



## Introduction

# The Impact and Importance of the Fourth Industrial Revolution and Sustainable Development for Academic Libraries in Africa

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### Abstract

Particularly in academic libraries in Africa the United Nations Sustainable Development Goals (SDGs) and the Fourth Industrial Revolution (4IR) are possibly the two most significant issues that need to be addressed by librarians in order to offer staff and students at their universities the support they need to flourish in the twenty-first century. This chapter critically examines some of the current literature exploring how academic libraries address the challenges and opportunities presented by these two factors. Five key areas are identified as being of particular importance in the current literature: the literacy rates and the academic reading ability of university students; accessibility of information to university students, researchers and communities in Africa; the impact, importance and limitations of open access information; the role of digital media to market libraries and the importance of teaching digital literacy in libraries; and lessons learnt from online teaching and learning during Coronavirus disease 2019 (COVID-19) which can help to enhance learning amongst students in the post-COVID-19 world. Overall, the chapter explores each of these five areas, showing how the 4IR tools, especially artificial intelligence (AI) and makerspaces can be used to address many of the concerns raised in the literature. It also shows how each of these five areas are avenues through which libraries are and can address SDGs in various ways. The chapter argues that libraries need to address the challenges they face without waiting for more government funding, but rather more innovatively use the funding they have. While admirable research has been conducted on the library needs of students at universities, much more work needs to be performed to understand the needs of researchers and how to support them.



## Introduction

In the second decade of the twenty-first century the Fourth Industrial Revolution (4IR) and the United Nations' Sustainable Development Goals (SDGs) offer both challenges and opportunities for societies in Africa. Several countries in Africa are trying to embrace the technological advancements of the 4IR, often by leapfrogging advancement aspects of the Second or Third Industrial Revolutions. For example, most people in Africa currently have a mobile phone, although few landline phones were ever installed in homes in rural areas in Africa. The goals set by the UN SDGs offer enormous opportunities for countries in Africa, but with limited funding; many of these are difficult to implement, *let alone* achieve. For example, the eradication of poverty in Africa is almost impossible without external funding and a change in the political will of many African governments and global neo-capital economic structures. Within this context, the 4IR and SDGs present interesting challenges and opportunities to libraries at universities and in communities in Africa. This chapter examines some of the key challenges faced by academic libraries at the beginning of the third decade of the twenty-first century. It offers an overview of the ways in which libraries in Africa have been addressing these challenges, as is discussed in detail in the chapters that follow in this book. The chapter is not an introduction to the chapters that follow in the book, but rather offers a critical reading of the scholarship on African academic libraries. It points to proposed ways in which the 4IR technologies, particularly artificial intelligence (AI) tools, can help libraries embrace contemporary technological opportunities in a way that may help them address SDGs generally and the SDG for access to information in particular.

This chapter examines five key issues faced by academic libraries in Africa as they aim to empower university staff, students and the communities connected to these universities. The first area is the literacy rate of students in Africa and students' ability to read complex academic articles and acquire new knowledge from these articles. Second are the SDGs and access to information as an important way libraries can help by providing the information people need to make more sustainable developmental decisions and choices. Third is open access to information and open scholarship and the positive and negative impact of these on scholarship in Africa. Fourth is the importance of digital media as both the way in which libraries can push information to clients and make catalogues and databases more easily accessible to clients. Fifth is the changing landscape of teaching and learning brought about by COVID-19 and affecting the post-COVID-19 world. In each of these five sections, addressing SDGs and exploring the role of the 4IR technologies, especially AI tools, is examined and key innovations are recommended for libraries in Africa, such that they could work with 4IR tools to positively impact societal change.

### **Literacy and Academic Reading**

Literacy levels in Africa vary between countries, but on average are lower than those in the Global North. In South Africa, the poor reading abilities of learners has significantly hindered students' academic performance at university and more interventions are needed to support underprepared students (Pretorius, 2002; Bharuthram & Clarence, 2015; Millin, 2015). In Francophone Africa, child labour hampers the development of a reading culture and continues to lower students' reading abilities and academic success (Lee, Kim & Rhee, 2021).

Nkomo and Ngoepe's (2023) research on literacy in Zimbabwe points to the urgent need to develop a reading culture amongst high school learners. Their research found that due to social media, learners have become used to reading short bits of information and have little desire to read longer texts. They found that learners spent five hours a day on social media, leaving them little time for reading. The authors showed that there is a positive side to Web 2.0 platforms such as WhatsApp and Facebook, because through these, learners have downloaded novels and newspaper articles. If these platforms are embraced early on in schools, they could be used to develop a positive reading culture amongst learners helping to improve literacy rates. Gbenu, Njagi and Adegrooye's (2023) research on the role of public libraries points to the important role they can play in developing literacy and a reading culture by providing freely accessible, reliable information to citizens and offering literacy training and reading campaigns to strengthen cultures of reading. In South African academic libraries, Munzhedzi and Mukhwantheli (2023) show how many university students do not know what a library is, how to use it or how librarians can assist them. This is due to the lack of attention given to developing a reading culture amongst school children and the lack of libraries in public schools. They argued that libraries need to foster a culture of learning and reading amongst the current generation of students.

These varied solutions to the problem of student literacy in Africa will only be possible if governments make funds available for libraries to offer the most relevant information on various platforms to people, thus ensuring that everyone has access to the information they need to solve the challenges they face, develop their overall knowledge and help spark creativity and curiosity (Munzhedzi & Mukhwantheli, 2023, Nkomo & Ngoepe, 2023, Gbenu, Njagi & Adegrooye, 2023). Within the context of the impoverished state of national economies in Africa, calling for more funding from government, which many of the authors cited above do, is not a particularly feasible solution. Librarians and scholars working in the field of academic reading need to develop more nuanced understandings of what hinders reading amongst young people and how this can be creatively overcome. More attention should be given to the research on multi-lingualism and the students' abilities to read in English. As

Verhoeven (2011:661) points out, by 2042, through migration most of the world will have people working in a language that is not their home language. It is therefore imperative that within the education system ways are found to help students master globally dominant languages such as English (Verhoeven, 2011:678). In the English-speaking countries in Africa, a key challenge to reading is that students must read academic texts in English, which is often their third or fourth language. To improve the English reading speed and breadth of university students, interventions are needed that help students master academic reading skills in English. One such intervention could be for librarians to show students how to use the 4IR technologies so that they can use AI to read the text out loud to them and offer translations of words that students do not understand. This would be an immediately implementable and cost-effective way to begin to address this problem.

### **Sustainable Development Goals and Academic Libraries**

One of the exciting developments of the 4IR has been the establishment of makerspaces in libraries, which can be a key way to address various SDGs, including access to information and access to work. Makerspaces which include robotics, 3D printing and laser cutting, are spaces which have been found to promote active community engagement (Koh, Abbas & Willett, 2018:17). They are also spaces that foster entrepreneurship, enabling students to become work-ready and possibly begin their own businesses based on the ideas they designed in university library makerspaces. Entrepreneurship in library makerspaces was also found in community libraries that had makerspaces both in urban and rural areas (Bergman & McMullen, 2020:811; Ensign & Leupold, 2018:1). Okuonghae (2019:49) found that both low-technology and high-technology library makerspaces enabled communities in Nigeria to explore new ideas and also fostered teamwork and problem-solving. Research has shown that makerspaces are also catalysts for better learning, as students can use multiple technologies to learn through doing (Colegrove, 2017:19). These examples all point to the impactful role that libraries can and should continue to play in helping countries in Africa realise many of the SDGs.

For countries in Africa to develop societal awareness of SDGs, public and academic libraries could play an important role (Ugwu & Ogunremi, 2019). Libraries are uniquely positioned to advocate for accessible information for learning, provide literacy training (Gbenu *et al.*, 2023) and computer literacy training (Adamu, Isah & Ajayi, 2023; Abata-Ebire, Adebowale & Ojokuku, 2018). The work of Hapel (2020) found that when libraries engage in these positive and valuable activities, they become nodes of social trust within communities. Nsibirano and Nsibirano (2023) argue that academic libraries need to play a role in making information accessible to communities outside of university. They focused their research on urban farmers in Kampala,

Uganda, and show that when these vegetable farmers were given access to up-to-date, relevant and reliable information from the university library, they were able to implement this information and improve their farming methods and practices. This was only made possible when the university under study changed the definition of library users to include the community beyond academic staff and students. Research found that the key issue blocking libraries from providing comprehensive support in the attainment of this goal is the lack of public funding for libraries, library services and library staff. While it is important that governments in Africa fund public libraries better, Agosto (2008) suggests that these libraries should generate additional income through actively pursuing grants and donations. An alternative could be making open access information easily accessible to communities in and around universities.

### **Open Access and Open Scholarship**

In her research on open access and postgraduate students at four universities in Nigeria, Onwukanjo (2023) found that libraries played a critical role in helping these students find, navigate and use open access information effectively. While the move to open information is exciting and liberating for many in Africa who, for financial reasons, have been denied access to information, the wealth of information now available can be overwhelming. In light of this, libraries and the librarians who can help people navigate their way through the maze of digitally available open access information are now even more critical than ever before (Ayre & Craner, 2017:173-5). In some cases, libraries have begun to play the role of publishers through their institutional repositories that make open access information freely available. Research on open access information in Tanzanian academic libraries (Mwilongo & Kachota, 2023) highlights the importance of institutional repositories as a platform for the sharing of open access theses, dissertations, and scholarly peer-reviewed research. It is argued that governments should support these platforms far more and provide funding for all academic libraries to have well-functioning institutional repositories in which all the work hosted on these platforms is easily accessible.

While the idea of libraries as publishers promoted by the authors cited above is noble, they do not engage sufficiently in the negative side of open access publishing. Research reviewing thirty-two academic libraries that had library publishers showed that library publishing is a complex and often financially difficult undertaking. Key considerations highlighted by the study included training staff to be able to run a publishing enterprise that met with world-best publishing standards, creating a business plan that enabled the publishing enterprise to be financially sustainable and then both marketing and preserving the manuscripts that were published (Davis, Robertson &

Simser, 2018:1-4). Open access publishing and access to open information poses further challenges with the arsenal of misinformation available online, and librarians need to play a key role in helping learners, students and communities learn how to identify misinformation (Jaeger & Taylor, 2021:19). Lastly, more critique of the impact of pay-to-read open access models that significantly reduce the ability of academics in the Global South to publishing in expensive high-impact journals. While this model makes information accessible, it makes it very difficult for academics to publish their work because they do not have the necessary funds to pay high article processing fees.

### **Managing Digital Media and Fostering Digital Literacy**

Academic libraries make use of various digital media sites such as Facebook, Twitter, LinkedIn, websites and student learning management systems to share information with university communities. A study of 15 academic libraries in Zimbabwe found that the key challenge faced by these libraries was updating and managing the content of their social media pages and websites (Tsekea & Chigwada, 2023). In South Africa, a survey I conducted in 2022 with five universities, found that libraries that had a dedicated person managing the library's marketing and website were able to offer up-to-date information, make changes to information quickly and continuously provide notifications about upcoming training effectively. At a few universities, the library provided better communication about university events than the general marketing teams of these universities. This had the effect of making these libraries the 'go to' places for students who felt that they could trust the libraries' information. Both studies found that libraries were able to offer effective marketing of their services to university communities when staff were given adequate training to use these varied platforms effectively.

Learning how to identify misinformation, disinformation and fake news in the digital space is one of the key digital literacy skills that librarians at academic libraries need to teach students. In Africa, authors such as Obinyan and Ikechukwu (2022) and Emiri (2017) address the increasingly urgent need for librarians to offer digital literacy training embedded in or as an extension of their information literacy training. As Baro, Obaro and Aduba (2019:172) found in a survey of several libraries in Africa, librarians rated their skills in 'database search skills, uploading documents to online platforms, skills in using different social media' as 'high'. Where librarians often needed more in-depth and comprehensive digital literacy training was in the use of platforms that make use of artificial intelligence in order to effectively train students and learners.

Libraries need to be or become places that teach integrated literacies, which include information literacy, digital literacy, media literacy and AI

literacy. Librarians with their particular skill set are well-placed to offer this type of training, but it will require them to learn new skills as they learn to use AI in the age of the 'data deluge' (Frederick, 2020:1). The research by Yoon, Andrews and Ward (2022:1893-4) showed that in America, librarians at academic libraries are well aware of the need to learn how to use AI and teach these skills to students, but in public libraries there was less engagement in AI by librarians. The research by Laybats (2018:168) showed that for academic libraries to be future-fit, their librarians will need to continually receive training so that they remain abreast of the latest developments in AI and other cutting-edge technologies. While the research shows that academic libraries in America in particular, ensure that librarians receive training in AI and other technologies, in Africa there is little research on the use and effective implementation of AI in academic libraries.

### **Teaching and Learning in Academic Libraries post-COVID-19**

While there may not be the same level of training on AI in African academic libraries as there currently is in American academic libraries, the research published in this book points to the important work performed by librarians in Africa in teaching and learning during the COVID-19 pandemic and the numerous valuable lessons learnt, which they continue to implement. During the COVID-19 pandemic, online learning was the only way in which teaching and learning could continue. Many people found this mode of teaching very asynchronous, with little class engagement. One study found that when lecturers created 'virtual office hours' which were sessions led by the students, in which they brought their questions and concerns to the lecturer after having watched online videos explaining concepts and theory, student participation increased (Rupasinghe, 2023). Students reported that they found this mode very helpful and engaging. As these sessions were solely led by students, they were different to tutorials. This points to the importance of student-led learning in which students have a space in the curriculum and classroom to voice their own concerns and questions. It is argued that this practice should be continued, even when face-to-face contact sessions have resumed.

A study by Agyei and Adu (2023) on the ability of librarians at universities to connect with users during the COVID-19 pandemic showed that libraries were unprepared to connect with users online. The libraries had to implement platforms such as WhatsApp, Moodle, Zoom, Microsoft Teams, Google Meet and Skype, depending on what platform the university they were working for used. Many librarians did not find these platforms ideal and struggled to find the training they needed to use them effectively. The result was that in the Volta region of Ghana, where the study was conducted, most librarians were not able to remain in effective communication with their clients. In South Africa, well-resourced universities like the Universities of Johannesburg, Cape Town,

Pretoria, the Witwatersrand and Stellenbosch were able to easily pivot into the online space and librarians quickly learnt how to use the 'new' technologies. At less well-resourced universities, librarians struggled to connect with students, as they found it difficult to gain access to online systems and training on how to use these online learning systems<sup>1</sup>. This is further supported by Munzhedzi and Mukhwanteli (2023), who found that at universities in South Africa, librarians play an important role in the academic success of students, particularly by teaching students information literacy skills. In most South African academic libraries, student access to the most up-to-date materials via an online system significantly improved the academic success of students. The study highlighted the need for all libraries to transition to online spaces in which almost all material can be accessed online. In Nigeria, the research of Amao-Taiwo, Eki and Ekpe-Iko (2023) pointed to the effectiveness of online learning, particularly when both library staff and students had sufficient training in information and communication technology devices, software, and platforms. They suggest that libraries should continue to facilitate online learning and research communities to foster knowledge-sharing and self-directed learning.

While online access to resources anywhere, anytime, is ideal for students and academics at universities, it is not always practical or sustainable in many African countries. This is largely due to power issues and lack of resources. The offline Internet provides a good alternative in which users who are hampered by connectivity issues are able to continue to access information. Adie, Bisong and Obuop (2023) have created three taxonomies of offline Internet; completely offline, hybridised offline systems and offline servers. Their research found that schools and universities need to encourage students to bring their devices, such as tablets, smart phones and laptops to class and to use them in classes and lectures while they learn. Remote learning remains possible even when students are offline when various forms of offline Internet devices are used in conjunction with a student's own device. These types of offline learning platforms should keep students engaged and help self-regulated learning if they are to be truly effective (Adie *et al.*, 2023).

### Conclusion

As the first chapter within this book has given a broad overview of the impact and importance of the Fourth Industrial Revolution and sustainable development for academic libraries in Africa. Using the lens of the 4IR and the UN SDGs as the two key issues impacting academic libraries in Africa at present, the chapter

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1 Evidence for this was drawn from the preliminary unpublished CHELSA report on the effect of the COVID-19 pandemic on South African Libraries, (Neerpath, Satgoor & McCallum 2021).

highlights five areas that libraries need to focus on, address or overcome. In this chapter I have argued that there are five key issues which need to be addressed and developed further by academic libraries and librarians if these spaces are to be future-fit spaces of learning for students and development for research in the future. The chapter critically engaged with some of the most recent literature on these five issues highlighting where further research is needed, more nuanced thinking or problem solving is required, or a different approach might need to be taken.

Literacy levels in Africa remain an ongoing challenge and one of the key issues facing African countries is how to improve the literacy levels of citizens. Libraries need to find innovative ways to engage students in reading. The study by Nkomo and Ngoepe (2023) showed how social media can be a good entry point to reading for many students and learners. I have argued that relying on governments to provide literacy training and support is not a helpful suggestion, as most governments in Africa simply do not have the funds. Librarians need to address the reality that most students at Anglophone universities need to be competent in English, while in Francophone Africa, students need to be competent in French. Using AI tools, librarians could help students improve their literacy rates and command of these languages at very little cost and quite effectively. More research is needed to ascertain how best AI can be used to improve literacy rates of students.

The second key issue impacting libraries in Africa is the drive at many universities to actively work towards helping countries achieve the UN SDGs. Regarding this, the research cited earlier points to the importance of information literacy as a key skill which all students and citizens need to master in order to access the vast and ever-changing wealth of knowledge available online. What is not covered in this volume is the pivotal role that makerspaces in libraries can play to help address SDGs such as poverty eradication and employment for all. More research needs to be conducted to think through more effective ways for libraries to use their makerspaces and other resources to help not only students, but communities, to become better educated, thus empowering people to work towards their own and their communities' sustainable development.

Fostering digital literacy and helping people to identify misinformation, disinformation and fake news has become a central part of the changing landscape of information literacy. It is clear from the research that in Africa librarians still have not had access to comprehensive and ongoing digital and AI literacy training. For academic libraries in Africa to offer students world-class support, librarians will have to master digital and AI literacy in order to train both students and academic staff at their respective universities.

During the COVID-19 pandemic, librarians at African universities became proficient in training in the online space, although many of them were underprepared for this move to online learning. Some very important lessons have been learnt during the COVID-19 pandemic as to how to make online learning accessible to students. Given the high students-to-staff ratios at universities in Africa, online learning, if performed well, can offer a cost-effective way for librarians to train the large numbers of students who enrol at public universities each year, but as the research in this book shows, online learning in Africa needs to be performed working with both the online and offline use of the Internet so that the effects of limited power supplies in many African countries is managed. In the future, more research needs to be conducted to share how librarians are finding innovative ways to manage this while still offering a high standard of education to students.

Overall, this chapter shows how libraries and librarians are playing a pivotal role in the academic institutions and the communities around them. Most of the research focuses on the needs of students and communities around universities. An area of research that is not sufficiently engaged with in the literature is the role that libraries and librarians play in supporting academic staff at universities in Africa. As African countries continue to develop, more awareness, attention and research should be conducted to understand the critical role that libraries play in the ongoing sustainable development of Africa in the 4IR.

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