Chapter 2

Ahead of the Artificial Intelligence Curve: Changing Roles of Information Professionals in Higher Education

Lorette Jacobs
Karin McGuirk
Department of Information Science
University of South Africa
Pretoria, South Africa

As an information professional,
I always thought my role in higher education was clear,
but that no longer seems to be the case
(Adapted from Jenkins 2016).

Introduction

In the digital era technological advancements brought about by AI (artificial intelligence) have extensively altered the manner in which information professionals should offer services and resources to cater for individualised information needs. Technological advances in AI combined with institutional changes, budget constraints, and alternative modes of delivery are affecting the scope and scale of services required of traditional information professionals. Information professionals therefore find themselves in a distorted and surreal world – a world that has changed in a way where AI and technological advancement create a context that is unfamiliar. Within the HE (higher education) sector where the focus is on fostering education, research, and societal development, the importance of information professionals in leading these institutions into the 5IR (fifth industrial revolution) by advancing their own skills and utilising

technology towards personalising information services and resources, cannot be overemphasised. More research is required to assess whether the vision proposed by the researchers will prepare information professionals effectively to stay ahead of the AI curve.

Exploring the role of the academic information professional in such unknowns, is only possible by attempting to predict the future based on existing knowledge about a particular situation or scenario. Towards such predictions, the chapter utilises an interpretive present future framework and explores the topic via the application of autoethnography. Discussions among the researchers and supported by existing literature conclude that skills of information professionals should expand to include social intelligence, cross-cultural competencies, computational thinking, trans-literacy skills, and adaptive thinking. These skills are to be applied in creating smart libraries founded on principles of automating manual functions, developing creativity, and innovation in a world founded on human-machine interaction. Information professionals should become cybersecurity managers, ethical ambassadors, advocates for inclusive access, data scientists, and open access and open science activists.

Although the central mission of modern HE is the production, transmission, and acquisition of knowledge (Le Grange 2009:103), the environment and context in which HE qualifications and support services, such as information access are provided, have changed significantly (UNESCO 2023). This is due to a variety of factors, such as changing policies, internationalisation, demand for study places, democratic changes, technological advances, and budget constraints, which combine to put increasing pressure on IHEs (institutions of higher education) (West 2016; Songkaeo & Yeong 2016:3 of 25).

In the South African context, there is a concerted drive for further change in terms of student access, funding, and curriculum redesign (Habib 2016). As a result, there is an increasing pressure on IHEs to create opportunities for access to information resources and services that support the advancement, creation, and dissemination of knowledge and research opportunities

(Akobe 2019). Conceptualising and organising how information professionals are to become part of the required changes in HE, are arduous and involve poorly constructed parameters (Nitecki & Davis 2017:3). The reason for this ambiguity lies primarily in technological advances, which have led to a change in educational paradigms, as well as in the increasing importance of information and digital literacy (Mandal & Dasgupta 2019:4).

While information professionals are embroiled in the speculations, concerns, and promises for HE under the 4IR (fourth industrial revolution), the 5IR with its discourses on AI and machine learning has begun to eclipse what used to be at the forefront of much academic discussion and research. AI has been around for some time; it is like a 'slumbering giant' that has now awakened with full force. For HE, this 'giant' is a game changer, affecting not only how students should be taught, but also how they and the academic community should be encouraged to engage in the creation, evaluation, use, dissemination, and application of information.

Considering that there are more than one billion websites worldwide, more than 16,000 open access journals, and about 30,000 closed scientific journals (Zul 2021), it is not surprising that technological interventions through AI and machine learning are needed to analyse and provide relevant information to support students in their academic endeavours. Due to the sheer volume of information available, the role and function of information professionals must change. Humans are no longer able to manage, organise, and disseminate information due to its expansive volume. The role of information professionals must change to reflect the dynamic landscape in which they play a central role in supporting the information needs of the academic community in a different way that enables university staff to acquire skills and competencies to navigate the vastness of information resources (Ngulube & Mosha 2024:4).

The focus of this chapter is on reconceptualising the role of information professionals in a changing HE context. In conjunction with the factors that impact the subject, it will explore how academic communities can be supported by

information professionals in the digital age. The focus of the chapter is on uncovering the role of information professionals in the HE context, considering the transformative impact of technology and the general availability of information. As access to quality information becomes increasingly important in various sectors of society, this chapter highlights the role of information professionals in HE as architects of knowledge, guardians of data integrity, and guides through the vast information landscape.

Transformation of Higher Education

To place the issue in a better perspective, it is necessary to briefly consider the broader context of HE and the changes that affect the role of information professionals in this environment. Songkaeo and Yeong (2016:3 of 25) note that the concept of HE is perceived differently due to different discourses in different countries. Maassen, Nerland, Pinheiro, Stensaker, Vabø, & Vukasović (2012:8) agree, noting that academic institutions have regularly faced pressure to change their focus and meaning over the course of their long institutional history. Since the early 1990s, for example, universities have been forced to rethink their purpose. This is mainly due to the development of the knowledge economy, massification, technological expansions, and the globalisation of both conceptual knowledge and acquired skills, to contribute to economic development (Johnstone & Marcucci 2007:2 of 36). In Europe, the Bolonga degree structure and the ECTS (European Credit Transfer and Accumulation System) have had a major impact on the purpose and scope of HE (Hay & Monnapula-Mapesela 2009:9; Sursock 2015:18).

Massification, global competitiveness, funding, curriculum structures, and the relations between teaching, learning, assessment, research, and access to information through HE have transformed Europe into a competitive knowledge economy (Garben 2012:8 of 44). As part of the Lisbon strategy, IHEs are expected to refocus and use limited resources to achieve maximum success. Like their European counterparts, IHEs in the US (United States) are shaped by the market, as they are dependent on external stakeholders for funding. Massification to improve equity and social mobility influences organisational structures,

the size and shape of systems, the nature of service delivery, and interinstitutional partnerships for academic programmes.

Various government policies have led to more open access to HE in China since 1999. The admission of workers, farmers, and soldiers has resulted in HE changing from an elitist approach to mass education (Songkaeo & Yeong 2016:1 of 25). The aim is to provide equal educational opportunities to boost the emerging economy. Despite the increase in student numbers, financial support from the government has decreased, forcing IHEs in China to rely more on nongovernmental funding for their operating costs (Kapur & Perry 2015:13 of 29). Under these pressures, HE staff, including information professionals, must provide services that go beyond their traditional roles. These include serving an increasing number and diversity of student profiles, providing tutoring support, utilising various forms of access to information resources, using technology to promote access to information resources, and performing functions that include advocacy and promoting the use of information resources (Marr & Forsyth 2011:65).

Like the transformation in HE that has occurred globally, IHEs in Africa, with few exceptions, have faced similar challenges to train a highly skilled workforce, build an academic tradition associated with universal knowledge, and become a driving force for economic development (Eshiwani 1999:32). These challenges, combined with inadequate financial resources, prolonged economic and social crises, as increasing technological advances have impacted on the role of HE in Africa. Countries such as Botswana, Algeria, Zimbabwe, Mali, and Tanzania report that IHEs are unable to meet development needs, and have opted for an Africanised model that is relevant, incorporates indigenous knowledge, and makes courses more wholistic (Eshiwani 1999:31).

However, due to political turmoil and despite the best intentions to create quality IHEs for the masses, a few reforms have transformed HE in African countries sufficiently to create a more egalitarian society. Rather, universities have become microcosms of societal structural problems (Assié-Lumumba 2006:96). Institutions such as the World Bank and the United

Nations, through Kofi Annan, have called for a revitalisation of African IHEs to support the development of Africa's knowledge economy and act as a driving force for development (DHET 2023:xii). HERNANA (The Higher Education Research and Advocacy Network in Africa) was established in 2008 to raise funds for the development of HE in Africa (MacGregor 2009). In 2009, participants from 41 African countries at the Africa Regional Conference on Higher Education called for more effective policies to promote the revitalisation of HE in Africa (Teferra & Altbach 2003:4). The conference called for strengthening human capacity to deliver services related to the highly demanding HE environment, including skills development in training, research information, and digital literacy (MacGregor 2009).

In South Africa, the restructuring of the HE system after 1994 initially focused on shaping macro-politics. The Programme for the Transformation of Higher Education (DoE 1997a:13) provided a framework for transformation based on equality. This was followed by the Green Paper on Transforming Higher Education (DoE 1997b) and the subsequent White Paper (DHET 2013), which aimed to address institutional inequalities, meet development needs, and create equal learning opportunities (cf. Subotzky 2003:550). In 2016, 20 years after the advent of democracy, however, the CHE (Council on Higher Education) highlighted the gap between high expectations and the harsh realities of state and institutional resources and capacity. Issues such as student access and success, research and postgraduate education, transformation, institutional diversity, funding, and the development of the current and next generation of academics, all impact the success of IHEs. In terms of growth and development, it is important that the HE sector responds by creating opportunities to expand the pool of skills and knowledge available to the country. Innovative pedagogical approaches, sustained student support, developing flexible curricula, and improving literacy and digital skills are potential means of addressing key issues in HE (CHE 2016:147).

However, Llopis (2022) argues that HE is facing one of its biggest unknowns despite the changes to date. Since COVID-19 (Coronavirus disease of 2019), all IHEs have had to rethink their

strategies, learning methods, access to teaching materials, budgetary structures, and the way in which students and staff are supported through access to information, among other things. Technology has changed the landscape for service delivery in HE, forcing IHEs to constantly rethink their purpose and operations due to continuous technological change. El-Azar (2022) points out that technology allows students to learn from anywhere, which requires a different contextualisation of immersive learning.

Many functions of educators can be replaced by active learning using AI tools, where real learning is based on principles such as spaced learning, emotional learning, and the application of knowledge. AI tools can support automated assessment by generating tests with multiple questions, providing detailed guidance and feedback, and evaluating and suggesting high-quality educational resources (Crompton & Burke 2023:14 of 22). Gen-AI (generative artificial intelligence) can create ecosystems for advanced teaching, learning, and research that require deliberate and purposeful thinking to promote transparency, accountability, and access to HE for the common good (Witwatersrand University 2023). AI thus opens tremendous new opportunities for HE, where one moves away from labour-intensive tasks and provides services that enable rigorous, adaptive, and personalised experiences for students and researchers (Klutka, Ackerly, & Magda 2018:6).

Transformation of Information Professionals

Given the changes in HE, Akobe (2019) argues that the role of information professionals has also changed. Originally regarded as custodians of information dissemination, information professionals in the digital age are competing with technology that provides instant access to vast amounts of information and data to anyone from anywhere. Lund and Wang (2023:27) believe that technology such as GPT (generative pre-trained transformer) and the technology underlying ChatGPT (chat generative pre-trained transformer) can access, disseminate, and integrate information in a more efficient and effective way than an information professional can. Mandal and Dasgupta (2019:1) argue that if information professionals want to remain competitive, they must

learn to make digital repositories their researchers. This means that the information professional in the digital age, competing with technology to provide high quality, accurate, and reliable information, must have skills in selection, content management, knowledge management, organisation of information on intranets and the internet, and the ability to develop and maintain digital libraries and bring information resources to the user's desktop (Nikta 2022:254). Tappenbeck and Sühl-Strohmenger (2023) rightfully claim that only a few professions have changed as much as the information professional in an academic setting because of technological advances.

The profession has undergone a significant revolution, particularly in the context of AI (Cox, Pinfield, & Rutter 2019:431). Various descriptions of AI have been cited in relation to the profession. Hare (2022) defines AI as systems that change behaviour, usage, and observations without being explicitly programmed to do so. Tähti (2024) describes AI in information science as a cluster of technologies designed to make flexible and rational decisions in response to unpredictable environments. Floridi (2023:6 of 12) presents AI in the context of the information profession more specifically as big data, analytics, machine learning, data visualisation, and natural language processing. With AI, certain workflows such as inventory management or the indexing of media and documents can be mechanised. AI technology in the context of the IoT (internet of things) can create digital reference networks and provide expertise that surpasses that of humans (Jacobs 2022).

Due to changes driven by technology, information professionals need to become versatile, not only in terms of their expertise, but also in developing technical skills to ensure they keep up with modern technological advances (Akobe 2019). Nikta (2022:256) therefore suggests that information professionals in academia are called upon to play a visionary role in transforming the information science industry, so that new technologies, new organisational structures, and new services can be cultivated to promote knowledge that is quickly and easily accessible. To achieve this, one of the things that needs to change is the way in which information professionals

participate in and support the academic environment (Nikta 2022:256). Professional development opportunities, supported by workshops, seminars, project-based interventions, peer mentoring, formal qualifications, rewards, incentives, research and innovation funding, professional associations, conferences, and special interest groups can help to develop visions for roles in which AI is used to benefit the delivery of information services (Banks 2023). However, such visionary tendencies are often incoherently structured, resulting in information professionals being inadequately prepared for a world in which technology is in vogue (Librarika 2022).

Contextualising the Challenge

Jacobs (2022) argues that the pace of change in HE has caught information professionals off guard. Whether regarded as a threat or a promise for useful applications in HE, the changes brought about by technological advances are impacting how people read, learn (and teach), evaluate, and therefore, think. Duggal (2023) explains that one of the main disadvantages of technology, and of AI in particular, is that people no longer need to memorise information or solve puzzles to find solutions to challenges. Humans are therefore using their brains less and less, which can lead to a lack of creativity, innovation, and even emotional disturbances (Greene-Harper 2023). In the information industry, the negative effects of AI have already been identified in the creation of information sources (Murphy 2023), language development, the E-A-T (expertise, authority, and trustworthiness) of information (Hare 2022), and in ethical areas of data protection (Palaha 2023).

In HE, information professionals are experiencing changes in the areas of academic engagement, innovation, technology utilisation, content development, and skills development. Technological advances in AI, combined with institutional changes, budget constraints, and alternative modes of delivery, are affecting the scope and scale of services required of traditional information professionals. Preparing information professionals for current (where we are) and future (what is coming) disruption, requires consideration of a variety of factors that guide and inform

their roles and responsibilities as information professionals in the digital age. Palaha (2023) refers to this as 'unknown unknowns.' The author explains that the environment in which information professionals operate in IHEs is riddled with knowledge gaps. It is in this area of 'unknown unknowns' that the challenge lies because it is impossible to ask and prepare for something you know nothing about.

We know that traditional information institutions, such as academic libraries, are no longer the one-stop shop for accessing information. Many users access large amounts of information via the internet (Mandal & Dasgupta 2019:1). Therefore, the value of academic libraries, and therefore academic information professionals, has diminished. Technological advances and the extensive formats in which data and information are developed and exchanged, require a rethinking of the position of information professionals in HE to embrace uncharted areas.

Through the Looking Glass – in Search of a Futuristic Frame

In his sequel to *Alice's Adventures in Wonderland* from 1871, Lewis Carroll metaphorically describes a situation in which things in the 'Wonderland' are viewed from a different, distorted, and surreal perspective (Carroll 2020). Looking through the mirror gave Alice the feeling of entering an alternative and unfamiliar reality. Similarly, in the reality of 'unknown unknowns,' information professionals find themselves in a distorted and surreal world, a world that has changed in a way where AI and technological advancement create a context that is unfamiliar. Exploring the role of the academic information professional in such unknowns, according to Omoogun (2019) and Padgett (2021), is only possible by attempting to predict the future based on existing knowledge about a particular situation or scenario. According to Minkkinen (2020:16), such predictions are highly dependent on the choice of a future-orientated theoretical framework. Fischer and Mehnert (2021:26) explain that a futuristic theoretical framework refers to a set of concepts, principles, and hypotheses that attempt to predict future developments in a specific environment. It draws

on current knowledge trends to envision scenarios about what the future may hold, either as the present future or as the future presents. Future presents refer to a situation later than now, a future present that is a point in time yet to come. Present futures on the other hand, refers to images of the future, thus descriptions of futures later than now, but embedded in the current discourse. Both these types of futuristic framework are speculative and used as tools for exploration, rather than prediction. Malhotra, Das, and Chariar (2014:123) argue that creative thinking is the foundation of both types of frameworks, where freedom of thought inspires a futuristic vision.

Within the context of this research, present futures are considered as frameworks that incorporate interdisciplinary perspectives, considering interactions between technological advancements, society, environment, and culture to propose a future. Though various classifications of futuristic theories are available, such as human augmentation and transhumanism, post-capitalism, environmental sustainability, six-pillar approach and cogent futuristic frameworks (Suckert 2022:402), to name but a few, the interpretive present futuristic framework as proposed by Inayatullah (2024), is applied to this research. Towards exploring a topic through an interpretive present future framework, Hejazi (2011:81) suggests that a process be followed to support or guide the building of present future suggestions into useful predictions. The proposed process comprises three distinctive steps as presented in Figure 1.

Linked to the figure, Hejazi (2011:84) proposes that the first step should identify variables that influence phenomena or challenges. Previous sections within this chapter already contextualised the changes in HE and the influence of AI and fourth and fifth technological advancements on the way IHEs operate, as changing expectations of information professionals manifest in these institutions. The issues related to the expectations of the roles of information professionals in the AI era receive further attention when this chapter examines the role of the information professional in the age of disruption.

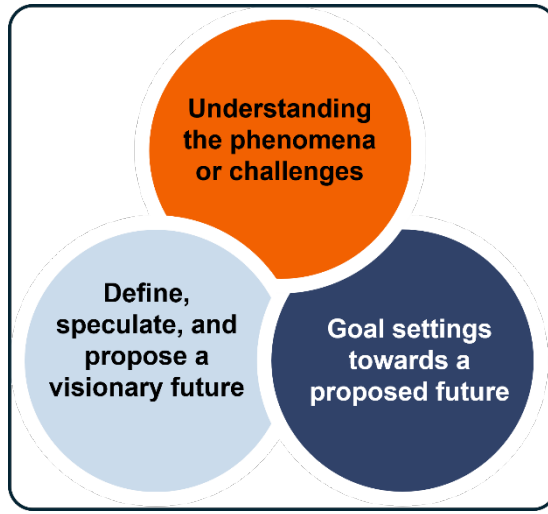

Figure 2.1: Proposed steps towards an interpretive present future framework *(Source: Adapted from Hejazi 2011:81)*

Pertaining to the second step proposed by Hejazi (2011:81), the aim of setting goals towards a proposed future relates to considering what is expected of a present future embedded in the current discourse. The aim of goal setting is to identify possible changes that will encourage a performance approach (Riopel 2019), where academic information professionals are able to use AI in a manner that will advance services and resources offered to users. Such goals are to guide predictions towards a transformative visionary future. The focus of the final step, in the words of Peter Drucker, relates to '[t]he best way to predict the future is to create it' (Goodreads 2024). In conclusion, the chapter will focus on suggesting alterations in the roles of academic information professionals, where AI tools can be used to advance and enhance the user experience.

Methodological Approach

Given that the proposed theoretical framework aligns to an interpretive present future framework, the paradigm applicable to this research is interpretivist by nature. Aligned to interpretivism,

reality is socially constructed with many intangible realities, based on subjective meanings that individuals create, based on their experiences of ever-changing worlds (Creswell 2009:8). The main point of following an interpretivist paradigm is that we as researchers are interested in the changing roles brought about by technology and specifically AI within the context of libraries in IHEs. This links to the ontological view of interpretivism, where reality is socially constructed (McMillan & Schumacher 2010:370). Interpretivists do not try to conduct value-free research but share and discuss the values that shape their research with those that form part of the research (Grant & Osanloo 2014:17). Following an inductive approach, the focus of the research is on proposing futuristic roles for information professionals, by theorising about the current trajectory of changes, based on AI advancements.

The emerging inductive technique of autoethnography allowed the authors to explore the topic of the changing roles of information professionals to stay ahead of the AI avalanche in a highly personalised manner (Guzik 2013:269). Autoethnography has its roots in two focus areas: Inquiry and meaning making (Edwards 2021:2 of 6). It requires a deep emergence in self-experience and reflection. During autoethnography, the authors retrospectively and selectively write about their experiences (Riordan 2014:3). The aim is to take an analytical look at experiences and present them in such a way that they may relate to others (Stigter 2016:229).

Being researchers, our interest in this topic stems from the fact that we have prior experience as information professionals in IHEs and are currently involved in the education and training of future information professionals. From an educational point of view, future predictions in the discipline are important to ensure that current programme offerings prepare future information professionals for the changes that await them. Following the interpretive present future framework as per Figure 2.1, the researchers engaged in conversation to explore the steps towards proposed roles for information professionals in IHEs. The selection of conversations to explore a possible present future aligns with the views of Lapadat (2017:600) that the acknowledgement of personal experiences embedded in

workplace and social structures are likely to bring about plausible solutions. Autoethnographic discussions revolve around questions about the disruption of AI on the work environment of information professionals, what the skills set of information professionals in academic organisations of the future should comprise of, and what roles information professionals should focus on to use AI in such a way as to offer innovative and ingenious services to users. Autoethnographic engagement findings are presented in the remainder of the chapter content.

Disruptions Caused by AI in the Professional Academic Information Work Environment

In the context of the digital era, disruption refers to the rapid change or transformation brought about by the introduction of new technologies, business models, or innovative ideas that fundamentally alter the way things are done. Puplampu, Hanson, and Arthur (2020:4) explain that the pace at which technology is transforming our lives is exponential, while the role of disruptive technologies is imperative for the development of innovation in Africa. Tarr (2021:68) agrees and states that disruptive technologies are bringing about robust transformative social advancements to promote economic growth. Linked to the education industry, Timotheau, Miliou, Dimitriadis, Sobrino, Giannoutsou, Cachia, Mones, and Ioannou (2023:6696) report that disruptive technologies such as augmented reality, virtual reality, blockchain, and smart devices have increased opportunities for advanced teaching and learning. The researchers can attest to this as technology has revolutionised the way in which teaching is being offered online through gamification, the use of virtual reality, and the creation of augmented realities through, for example, digital twinning.

Where the 4IR has provided opportunities for mechanisation and mass production, automation, and digitalisation (Shadrach 2022:4), the 5IR offers improvements on and applications of mechanical and digital technologies, especially wireless technologies, developed during the 4IR such as AI, robotics, IoT, cloud computing, and big data (Ibinaiye & Jiyane 2021:87). These

technological advancements offer significant changes to the way information professionals in IHEs function and the services and resources they provide.

Guided by the suggestions of Guzik (2013:269) that individuals represent their own experiences through autoethnography, researchers can attest that the roles and responsibilities of academic information professionals include organising and managing library resources so that the needs of users can be met to advance their academic and/or research careers. This view is supported by Abels, Jones, Latham, Magnoni, and Marshall (2003:1), who explain that the traditional role of information professionals is to advance the mission of an organisation by developing, deploying, and managing information resources and services. Where information professionals traditionally were responsible for managing physical collections of books and other materials, the advancement of technology has brought about disruptions to the type of information resources that should be managed and how information resources are retrieved, data managed, and services offered. Disruptions due to technological advancements impact existing business models (Patel 2012:73). The result is that information professionals face challenges related to making effective use of technology and responding to changing user needs as part of their service delivery business model.

Academic information professionals are required to anticipate and embrace change constructively, and to be visionary in the business model that is applied to meet technological advancements. For example, instead of being collectors of sources, academic information professionals must offer access to digital information resources including e-books, online journals, databases, and multimedia resources, often through virtual reference services, rather than reference interviews. This requires new skill sets to mediate the increasingly digitally orientated academic library environment (Lapuz 2005:79). Ogedengbe, James, Afolabi, Olatoye, and Eboigbe (2023:317) suggest that such skill sets should include the ability of information professionals to advance connectivity and big data management, display analytics and intelligence skills, promote human-machine interaction

through robotics, VRs (virtual realities), and AR (augmented reality), and engage in advanced engineering through 3-D (three-dimensional) printing.

New skills are needed in areas such as data literacy, critical thinking about AI-generated information, and teaching students how to effectively use AI tools (Floridi 2023:2-3 of 12). Shadrach (2022:7) also mentions that for information professionals to make the paradigm shift towards utilising 4IR and 5IR technologies effectively, they will require softer skills related to learnability, critical thinking, growth mindset, self-regulation, and perseverance. Aligned to the views of Ashikuzzaman (2019:2) that information professionals should present a stronger voice, researchers are of the opinion that information professionals in academic libraries require an advanced scope of skills to offer seamless and swift access to information resources and services to the right user at the right time and in the most suitable format. Academic information professionals should be able to take advantage of the wide scope of technologies that have emerged as a result of industrial revolutions, to foster a culture of intellectual growth and exploration.

Regarding the use of specifically AI technologies, Copeland (2024:1) states that information professionals should know how to most effectively use digital computers or computer-controlled robots to perform tasks commonly associated with intelligence, such as the ability to reason, discover meaning, generalise, or learn from past experiences. Computer search engines, chatbots, and LLMs (large language models) perform certain tasks at the level of experts and professionals (Floridi 2023:1 of 12). The advancement made with LLMs and GPT software such as ChatGPT, enables AI to process texts with extraordinary success and in a way that is indistinguishable from human output. Through such AI, technology is more effective than humans in arriving at outcomes within an increasingly complex world (Zielinski, Winker, Aggarwal, Ferris, Heinemann, Lapeña, Pai, Ing, Citrome, Alam, Voight, & Habibzadeh 2023:1). In fact, within the context of the roles and responsibilities of information professionals, such AI technologies have completely transformed the way in which traditional roles are executed.

AI is used to automate tasks such as cataloguing, interlibrary loans, and basic reference services. AI can assist information professionals in conducting literature searches, data analysis, and visualisation, leading to more efficient and innovative support for researchers. AI can be used to personalise learning material and resources for individual students that are adapted to their learning needs and styles. Examples of how AI is currently being used in HE settings include the use of chatbots for reference services, personalised learning platforms, and AI-powered research assistants. The successes and challenges of these implementations offer important lessons for future applications and require continued research into these areas. As per our views, the use of AI in academic libraries can lead to new career opportunities for information professionals in areas such as data curation, AI literacy instruction, and the development of AI-powered research tools and IoT applications towards creating a more modern, effective, and user-centric library experience.

The views of Corrall and Jolly (2019:115) support the perceptions of the researchers by explaining that information professionals in academic environments should be able to effectively use AI technology to enhance search and data discovery abilities through the application of AI algorithms. Additionally, Akobe (2019:4) encourages information professionals to utilise AI tools for automated cataloguing and metadata creation, to provide virtual assistance through chatbots, and to improve accessibility to information resources by AI-powered tools able to convert text to speech and supply audio descriptions for visual content.

In terms of the operations and management of academic libraries, information professionals are well aware of the time and energy spent on repetitive tasks. Shelving, inventory management, and book tracking can be improved with AI technologies (Ciccone & Hounslow 2019:8 of 21). For example, RFID (radio frequency identification) technology can track the movement of physical objects. This can simplify checkout and return processes and help with inventory control. Mobile and beacon technology can be used to send notifications to users on information services or direct them to information about events, new arrivals, and their location within an academic library

(Jacobs 2022:118). Information professionals can thus use mobile technology to engage with communities through social media, blogs, and other on-line platforms. In this way, users can be made aware of library events and resources and be encouraged to participate in on-line forums for discussions.

It is our view that AI technology used to globalise connectivity has the advantage that it provides opportunities for library services to be offered on a more global scale, and this increases interconnectedness to engage in and collectively find solutions towards achieving sustainable development goals. Using AI tools for such connectivity increases not only the ability of information professionals to benchmark against international best practices, but provides vast opportunities to support one of the key functions of academic libraries, namely to promote research.

Goal Setting towards Proposed Future

In the second component of the interpretive present future theoretical framework, the focus is on considering what is expected of a present future embedded in the current discourse. Towards setting such goals, it was necessary for the researchers to consider the views of, for example, CHELSA (the Committee of Higher Education Libraries of South Africa – CHELSA 2021) and the Academic and Research Libraries Section of IFLA (the International Federation of Library Associations and Institutions – IFLA 2024). CHELSA (2021:9) argues that academic libraries must shed old restraints, utilise unlimited opportunities, and present an optimism towards the future. In the context of unknown unknowns, it is expected from information professionals in IHEs to play a pivotal role in utilising technological advances, new pedagogies, and transformative drivers to bring about change aligned to the needs and expectations of users. Similarly, IFLA (2024) encourages information professionals to advance their skills, so that they are able to engage in and embrace trends such as open access publishing, open data management, e-research, and digital information literacy.

The use of technology to engage in such advanced skills requires a responsive AI library strategy, so that skills development can be linked to the roles and responsibilities expected from information professionals in the digital era (Cox 2024). Similarly, CHELSA (2021:14) emphasises the importance of strategies to enhance the integration of technology tools, to allow for on-demand services and resource access in academic libraries. The goal to consider as part of this research and in alignment with the above directive sources, thus involves considering future strategies that will guide roles, responsibilities, and skill requirements of information professionals based on the current trajectory of AI use in academic libraries.

A Visionary Future Based on the Current Curve

Cox (2024) explains that AI is not new. Information professionals are already familiar with many of its applications related to text summarisation, text and data mining, as well as machine learning. The most powerful AI applications currently in use relate to descriptive and Gen-AI (Tähti 2024). Where descriptive AI aims to make all kinds of material such as photos, videos, and sound machines readable, Gen-AI focuses on generating responses from data that humans accept as valid communication.

Within the academic library environment, descriptive AI provides opportunities of access to specialised collections that can now be shared with users. Descriptive AI can generate metadata from unstructured records, and extract as well as classify documents and records with high accuracy. Through Gen-AI, information can be created and used for communication purposes. Augmented with chatbots, Gen-AI consists of powerful tools for information sharing. According to Kaur (2024:31), utilising such AI technologies requires of information professionals to look beyond walls, campuses, and even borders to offer global opportunities to information access and use that serve students and faculty through more open access to knowledge. This requires the extended use of AI towards deep learning, reinforcement learning, and context-aware computing.

Linked to machine learning, deep learning involves artificial neural networks to expand tasks, such as image and speech recognition, natural language processing, and pattern recognition (Reyes 2023). Extended from deep learning, reinforcement learning involves AI learning to make decisions by interacting with an environment. Reinforcement AI learning allows for improved decision-making that may advance services and resources offered by academic libraries (Brooks 2024). Through context-aware AI, the available information related to user contextual information such as user location, time, devices, behaviour, and input data, can be analysed to provide continuous improved services to users based on their current and changing situations. Context-aware AI thus can recognise user behaviour and provide intelligent services based on analysed results (Kaur 2024:32). Through the application of these types of AI, information professionals in academic libraries can shift their centres of gravity from storage and physical collections to environments that support 'high energy learning,' providing expansive opportunities for users to engage and immerse themselves in the information and resources available through library collections.

However, while AI offers numerous benefits and advancements, there are also concerns related to its use. Because AI algorithms that are currently available are still regarded as general or strong, results can be biased based on the current data (Marr 2024). AI systems may extend current social biases that may extend to unfair or discriminatory outcomes. AI systems can also be vulnerable to adversarial attacks where carefully presented data can mislead AI models. Until artificial superintelligence systems are available, where AI capacity can outperform humans in all tasks, the use of AI technologies still requires a type of 'human quality assurance' to validate the accuracy of outputs, to minimise social disruption and the negative reliability of society on AI over dependency (Masaar 2022).

In addition, concerns have been raised about data privacy and the use of personal data (Arena 2022). Ensuring that AI applications adhere to privacy regulations and protect sensitive information, is a continuous challenge that information professionals must consider. Bartley, Kerjouan, and Shahidullah

(2024) thus call for increased considerations of AI regulations to offer a common minimum level of ethics to safeguard privacy, security, fairness, accountability, and transparency in the use of AI.

Considering the extent to which AI can be utilised effectively to offer a variety of personalised services and resources to users, and the potential issues in using it, the goal on strategies to be applied to ensure the effective use of AI by academic information professionals remains unanswered. Moving from Library 4.0 to 5.0 sets, according to Noh (2022:902), the foundation for creating strategies is to move libraries to community centric, highly digitised, and intelligent information services.

Within the context of Library 5.0 the emphasis is on personalised user experiences, big data analytics, and the IoT. According to the view of Oliveira and Rodrigues (2021), Library 5.0 should understand the needs of users and how ease of access can be improved in a relevant and immediate way. It requires a retriangulation of knowledge to include education, research, and innovation for the renewal of intellectual potential (Denchev & Varbanova-Dencheva 2021:111). Where the academic Library 4.0 was based on creating smart services, spaces, technologies, and resources, academic Library 5.0 should build on this progress through the application of technology that continues to progress tremendously. Aligned to the vision of the 5IR, Library 5.0 should place the wellbeing of users and staff at the centre of the information cycle and use new technologies to provide prosperity and growth, whilst respecting innovation, inclusivity, and cooperation between humans and machines (Ambasna-Jones 2023).

Homing in on important skills that information professionals need to acquire to prepare for the Library 5.0 future include, according to authors such as Mandal and Dasgupta (2019:8-9), Momoh and Folorunso (2019:7-8 of 10), as well as Ayinde and Kirkwood (2020:143-145), the following:

- Sense making where information professionals can identify and establish a deeper meaning of what is expressed to answer queries and can work with technology to exact and

ensure 100% perfection of sources retrieved versus the needs of users.
- Social intelligence to bring a deep connection to users to stimulate reactions and desired interactions through social relationships.
- Novel and adaptive thinking where human intelligence, coupled with technological innovations move beyond rote thinking to predict unexpected circumstances and modify ideas towards problem-solving.
- Cross-cultural competency, where information professionals are able to operate in different cultural environments and disciplines, to be open minded and promote a mutual understanding within relationships.
- Computational thinking, where interrelations exist between humans and machines to analyse, evaluate, and create information/data, by breaking complex problems down into smaller chunks to find solutions.
- Transliteracy skills that will enable information professionals to train and develop new content via new media and reinforce changes in the mindsets of users.
- Makerspace creators that can offer various tools and material to facilitate inventions, creativity, and ingenuity.
- Transdisciplinary skills to understand concepts across different disciplines and to know how to link these to the offering of individualised services and support to users.

Aligned to the advanced skills required of information professionals to stay ahead of the AI curve, authors such as Tembe and Mkhathali (2019:7), Ocholla and Ocholla (2020:364), Nkiko and Okuonghae (2021), Jacobs (2022:126), and Santhi and Muthuswamy (2023) propose a number of strategies that should be considered. All these strategies relate in one way or another to academic libraries becoming 'smart.' In lucid terms, 'smart' academic libraries refer to libraries that integrate advanced technology and human intelligence to improve services, methods, automation, resources, and technology to advance library services (Orji & Anyira 2021:266). Within the context of existing smart academic libraries, technology has already been used to improve services, advance methods to manage manual tasks,

automated functions such as circulation, lending and acquisition, digitised library resources, and utilised technology such as cloud computing to ensure optimal access and use of library resources.

Moving into the Library 5.0 space, more advanced management of technology and human resources are required to provide access to information, knowledge, cultural heritage, and opportunities for collaboration, creativity, and innovation. AI technology should be used to enhance library services by providing access to online resources, digital collections, and enhanced value-added user experiences (Hoque 2023:a816).

Aligned to the views of the abovementioned authors and towards advancing library services based on current trajectories, the researchers are of the opinion that the roles and responsibilities of academic information professionals should expand towards digital resource managers, digital literacy educators, collaborative and creative space makers, cybersecurity managers, ethical ambassadors, advocates for inclusive access, data scientists, and open access and open science activists. The use of a variety of existing and future AI technologies will offer opportunities for information professionals to leverage human-machine collaboration for greater societal wellbeing (Noble, Mende, Grewal, & Parasuraman 2022:202). As digital resource managers, academic librarians can utilise AI, such as the IoT, to offer extensive ranges of digital resources to support learning in current and emerging fields, such as biotechnology and nanotechnology.

Within the context of digital literacy educators, information professionals play a vital role to educate users about AI technologies, their capabilities, and limitations. This involves offering information literacy instruction sessions through virtual spaces, and using augmented technologies to help users understand and develop the ability to critically evaluate AI-generated content and the ethical implications of AI in information retrieval. As collaborative and creative makers of learning spaces, information professionals can create collaborative and flexible spaces to accommodate various learning styles and groups,

thereby fostering interdisciplinary collaboration, which is imperative in the digital era (Masenya 2023:4).

As cybersecurity managers and ethics ambassadors, information professionals should not only be responsible for monitoring data privacy, but also propose policies and standards that can be applied to security data and information that are easily accessible by AI technology. Consideration should be given to prevent advanced malware and evasion techniques, phishing, social engineering, and reverse engineering to bypass AI tools. This requires that information professionals be educated in advanced technology programmes and systems to fulfil this role (Hoque 2023:a817). Similarly, as ethics ambassadors, information professionals should be educated and be able to educate others on privacy and ethical data practices.

Information professionals must advocate for responsible data management, protection of user privacy, and the adherence to ethical principles in handling information. As ethics ambassadors, information professionals should actively participate in identifying standards and guidelines for the use of data in AI (Ankamah, Vidza, & Addo 2024:63). The consideration, development, and implementation of such standards should extend to inclusive access to AI-powered resources and services. It is the responsibility of information professionals to ensure that AI technologies and services offered with the support of such technologies, do not create or perpetuate disparities in information access.

The monitoring role of information professionals thus includes ensuring that tools such as deep learning and artificial neural networks offer access to information via speech, video, 3-D imaging, and virtual reality simulations (Li 2018:3 of 5). As advocates for open access and open science, the role of information professionals should change to advocating with students, faculty, and researchers that research outputs should be made open to support science initiatives. This links closely to the revised role of information professionals as data scientists rather than data managers. This requires information professionals to be

familiar with software related to data mining, data processing and modelling, and data visualisation.

Moving into the data science role provides information professionals with the opportunity to make libraries even more powerful sources of knowledge. As stated by Discover Data Science (2024), information professionals 'have a unique set of skills that makes them uniquely able to advise library patrons on the best practices for the collection, management, and organisation of data.' Information professionals, such as data scientists, are therefore in a unique position to usher in a new generation of data-driven insights that can be used by others interested in big data. By actively changing the current roles of information professionals to prepare them for a future where AI driven technologies may take over many current jobs, we will not only enhance the quality of library services, but also ensure an individualised, on-time, and in-demand delivery of information to support the needs of academic communities. As argued by CHELSA (2021:17), 'the efficacy of services and systems of a 21st-century academic library is contingent on the competencies and skills of its librarians.' Academic information professionals should therefore develop an array of competencies to take on new roles within the industry to advance scholarly communication, data management, data analytics, and user analytics.

Conclusions

Moving ahead of the AI curve provides a dynamic future to academic information professionals that is transformative in the way they shape technological advancements towards improved services. Learning how to use technology effectively and integrating AI technology with human expertise, creates a dynamic and multifaceted future for information professionals. Through their adaptability, expertise, and dedication to the mission of HE, information professionals are well-positioned to navigate the opportunities and challenges that exist and will be brought about by advanced AI technologies.

As technology continues to advance in IHEs, the role that information professionals will play is central in ensuring that

these institutions remain at the forefront of education, training, and research. The digital age has elevated the importance of information and the need for more accessible and interconnected engagement with a variety of information resources. Within the HE sector, where the focus is on fostering education, research, and societal development, the importance of information professionals in leading these institutions into the 5IR cannot be overemphasised. Information professionals are essential partners in the achievement of the mission of IHEs. Their expertise and advanced knowledge of managing AI-human interaction will in future be key to support academic experiences, research, innovation, and knowledge generation.

More research is required about remaining ahead of the AI curve and utilising AI technology to the advantage of offering library services and resources to promote critical thinking, knowledge creation, and innovation. As a starting point, the researchers aimed to provide a present future vision of what is expected of information professionals and what roles they need to engage in as part of Library 5.0. As limited research on the topic is currently available (cf. Noh 2022), more empirical research is needed to assess where and how information professionals feature in the changing roles of information professionals. Such research will investigate the issue in more detail and offer innovative and creative views to ensure the advancement of information professionals toward the future.

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