threats of other retrieval systems and provide services that surpass that of Google search. Liu (2010) provided an almost exhaustive literature review on the utilization of AI and robotics to enhance the quality of services in the university library. The activities include automated indexing and abstracting, expert system reference services, cataloging, and classification. The libraries now have automated storage and retrieval systems, autonomous shelf reading robots, telepresence and humanoid robots, Chatbots and voice activated systems. Different robots are deployed for internal operations as well as public services¹³. The new Chatbot technology is increasingly allowing automated conversations between library patrons and a machine. This helps to move the desired materials at a very fast speed, navigate through the vast library digital and physical holdings with ease. This allows for extended opening hours of both in-person and online services. There is also the speech-to-text-to-speech service. A library patron explains to the robot their information need and it uses machine-made indexes to locate potential contents. Then the robot summarizes those contents in seconds, reads the summary, and has the patron determine whether it is relevant for their purpose¹⁴.

¹² K. N. Rao, K. Babu, *Role of Librarian in Internet and World Wide Web Environment*, Information Science, vol. 4: 2001, no. 1, pp. 24-28; S. Coffman, *The Decline and Fall of the Library Empire*, Searcher [online], vol. 20: 2012, no. 3, [available 17 V 2021]. Available on the World Wide Web: <https://www.infoday.com/searcher/apr12/Coffman--The-Divine-and-Fall-of-the-Library-Empire.shtml>; C. Nkiko, *Catalogue 2.0 and Resources Description & Access (RDA)*, [in:] *Paper presented at NCA Information Technology Section Workshop, October 7-11, 2013*, 2013, p. 11.

¹³ *Call for Papers — Satellite Meetings. Information Technology Section*, [w:] IFLA [online], [available 18 V 2021]. Available on the World Wide Web: <https://2019.ifa.org/cfp-calls/information-technology-section/>.

¹⁴ A. S. Brede, *7 Ways AI will change University libraries*, [in:] *LinkedIn* [online], 2018, [available 17 V 2021]. Available on the World Wide Web: <https://www.linkedin.com/pulse/7-ways-ai-change-university-libraries-anita-schj%C3%B8ll-brede>.

New Library Spaces

The libraries in the 4IR provide a welcoming, conducive, secure, serene, aesthetic, common space that is technologically enabled and engenders inspiration, reflection, creativity, innovation as well as exchange of ideas. The modern libraries are expected to reconfigure their physical spaces to suit current realities of fostering learning, sharing, communication, and collaboration. The new library spaces must include: learning commons, research commons, and makerspaces. Learning common is a departure from the silent and individual learning arrangement toward the inclusion of supportive and communal environment that allows for a group study by like-minded persons, dealing with similar issues and related problems¹⁵. Research common is dedicated to postgraduate students and researchers. The space consists of technological resources, seminar rooms, teleconferencing facilities, areas for discussion and relaxation as well as those offering services which directly support research endeavors¹⁶. Makerspace is a physical location where people gather to share resources, knowledge, work on projects, access materials and tools, network and build. It is an open environment for the expression of creativity and innovations¹⁷. It provides a platform for hands-on interactivity, training, teamwork, incubation of ideas, and mentoring leading to skills acquisition, and product development.

Robust Hybrid Library Collection

The 4IR university library at the moment is predominantly hybrid, integrating the traditional and the digital as one; there is no awareness of any absolutely digital university library in existence across the globe¹⁸. The global best practice for collection development is providing a broad range of contents in formats accessible to the broadest possible spectrum of end users¹⁹. It is principally the responsibility of the university library in consultation with respective academic departments to ensure balanced and robust collection development based on predetermined policies. Content is king; hence, the value of the university library is measured by the quality, diversity, and size of its collection. It is imperative, therefore, that the library provides to all academic programs varied, authoritative, up-to-date, and excellent scholarly materials to support the university's overall goals of delivering high quality education. Libraries as gateways to knowledge now subscribe to electronic databases containing a plethora of electronic books and journals as well as facilitating

¹⁵ R. Applegate, *The library is for studying: student preferences for study space*, *The Journal of Academic Librarianship*, vol. 35: 2005, no. 4, pp. 341-346; R. Houlihan, *The Academic library as congenial space: more on the saint Mary's Experience*, *New Library World*, vol. 100: 2005, no. 1-2, pp. 7-15.

¹⁶ A. Balci, *The changing context of Educational Administration and its effects on Educational Administration of Postgraduate Programmes*, *Education and Science*, vol. 36: 2011, no. 162, pp. 196-208; R. M. Mabweazara, op. cit.

¹⁷ Y. Noh, *A study on creating and managing makerspaces in libraries*, *Korean Society for Information Management*, vol. 31: 2014, no. 1, pp. 53-76; M. Lotts, *Implementing a Culture of Creativity: Pop-up Making Spaces and Participating Events in Academic Libraries*, *College & Research Libraries News*, vol. 76: 2015, no. 2, pp. 72-75.

¹⁸ C. Oppenheim, D. Smithson, *What Is the Hybrid Library?*, *Journal of Information Science*, vol. 25: 1999, no. 2, pp. 97-112.

¹⁹ *Guidelines for Media Resources in Academic libraries*, [in:] *American Library Association* [online], 2018, [available 17 V 2021]. Available on the World Wide Web: <http://www.ala.org/acrl/standards/mediaresources>.

access to the global information networks and curated information resources such as videos, case studies, company profiles, magazines, thesauri, and so on.

Virtual Operations and Full Automation

Bibliographic records of the University Library holdings are held in a digitized format and made accessible through remote login from anywhere and anytime in the world. This is made possible due to automation using web-based library management software, thus providing the most robust virtual library platform. The Web Online Public Access Catalogue now replaces the traditional card catalogue. The availability of WebPAC is a distinguishing feature of modern libraries. "It is about remote login to the library catalogue on the cyberspace through a Uniform Resource Locator" (URL). It helps in guaranteeing borderless library services. Virtual library provides access to databases containing electronic books, journals, theses, dissertations, alert services, electronic document delivery, online transactions such as renewal of loans, reserving items, booking rooms and equipment, online chat services and online tutorials.

Corollary to virtual operations is the issue of full automation of library routines and processes. The installation of automatic doors, Telelift to deliver books to several floors, biometric systems, provision of self-service machines with RFID functionality, electronic security gates, CCTV, automated bindery system, the use of scanners and beacon application as well as automatic book sorters.

Research Data Management

Tenopir (2014) posited that RDM involves data storage of full dataset files, for example, the Andrew File System (AFS) storage system, or backups containing snapshots of the actual dataset file, like the Time Machine software on a Mac laptop²⁰. "It involves preserving and keeping sensitive data secure as well as scanning research data recorded on paper to be kept in digital formats. All raw data in the collection are curated to increase access and are assigned object identifier or DOI"²¹. Different institutional policies must provide necessary guidelines for data sharing and reuse as well as requirements for removal.

Open Scholarly Communication

The United Nations Educational, Scientific and Cultural Organization (UNESCO) (2015) conceptualizes "open scholarly communication as a process of sharing, disseminating and publishing research findings conducted by researchers for its free availability to the global communities". It is the responsibility of a university library in the 4IR to ensure global visibility and unhindered access to its institutional

²⁰ C. Tenopir, D. King, *Perceptions of Value and Value Beyond Perceptions: Measuring the Quality and Value of Journal Article Readings, the Quality and Value of Journal Article Readings*, *Serials. The Journal for the Serials Community*, vol. 20: 2007, no. 3, pp. 199-207.

²¹ R. M. Mabwezara, op. cit.

intellectual productivity and all scholarly outputs. The libraries advance this objective through institutional repositories, Open Educational Resources (OER), and influencing faculty members to publish in reputable Open Access outlets.

Bibliometrics

This relates to understanding and evaluating the patterns, impact, relevance, influence direction, utility of research outputs. Global ranking of universities has become a major factor in the 4IR higher education with its consequences for the reputation and profile of universities. One of the major parameters is volume of research output and citations. The Times Higher Education (THE) relies on metrics provided by the Scopus database. It is expected that the university library would be at the vanguard of educating scholars on reputable outlets recognized and indexed in Scopus for their scholarly publishing. The issues of impact factor, citation index, visibility on social web platforms such as Google Scholar, Mendeley, ResearchGate, Zotero, Academia edu, Almetrics, etc., should be thoroughly understood by all academic staff through the intervention of the university library.

One cannot pretend to have carried out an exhaustive discussion of trends and opportunities of the university library in the 4IR as practices are evolving and technological development remains dynamic and volatile. However, other issues worthy of mention are: Internet of Things (IOT) in libraries, cloud computing, semantic web and library services, mobile library services with web 3.0 and 4.0, etc. However, it may be necessary at this juncture to highlight some challenges that need to be surmounted for achieving and sustaining the university library of the 4IR.

Challenges

There are so many challenges facing university libraries in the 4IR. These challenges range from inadequate funding or financial constraints, staff resistance to change, inadequate digital literacy skills, to the lack of an adequate infrastructure. However, for the purpose of this study, the following challenges were examined:

Financial constraints:

Adequate funding is considered a fundamental necessity for a robust and effective University library. Abubakar (2011) bemoaned the gross under-funding of the federal and state universities despite TETFund intervention scheme as well as clear statutory policies in this regard²². Zaid (2008) observed that in most private universities, funding is at the whims and caprices of the proprietor and that most of the allocations are haphazard and inadequate. Most university libraries in Sub-Saharan Africa only run for window-dressing effects during accreditation. The issue of inadequate funding is exacerbated by the fact that a majority of library equipment

²² B. M. Abubakar, *Academic libraries in Nigeria in the 21st century*, Library Philosophy and Practice [online], 2011, [available 17 V 2021]. Available on the World Wide Web: <https://digitalcommons.unl.edu/libphilprac/446/>.

and materials are imported and subjected to the vagaries of high exchange rates and difficulty in obtaining requisite foreign currency for the required transactions²³.

Inadequate Infrastructure:

Uninterrupted power supply is a basic requirement for an effective ICT-based library system. Chukwusa (2015) noted that most universities indulge in self generation since the capacity for generation, transmission, and distribution has been defective. Insufficient ICT infrastructure is also a major constraint. The low bandwidth level, poor network systems, unavailability of requisite hardware and software are among the infrastructure which is not adequately provided in the library. Ubabukoh (2017) observed that a poor infrastructure is the bane of Information and Communication Technology development in Sub-Saharan Africa. Quality digital library services thrive on the basis of standard and adequate infrastructure²⁴.

Resistance to Change, Inadequate Skills and Competencies

There has been an increasingly positive attitude toward the adoption of emerging technologies in the university libraries in Sub-Saharan Africa; however, some librarians and top policymakers in the university system still show aversion and anxiety toward adapting to a digital environment. It appears librarians are digital immigrants lacking the necessary skills and competencies to meet the dynamic and new demands of the predominantly digitally native clientele. The overreliance on personnel outside of the library with little or no orientation in library services and practices to provide the required technical expertise on the ICT needs of the system may not be as responsive and effective. There is also the issue of reliance on foreign Library Management Software with attendant high cost and open source applications for the automation purposes.

Security and Intrusion

The library server and databases are akin to a databank where vital and sensitive information and documents are stored and retrieved. The need to strengthen security and safeguard the contents is critical. Intrusion is usually orchestrated by hackers to compromise or endanger the confidentiality and integrity of the vital data stored or processed by the server as well as on occasion to deny service. Intruders can be external or internal. The routine back-up of digital operations if not properly done could constitute a challenge in the event of loss of data, their damage or corruption.

²³ Y. Zaid, *A study of Internally Generated Revenue (IGR) by University libraries in Nigeria*, Borno Library, Archival and Information Science Journal, vol. 7: 2008, no. 1, pp. 1-14.

²⁴ O. Ubabukoh, *Poor infrastructure, bane of ICT growth, say experts*, Punch [online], 2017 January 9, [available 17 V 2021]. Available on the World Wide Web: <https://punchng.com/poor-infrastructure-bane-ict-growth-say-experts/>.

Lack of Exposure to International Standards

Many librarians have not been able to attend conferences outside the country and sometimes lack practical exposure to international standards and experience. They only rely on the Internet to learn about some emerging technologies and current practices.

The Way Forward

Having x-rayed some challenges, the question arises, what is the way forward to achieving and sustaining the university library of the 4IR? Some of the critical enabling factors include the following:

Leadership

The nexus between leadership and any form of advancement is undeniable and incontrovertible. Positive attitude of leaders and competencies that are indispensable in achieving the laudable objective in the 4IR university library are fundamental imperatives. The top leadership of university education must be the major driver of the envisioned library system. It has been validated by several studies that when leaders are enthusiastic and visionary about ICT, all other members of the organization would naturally accept the philosophy thereby giving rise to its successful adoption and implementation

“The library leadership must be strategic thinkers, an effective communicator, having enough political clout and good tactical sense to persuade the relevant stakeholders on the need for specific technologies in the library. It may be appropriate to develop a phase by phase strategic document detailing roadmap of ICT adoption in the library, noting that the parent institution have scarce financial resources with alternative uses”²⁵.

Demonstrating and Justifying Returns on Investment

University libraries are constantly expected to demonstrate to their institutional administrators and council, concrete benefits from a huge investment in the state-of-the-art facilities. It should be observed that benefits of the investment in the libraries cannot only be measured in the narrow economic perspective of monetary gains. However, it is recommended that libraries devise strategies to assess and measure their value and/or contributions to the organizational goals. This can be measured through: usage logs, vendors' reports, survey to measure the purpose and value of use, perceived value through surveys or interviews. The bottom line is that libraries should regularly articulate their concrete contributions to the overall mission and objectives of the parent institutions to justify or warrant continued investment.

²⁵ C. Nkiko, *Managing ICT-Driven libraries in Nigeria: Critical Leadership Issues*, [w:] *Library Automation*, ed. B Ghante, A. Yakkaldevi, Laxmi 2014, p. 120.

Benchmarking Practices

Benchmarking exercises are premised on the inquisitiveness of what other reputable libraries are doing with a view to measuring the performance and mapping out future strategic pathways. Crawford (2001) noted that the ability to network with and learn from the experiences of other institutions that have shown leadership in the deployment of ICT is among the many benefits of being a part of the global community. University libraries must avoid any form of isolation and periodically engage in study visits of other libraries with a view to comparing their facilities, infrastructure, processes, practices, and policies²⁶.

Anti-Intrusion and Back-up Systems:

Library Management in a digital environment should be concerned with the issue of intrusion and put in place necessary anti-intrusion arrangements. There is a need to engage the services of Network Security Engineers to provide necessary firewalls, authentication, encryptions, software deployments, and secure socket layers to protect the library network and servers from attacks and abuses. Daily transactions or operations are usually backed up on a tape drive, cloud or other storage mechanisms. Each back-up file is dated and in the event of loss of data, their corruption or damage, the most current is used for their restoration. Back-up as a device for disaster preparedness should be done in such a way that the back-up data are kept in different locations to mitigate possible force majeure. In this instance, cloud back-up system is most preferred because the servers are kept in different locations.

The organizations with a robust network system may also consider the adoption of Enterprise Storage Server. This is an online server solution for data storage for multiple user departments in a centralized platform. The back-up solution will be individual and private to different units. The advantage of this is that data could be mirrored to a redundant server in another location thereby providing dual back-up system. The issue of back-up and anti-intrusion is so critical to the survival of the library digital platform that it must not be left to the whims and caprices of the System Librarian. The highest level of the University Library Management must provide necessary oversight function in this regard²⁷.

Adequate Power Supply and Bandwidth:

Uninterrupted power supply and sufficiency of bandwidth represent non-negotiable infrastructural imperatives for effective ICT-based library system. ICT devices, gadgets, and databases will be mere decorations in the library if the power supply is irregular coupled with slow Internet speed arising from inadequate bandwidth

²⁶ M. Crawford, *King John's Christmas: Developing Leadership Communities On-Line*, [in:] Paper presented at the Annual meeting of the *American Educational Research Association (AERA)*. Seattle, WA, April 10-14, 2001 [online], pp. 17-25, [available 17 V 2021]. Available on the World Wide Web: <https://files.eric.ed.gov/fulltext/ED453213.pdf>.

²⁷ C. Nkiko, *Managing ICT-Driven...*

levels. Engaging parent institutions in increased budgetary allocation, leveraging on endowments, corporate social responsibilities, deployment of alternative sources of energy, formation of consortia constitute likely solutions to the issue of power and bandwidth inadequacies.

Endowment and Corporate Social Responsibility

Robust funding is a critical factor in building a sustainable university library that compares favorably with the best ones. There is a need to look for alternative sources of funding. Endowment is considered a credible option. It is associated with the institution's income derived from donations and gifts. It is also regarded as money accumulated by a university in a permanent fund that is invested to produce income to help meet institutional expenses. It could take the form of restricted endowment in which the donor specifically ties the giving to specific projects. The unrestricted type allows the recipient institution to utilize it for whatever project it deems fit. There is a need to identify and leverage on institutional network and goodwill to attract donors. Many world class universities thrive on their endowment profile.

University partnership with a host of corporate sponsors provides a great avenue for realizing intended outcomes and sustainability as well as mutual benefits. This helps to augment proprietors' funding efforts and mitigate financial constraints in achieving envisioned projects.

Indigenous Library Management Software:

Library automation in Sub-Saharan Africa relies heavily on foreign Library Management Software either proprietary or open source. The former is off the shelf but most times very expensive as a result of foreign exchange rate intricacies. An indigenous Library Management Software that is of international standards and web-based would be more desirable and affordable. This is a challenge for indigenous programmers and software engineers to collaborate with librarians for investment in the manufacturing of credible local alternatives.

Aggregators of Electronic Resources and Indemnity against Infringement of Copyright:

In the acquisition of electronic books and journals, the University Librarian is usually under pressure to sign lopsided license Agreements. Those agreements presume that aggregators have obtained necessary permissions and authorizations from copyright holders. However, in the event of litigation for violation of copyrights, the aggregator and the library would be held jointly liable as ignorance or presumption would not be tenable. It is, therefore, essential that libraries strive to include a clause in the license Agreement which indemnifies the library and the

parent institution against any financial loss arising from undisclosed facts leading to infringement of copyright²⁸.

Capacity Building Initiatives:

University Library Management should continue to envision and entrench policies that help to maximize ICT capacity of librarians for organizational effectiveness and sustainability. Strategic thinking requires provision of opportunities for library personnel to master and deepen their skills in some computer competencies such as troubleshooting of hardware and software, web design/management and content development, programming, retrospective conversion, data migration, etc. The tendency for a high turnover of ICT-trained librarians is most probable. The university library should, therefore, take steps to protect such a huge investment on human capital development through bonds, incentives, and diversification of skills and training.

Conclusion

The university library in the 4IR is a hybrid library that brings together the best of the physical and digital to create learning hubs. It is characterized by the level of automation, deployment of emerging technologies and artificial intelligence, internet connectivity, and accessibility to the global information network, subscription to reputable online databases, quality and comprehensive collection in diverse formats, preponderance of digital natives among patrons, increased demand for seamless access to online resources and virtual operations, new library spaces (learning commons, research commons, and makerspace), open scholarly communication, social mediation applications, digitalization and curation. The challenges militating against the achievement of this are surmountable. It was Nelson Mandela that said “the problem with Africa is not aiming very high and not meeting the target but not aiming at all and taking appropriate steps”. Where there is a will, there will always be a way. University proprietors must demonstrate a palpable will to galvanize articulated strategies and attract requisite donors to achieve and sustain the university library in the 4IR in our various institutions.

References

- Abubakar, Bappah Magaji. 2011. “Academic libraries in Nigeria in the 21st century.” *Library Philosophy and Practice*. <https://digitalcommons.unl.edu/libphilprac/446/>.
- ALA. 2018. “Guidelines for Media Resources in Academic libraries.” American Library Association, Accessed May 17, 2021. <http://www.ala.org/acrl/standards/mediaresources>.

²⁸ C. Nkiko, *Managing ICT-Driven...*

- Applegate, Rachel. 2005. "The library is for studying: student preferences for study space". *The Journal of Academic Librarianship* 35(4): 341-346. <https://doi.org/10.1016/j.acalib.2009.04.004>.
- Augst, Thomas. 2001. "American libraries and Agencies of Culture." In *The libraries as Agencies of culture*, edited by T. Augst and W. Wilgand, 5. Madison: The University of Wisconsin Press.
- Balci, Ali. 2011. "The changing context of Educational Administration and its effects on Educational Administration of Postgraduate Programmes." *Education and Science* 36(162): 196-208.
- Bell, Steven, and Lorcan Dempsey, Barbara Fister. 2015. "New Roles for the Road Ahead: Essays commissioned for the ACRL's 75th Anniversary." American Library Association, Accessed May 17, 2021. http://www.ala.org/acrl/sites/ala.org.acrl/files/content/publications/whitepapers/new_roles_75th.pdf.
- Brede, Anita Schjøll. 2018. "7 Ways AI will change University libraries." LinkedIn, December 12, 2018. <https://www.linkedin.com/pulse/7-ways-ai-change-university-libraries-anita-schj%C3%B8ll-brede>.
- Brown, Karen, and Kara Malenfant. 2015. "Academic library contribution to student success: Document practices form the field." Association of College and Research Libraries, January, 2015. http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/value/contributions_report.pdf.
- Brown, M. 2014. "Nigerian University Library: The value of Academic and Research libraries: A confluence of knowledge". Paper presented at *The Committee of University Librarians of Nigerian Universities, University of Lagos, April 7-11, 7-8*.
- Coffman, Steve. 2012. "The Decline and Fall of the Library Expire." *Searcher* 20(3). <https://www.infotoday.com/searcher/apr12/Coffman--The-Dcline-and-Fall-of-the-Library-Empire.shtml>.
- Commission for Higher Education. 2012. "Standards and Guidelines for University libraries in Kenya." Accessed May 17, 2021. <https://dokumen.tips/documents/standards-and-guidelines-for-university-libraries-in-kenya-standards-and-guidelines.html>.
- Crawford, Megan. 2001. "King John's Christmas: Developing Leadership Communities On-Line." Paper presented at the *Annual meeting of the American Educational Research Association (AERA), Seattle, WA, April 10-14, 2001, 17-25*. Accessed May 17, 2021. <https://files.eric.ed.gov/fulltext/ED453213.pdf>.
- Dewane, David. 2010. "Libraries Across Africa: Information Access for the Largest Number, at the least cost. A plan Action for social Innovation submitted to Grain further support from the Evoke Network and The world Bank Institute." GlobalGiving, Accessed May 18, 2021. <https://www.globalgiving.org/pfil/5993/projdoc.pdf>.
- Hair, Adnan Rizal. 2016. "The 21st century library." ResearchGate, Last modified October, 2016. https://www.researchgate.net/publication/328528041_The_21st_Century_Library.

- Houlihan, Ron. 2005. "The Academic library as congenial space: more on the saint Mary's Experience". *New Library World* 100(1-2): 7-15. <https://doi.org/10.1108/03074800510575311>.
- IFLA. 2019. "Call for Papers — Satellite Meetings. Information Technology Section." IFLA, Last modified February 5, 2019. <https://2019.ifla.org/cfp-calls/information-technology-section/>.
- Jain, Priti, and Akakandelwa Akakandelwa. 2016. "Challenges of Twenty-first century Academic libraries in Africa." *Africa Journal of library, Archives and Information Science*, 26(2): 147-155.
- Jennings, Eric. 2013. "The Relevance of Academic Libraries in the Twenty-first century." *College & Undergraduate Libraries* 20(1): 107-116. <https://doi.org/10.1080/10691316.2013.761037>.
- Johnson, L., Becker, S. Adams, V. Estrada, and A. Freeman. 2015. *NMC Horizon Report: 2015 Higher Education Edition*. Austin, Texas: The New Media Consortium.
- Lotts, Megan. 2015. "Implementing a Culture of Creativity: Pop-up Making Spaces and Participating Events in Academic Libraries." *College & Research Libraries News* 76(2): 72–75. <https://doi.org/10.7282/T3D2208V>.
- Mabweazara, Rangarirai Moira. 2018. "The 21st century Academic Library. The case of three state universities in Zimbabwe." Unpublished Ph. D Thesis, University of the Western Cape, Bellville, South Africa. Accessed May 18, 2021. <https://etd.uwc.ac.za/handle/11394/6466>.
- Momodu, O. 2018. "Academic Library in Nigeria: Yesterday, Today and Tomorrow". *American Journal of Social Sciences* 3(4): 115-119.
- National University Commission. 2012. "Manual of Accreditation procedures for Academic programmes in Nigerian Universities." Accessed May 18, 2021. <https://docplayer.net/17891671-Manual-for-accreditation-procedures-of-academic-programmes-in-nigerian-universities-map.html>.
- Nkiko, Christopher. 2008. "Running and Maintaining an ICT-Based library in a Developing Economy: The Covenant University Experience." *Journal of Library and Information Science* 6(2): 22-34.
- Nkiko, Christopher. 2013. "Catalogue 2.0 and Resources Description & Access (RDA)." Paper presented at *NCA Information Technology Section Workshop, October 7-11, 2013*, 11.
- Nkiko, Christopher. 2014. "Managing ICT-Driven libraries in Nigeria: Critical Leadership Issues." In *The library Automation*, edited by P. B. Ghante & A. Yakkaldevi, 113-132. Solapur: Laxmi Book Publication.
- Obama, Barack. 2014. "Quotable Quote." GoodReads, Accessed May 18, 2021. <https://goodreads.com/quotes/200568-at-the-moment-that-we-persuade-a-child-any-child>.
- Omorodion, Okuonghae. 2019. "Creating Makerspaces in Nigerian Libraries: Issues and Challenges." *Indian Journal of Information Sources and Services* 9(2):49-52. <https://www.trp.org.in/index.php/ijiss/article/view/625>.

- Oppenheim, Charles, and Daniel Smithson. 1999. "What Is the Hybrid Library?" *Journal of Information Science* 25(2): 97–112. <https://doi.org/10.1177/016555159902500202>.
- Olorunsola, R. 2009. "Library Development In a Private University: The First Seven Years." In *Change and Choice: The Development of Private Universities in Nigeria*, edited by Anthony U. Osagie, 130-149. Benin City: Rawel Fortune Resources.
- Rao K. Nageswara, and Kh Babu. 2001. "Role of Librarian in Internet and World Wide Web Environment." *Information Science* 4(1): 24-28. <https://doi.org/10.28945/554>.
- Regalado, Mariana, and Maura A. Smale. 2015. "I Am More Productive in the Library Because It's Quiet": Commuter Students in the College Library." *College & Research Libraries* 76(7): 899-913. <https://doi.org/10.5860/crl.76.7.899>.
- Roemer, Robin Chin, and Rachel Borchardt. 2015. "Major Altmetrics Tools." *Library Technology Reports* 5(5): 11-19. <https://doi.org/10.5860/ltr.51n5>.
- Sheldon, Sidney. 2013. "Quotable Quote." GoodReads, Accessed May 18, 2021. <https://www.goodreads.com/quotes/339370-libraries-store-the-energy-that-fuels-the-imagination-they-open>.
- Singh, Jagtar, and Trishanjit Kaur. 2009. "Future of Academic libraries in India: challenges and opportunities." A paper presented at the International Conference on Academic libraries (ICAL) held at the University of Delhi, India, 52. Accessed May 18, 2021. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.476.3241&rep=rep1&type=pdf>.
- Tenopir, Carol, and Donald King. 2007. "Perceptions of Value and Value Beyond Perceptions: Measuring the Quality and Value of Journal Article Readings. the Quality and Value of Journal Article Readings." *Serials. The Journal for the Serials Community* 20(3): 199-207. <https://doi.org/10.1629/20199>.
- Ubabukoh, Ozioma. 2017. "Poor infrastructure, bane of ICT growth, say experts." Punch, January 9, 2017. <https://punchng.com/poor-infrastructure-bane-ict-growth-say-experts/>.
- Zaid, Yetunde. 2008. "A study of Internally Generated Revenue (IGR) by University libraries in Nigeria." *Borno Library, Archival and Information Science Journal* 7(1): 1-14.
- 노영희[Noh, Younghee]. 2014. "도서관 무한창조공간 구축 및 운영모형 제안에 관한 연구. [A study on creating and managing makerspaces in libraries]" *정보관리학회지[Korean Society for Information Management]* 31(1): 53-76. <https://doi.org/10.3743/KOSIM.2014.31.1.053>.

Christopher Nkiko

Uniwersytet Elizade

e-mail: Christoper.nkiko@elizadeuniversity.edu.ng

ORCID: 0000-0001-9993-9090

Omorodion Okuonghae

Uniwersytet Samuela Adegboyega. Biblioteka Uniwersytecka

e-mail: okuonghaeo@yahoo.com

ORCID: 0000-0002-6552-8127

Realizacja czwartej rewolucji przemysłowej w bibliotece uniwersyteckiej w Afryce Subsaharyjskiej: trendy, szanse i wyzwania

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Zaakceptowany: 31 VIII 2021

Christopher Nkiko jest uniwersyteckim bibliotekarzem na Uniwersytecie Elizade w Ilara-Mokin w stanie Ondo w Nigerii. Posiada tytuł licencjata nauk politycznych Uniwersytetu w Beninie, magistra nauk politycznych, a także magistra i doktora bibliotekoznawstwa i informacji naukowej Uniwersytetu w Ibadan. Christopher publikował w licznych renomowanych krajowych i międzynarodowych wydawnictwach w dziedzinie bibliotekoznawstwa i informacji naukowej. Jest laureatem licznych nagród, w tym nagrody Uniwersytetu Przymierza (Covenant University, Nigeria) w roku 2014/2015 za skuteczny system archiwizacji i ważny wkład w naukowość na uczelni. Christopher jest członkiem różnych grup zawodowych, w tym Instytutów Dyplomowanych Profesjonalistów ds. Biblioteki i Informacji Wielkiej Brytanii oraz Nigeryjskiego Stowarzyszenia Bibliotek (dalej: NSB).

Omorodion Okuonghae jest kierownikiem działu usług e-bibliotecznych na Uniwersytecie Samuela Adegboyega w Ogwa w stanie Edo w Nigerii. Posiada licencjat i magisterium z bibliotekoznawstwa i informacji naukowej Uniwersytetu Stanowego Delta w Abraka w Nigerii (dalej: USDA). Jest autorem licznych naukowych publikacji w renomowanych lokalnych i międzynarodowych wydawnictwach z zakresu bibliotekoznawstwa i informacji naukowej. Wygłaszał referaty na wielu lokalnych i krajowych konferencjach. Omorodion otrzymał kilka nagród i wyróżnień, w tym nagrodę „Najlepszy Referent” na 57. Konferencji i Dorocznym Walnym Zgromadzeniu SBN oraz wyróżnienie dla najlepszego absolwenta Instytutu Bibliotekoznawstwa i Informacji naukowej USDA. Omorodion bardzo pasjonuje się bibliotekarstwem, nowymi technologiami w bibliotekach, wiedzą z zakresu informacji i komunikacji naukowej. Jest członkiem NSB.

S

Słowa kluczowe: trendy biblioteczne; biblioteka uniwersytecka; sztuczna inteligencja; zarządzanie danymi badawczymi; otwarta komunikacja naukowa

S

Streszczenie. Cel: W artykule podano badaniu uniwersytecką bibliotekę w czasie czwartej rewolucji przemysłowej (dalej: CRP) oraz warunki wdrożenia i utrzymania takiego rozwiązania w Nigerii. CRP jest charakteryzowana przez poziom automatyzacji, wdrażanie nowych technologii i sztucznej inteligencji, łączność z Internetem i dostępność do globalnej sieci informacyjnej, subskrypcję renomowanych internetowych baz danych, jakość i kompleksowy zbiór w zróżnicowanych formatach, generację epoki cyfrowej jako dominujących klientów, zwiększony popyt dla bezproblemowego dostępu do zasobów online i operacji wirtualnych, nowe przestrzenie biblioteczne (wspólne uczenie się, wspólne badanie i twórcza przestrzeń), otwartą komunikację naukową, zarządzanie danymi badawczymi, aplikacje mediacji społecznościowych, cyfrowe odzyskiwanie i zabezpieczanie. Wyzwania przeciwstawiające się skutecznej krystalizacji bibliotek uniwersyteckich CRP to: ograniczenia finansowe, nieodpowiednia infrastruktura, odporność na zmiany, nieodpowiednie umiejętności i kompetencje, kwestie bezpieczeństwa i włamań, brak znajomości międzynarodowych standardów.

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Wnioski: Artykuł zaleca następujące rozwiązania: przywództwo, wykazanie i uzasadnienie zwrotu z inwestycji, praktyki porównawcze, systemy przeciwwłamaniowe i systemy tworzenia kopii zapasowych, odpowiednie zasilanie i przepustowość, wyposażenie i społeczną odpowiedzialność biznesu, rodzime oprogramowanie do zarządzania bibliotekami oraz inicjatywy na rzecz budowania potencjału.

Christopher Nkiko

Universität Elizade

E-Mail: Christoper.nkiko@elizadeuniversity.edu.ng

ORCID: 0000-0001-9993-9090

Omorodion Okuonghae

Samuel Adegboyeg Universität. Universitätsbibliothek

E-Mail: okuonghaeo@yahoo.com

ORCID: 0000-0002-6552-8127

Durchführung der vierten industriellen Revolution in der Universitätsbibliothek in Subsahara-Afrika: Trends, Chancen und Herausforderungen

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Christopher Nkiko ist Universitätsbibliothekar an der Elizade Universität in Ilara-Mokin im Bundesstaat Ondo in Nigeria. Er ist Bachelor der politischen Wissenschaften (Universität in Benin), Magister der politischen Wissenschaften sowie Magister und Doktor der Bibliothekswissenschaft und wissenschaftlichen Information (Universität in Ibadan). Er publizierte seine Beiträge in zahlreichen in- und ausländischen Zeitschriften im Bereich der Bibliothekswissenschaft und wissenschaftlichen Information, wurde mehrmals mit Preisen ausgezeichnet, darunter mit dem Preis der Covenant Universität in Nigeria 2014/2015 für das effektive Archivierungssystem und den Beitrag zur Wissenschaftlichkeit der Universität. Er ist Mitglied verschiedener Berufsgruppen, darunter der Institute für Diplomfachleute im Bereich der Bibliothek und Information in Großbritannien sowie des Verbandes der Nigerianischen Bibliotheken (weiter im Text als VNB).

Omorodion Okuonghae ist Leiter der Abteilung für e-Dienste der Bibliothek an der Samuel Adegboyeg Universität in Ogwa im Bundesstaat Edo in Nigeria, Bachelor und Magister der Bibliothekswissenschaft und wissenschaftlichen Information an der Delta Bundesstaatsuniversität in Abraka in Nigeria (weiter im Text als USDA), Autor zahlreicher wissenschaftlicher Publikationen in renommierten in- und ausländischen Zeitschriften im Bereich der Bibliothekswissenschaft und wissenschaftlichen Information. Er hielt Referate während verschiedener regionaler und inländischer Tagungen, erhielt auch einige Preise und Auszeichnungen, darunter den Preis „Der beste Referent“ während der 57. Tagung und

des Alljährlichen Generalversammlung des VNB sowie die Auszeichnung für den besten Absolventen des Instituts für Bibliothekswissenschaft und Wissenschaftliche Information der USDA. Omorodion ist für das Bibliothekswesen, neue Technologien in den Bibliotheken, das Wissen aus dem Bereich der Information und wissenschaftlichen Kommunikation begeistert. Er ist Mitglied des VNB.

S **tichworte:** Bibliothekstrends; Universitätsbibliothek; künstliche Intelligenz; Forschungsdatenmanagement; offene wissenschaftliche Kommunikation

Z **usammenfassung. Ziel:** Im Beitrag untersuchte man die Universitätsbibliothek während der vierten industriellen Revolution sowie die Bedingungen der Einführung und Aufrechterhaltung einer solchen Lösung in Nigeria. Die Revolution ist gekennzeichnet durch das Niveau der Automatisierung, die Einführung neuer Technologien und der künstlichen Intelligenz, den Zugang zum Internet und die Zugänglichkeit des globalen Informationsnetzes, die Subskription renommierter Internetdatenbanken, die Qualität und die komplexe Sammlung in verschiedenen Formaten, die als dominierende Kunden betrachtete Generation des digitalen Zeitalters, die erhöhte Nachfrage nach problemlosem Zugang zu Online-Ressourcen und virtuellen Operationen, neue Bibliotheksräume (gemeinsames Lernen, Untersuchen und schöpferischer Raum), die offene wissenschaftliche Kommunikation, das Forschungsdatenmanagement, die Applikationen der Sozialmedien, die digitale Wiedergewinnung und Sicherstellung. Zu den Herausforderungen, die sich der effektiven Kristallisierung der Universitätsbibliotheken während der Revolution widersetzen, gehören: Finanzeinschränkungen, eine ungeeignete Infrastruktur, der Widerstand gegen Veränderungen, unzureichende Fähigkeiten und Kompetenzen, Sicherheits- und Einbruchsprobleme, die mangelnde Kenntnis internationaler Standards.

S **chlussfolgerung:** Der Beitrag schlägt folgendes vor: das Leadership, die Festlegung und Begründung des Return on Investment, Vergleichspraktiken, Einbruchs- und Sicherungssysteme, eine angemessene Stromversorgung und Kapazität, die Ausrüstung und soziale Verantwortung des Unternehmens, native Bibliotheksverwaltungssoftware und Initiativen zum Potentialaufbau.