



# A scoping review of digital literacy, digital competence, digital fluency and digital dexterity in academic libraries' context

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## ABSTRACT

**Purpose:** The purpose of this paper is to report on a scoping review investigating the preference for using digital literacy, digital competence, digital fluency, or digital dexterity when considering continued professional skills development for academic librarians.

**Methodology:** A scoping review of peer-reviewed scholarly articles published in the English language between 2013 and 2023 (a 10-year period) was conducted. An initial 485 results were retrieved with 184 duplicates removed. 301 studies were screened based on the title, keywords, and abstract fields, 108 full-text reviews took place, with a final 61 papers included for analysis. Data were analysed using Microsoft Excel to sort, group, and further analyse and visualise the data. Thematic analysis was used to report the results.

**Findings:** The review provided valuable insights into the concepts of digital literacy, digital competence, digital dexterity, and digital fluency for the development of information professionals in academic libraries. It also identified distinctive characteristics of each of the four concepts that were reviewed.

**Originality:** The scoping review distinguishes between digital literacy, digital competence, digital fluency, and digital dexterity. It also highlights the gaps, making it clear what is required for each, including the knowledge, skills, and competencies.

**Limitations:** Several databases (Emerald Insight, ScienceDirect, and Taylor and Francis) could not be interrogated directly, however, relevant articles from these databases were retrieved, nonetheless making use of the complementary databases searched.

## Introduction

Academic libraries are primarily focused on supporting the teaching, learning, and research agendas of the institutions they are part of (Chukwueke & Idris, 2023; George, Okwu, & Ogunbodede, 2022; Owolabi et al., 2022; Yeh & Walter, 2017). Academic libraries primarily concentrate on promoting and developing users' information literacy skills. With developments in digital technologies, the focus has shifted to developing digital literacy skills as the attainment of these skills, are crucial to functioning in the 21st century (Khumalo, Rajkoomar, & Rajagopaul, 2022; Munshi, Biswas, & Barsha, 2023; Osinulu, 2021; Subaveerapandiyana & Maurya, 2021).

Advances in digital technologies (Cox, 2021; Cox, 2022) have necessitated the advancement of digital knowledge and skills (Baro, Obaro, & Aduba, 2019; Janssen et al., 2013), ranging from basic to complex (Baro et al., 2019; Secker, 2016). Artificial intelligence is a prime example of how rapidly technologies are evolving. Technology is

not the primary driving force in this context. It is rather a way of laying the foundation for the need to better understand and explain **digital literacy** (Chukwueke & Idris, 2023; Johnston, Hadley, & Waniganayake, 2020; Munshi et al., 2023; Subaveerapandiyana, Sinha, & Ugwulebo, 2022), **digital competence** (Freiman et al., 2017; Sanches, 2022), **digital fluency** (Sanches, 2022), and **digital dexterity** (O'Sullivan, Slocombe, Mckenzie, & Salisbury, 2019). There is still considerable confusion between the concepts of information literacy and digital literacy (Alabi & Mutula, 2017), with the two concepts being merged as digital information literacy (Feerrar, 2019). This confusion is exasperated by the fact that digital literacy is also sometimes used interchangeably with digital competence (Janssen et al., 2013:474; Alabi & Mutula, 2017; Coldwell-Neilson & Cain, 2019) and recently, new concepts such as digital fluency and digital dexterity have been introduced. The concepts are briefly defined as follows.

Digital literacy is the ability to find, evaluate, use, share, and create content using information technologies and the Internet (Alfida,

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Maryam, & Rianti, 2019; Subaveerapandiyani et al., 2022). It is the most basic level of understanding of digital technologies and environments and includes using the internet, for example. Digital competence is a step beyond digital literacy and is more about applying digital skills and not just possessing them. It encompasses a deeper understanding of digital tools and environments, and the use of digital technology in a more appropriate and integrated manner in various situations (Freiman et al., 2017; Sanches, 2022). This includes the use of digital tools and technologies to enhance productivity, as an example. Digital fluency represents an almost instinctive ability to use digital technologies to achieve desired outcomes (Sanches, 2022). It is a more advanced level of digital competence. Digitally fluent individuals can adapt to new technologies and use them in a variety of contexts, including their personal and professional lives. They are also able to critically evaluate digital tools and use them appropriately. Digital dexterity is the most advanced, and it is a learned ability that leads to fluency to adapt and leverage digital tools for varied purposes, including to innovate (O’Sullivan et al., 2019). It includes the ability to critically evaluate digital tools and use them in complex situations.

**Rationale and objective**

There is an abundance of literature available on digital literacy (George et al., 2022; Johnston, 2020; Khumalo et al., 2022; Lobo & Dhuri, 2021; Martzoukou, 2021; Osinulu, 2021; Thomas, 2021; Wilkes, 2016). Digital competence (Babina, Ermolovich, & Bekuzarova, 2022; Joel & Ibrahim, 2021; Khan & Bhatti, 2017; Khan & Bhatti, 2018), digital fluency (Sanches, 2022), and digital dexterity (O’Sullivan et al., 2019), appears to be less popular from an academic library perspective. The literature is limited when looking at it from the perspective of developing the skills of information professionals working in academic libraries. As academic libraries become more digitally integrated, understanding the similarities and differences implied when using these concepts becomes crucial when considering sustainable continued professional development. The objective of the scoping review is to make a distinction of the four digital concepts, to note the gaps, make it clear what is required for each, and to identify the knowledge, skills, and competencies associated with each of these terms.

**Research questions**

The question that came to mind in attempting to address the gaps identified, considering studies published between 2013 and 2023, were the following:

(RQ1) What are the differences between digital literacy, digital competence, digital fluency, and digital dexterity, or are different names being used for similar concepts?

(RQ2) How do the major characteristics of digital literacy, digital competence, digital fluency, and digital dexterity distinguish them from one another in the context of academic libraries?

(RQ3) Why is it important to identify the specific skills and competencies associated with each term, and how do they align with the evolving needs of information professionals in academic libraries?

This paper will attempt to answer the questions through a scoping review that considers the various definitions and explanations of the concepts, their differences, and the characteristics and relevance of each concept in relation to the others. This scoping review will pave the way for exploring the relationships between the concepts further and decisions on how these ‘four digitals’ can be developed in the modern academic library environment.

The methodology used for the scoping review will be discussed.

**Methods**

This study attempts to map the four concepts related to. The study is qualitative and entails conducting a scoping review of relevant

published literature. To do this, the PRISMA extension for Scoping Reviews (PRISMA-ScR) was selected as it is tailored to scoping reviews, which are used to map the evidence on a broad topic and identify main concepts, theories, sources, and knowledge gaps (Tricco et al., 2018; McGowan et al., 2020:2). Additionally, using PRISMA-ScR helps maintain a high standard of reporting and enhances the reproducibility and usefulness of the review conducted. There are several items part of the PRISMA-ScR checklist which will be included in conducting the scoping review: rationale and objectives, eligibility criteria, search strategy, selection of sources of evidence, data charting, data items, critical appraisal of individual sources of evidence, and synthesis of results.

*Eligibility criteria*

The criteria used in the literature search for the scoping review included: research focus, types of published works to be included, format, electronic databases to be searched, language of publications, and peer-review. Included studies focus on academic libraries in universities between 2013 and 2023. A decision was made to exclude 2024 as it is an ongoing year and to allow for replicability of the review, only complete years were included. Full text research outputs written in the English language and published as either electronic journal articles, conference papers, or book chapters, and are peer reviewed, were included. Studies that are not written in the English language, about schools, public libraries, or colleges, are in print, abstracts only, review articles, demonstrations, videos, or posters, are not peer-reviewed, are excluded. Publications before 2013 will also be excluded. Table 1 summarises the inclusion and exclusion criteria used to search for literature.

*Search strategy*

Relevant databases that contain literature related to digital literacy, digital competence, digital fluency, and digital dexterity and information professionals and academic libraries were identified and selected by looking at the scope and coverage of the databases. The study was conducted using the following electronic databases: EBSCOHost, Proquest, Scopus, and Web of Science Core Collection. For EBSCOHost, four (4) databases were included: Academic Search Complete, ERIC, Library & Information Science Source, and Library and Information Science & Technology Abstracts. For ProQuest, six (6) databases were searched: ERIC, Library & Information Science Abstracts (LISA), Education Database, Library Science Database, Research Library, and Social Science Database.

A comprehensive search was conducted on the selected databases to

**Table 1**  
Inclusion and exclusion criteria for literature search.

Filter	Inclusion criteria	Exclusion criteria
Research focus	Academic, public, and government libraries	School, K-12, corporate, and private libraries
Study participants	Adults, students	Children
Date range	2013–2023	Pre 2013 and post 2023
Publication type	Journal articles, conference papers	Abstracts, review articles, workshops, videos, posters, brochures, classroom guides, lecture notes, grey literature, editorials, commentaries, books, book chapters, book reviews, other
Publication type	Full text	Abstract only
Format type	Electronic	Print
Databases	<ul style="list-style-type: none"> <li>• EBSCOHost</li> <li>• Proquest</li> <li>• Scopus</li> <li>• Web of Science</li> </ul>	All others not mentioned
Language	English	Other languages other than English
Peer review	Peer-reviewed	No peer-review

find relevant results. The main keywords selected and used are digital literacy, digital competence, digital fluency, digital dexterity, information professionals, academic libraries, and professional development. Boolean operators were used to ensure that the most relevant results are retrieved and synonyms for keywords are included as far as possible if they are used instead of the selected keywords. The search string used is shown in Table 2. It was used to search in the title, abstract, and keyword fields where possible, and all fields where it was not possible to do so.

#### Selection of sources of evidence

The results were obtained after applying the inclusion and exclusion criteria to the initial search results, which were then retrieved and recorded. The results were then exported in a RIS format and imported into Covidence, which is a tool used for managing and streamlining systematic and scoping reviews, from the title and abstract screening phase up to the extraction phase. A total of 485 results were imported into Covidence from the four identified databases. Table 3 presents the initial search results imported into Covidence, along with the duplicates removed by Covidence, resulting in the results included for initial title and abstract screening.

One hundred and eighty-four (184) duplicates in total were removed with 168 identified by Covidence and another 16 identified manually. The removal of additional duplicates meant that 301 studies underwent title and abstract screening with 193 studies excluded and 108 studies included for full-text screening. Although some of the search terms appeared in the title, abstract, and keywords in three of the four databases searched – Web of Science allowed for an ‘all fields’ search, not all the results were relevant as they focused on media literacy, information literacy, visual literacy, and other topics in higher education that are irrelevant to the study, as well as the full-text not being available. This led to a further 47 full-text papers being excluded, and the final number of papers included for further analysis was 61 papers. A list of the 61 full-text studies were included for extraction. Fig. 1 illustrates the complete process of data identification, screening, and inclusion for the scoping review.

#### Data charting and data items

The 61 papers extracted from Covidence were exported for further analysis. Covidence as previously stated, is a tool for managing and streamlining systematic and scoping reviews. The data extracted from the papers were organised in an Excel Spreadsheet with the following fields: Article title, Authors, source title, year, country in which the study conducted, aim of study, type of study, study design, data collection methods, population description, method of recruitment of participants, definitions of the concepts, characteristics identified for the four concepts, and keywords related to the four concepts. The data from the extracted studies were collated using categories determined by the researchers while some of the data were mapped and represented visually.

#### Synthesis of results

This study, as explained, sought to map the differences between digital literacy, digital competence, digital fluency, and digital dexterity, if any, and to provide evidence if different names are being used for the same concept. Additionally, the study sought to highlight the major characteristics of the four concepts mentioned to distinguish them,

**Table 2**

Search string used to search for literature.

[("digital literac\*\*") OR ("digital competen\*\*") OR ("digital fluen\*\*") OR ("digital dexter\*\*")] AND [("higher education libraries") OR ("academic libraries") OR ("university libraries") OR ("research libraries")]

**Table 3**

Initial search results, duplicate removal and included studies in title and abstract screening.

Database	Initial search results	Records limited to inclusion criteria	Duplicates removed
EBSCOHost	178	118	60
Proquest	140	102	38
Scopus	86	16	70
Web of Science Core Collection	81	81	0
Total results	485	317	168

should it be proven that they are different concepts. This meant finding themes in the data through the recurrence of words and phrases in the extracted data with a focus on the definitions, characteristics, and findings of the studies.

#### Results

This study's focus was to differentiate between digital literacy, digital competence, digital fluency, and digital dexterity, and identifying the main characteristics that distinguish them from each other. Many the papers focus on digital literacy, which some noting the confusion between digital literacy and digital competence. This validates the study in its attempt to make a distinction between the concepts to make them less confusing, especially when attempting to develop each of the skills and competencies. Although the focus of the study is on academic libraries, a decision was made by the researchers to also include literature in public and government libraries, where the audience was not children, in order to ensure that all relevant definitions and characteristics are included.

The selected papers that were extracted for analysis were published in 34 unique titles which were either journals or conference proceedings. There were 26 unique journal titles and 8 conference proceedings. Of the 26 unique titles, 48 of the 61 papers were published in these titles while 13 were in conference proceedings.

There were 34 source titles in total, with most papers published in the journal *Library Philosophy and Practice*. The most popular source which published most of the included papers was *Library Philosophy and Practice* (15/61; 24.5 %), followed by *IATUL Annual Conference Proceedings* (6/61), *Global Knowledge Memory and Communication* (3/61), *Qualitative & Quantitative Methods in Libraries* (3/61), *Digital Library Perspectives* (2/61), *Journal of Siberian Federal University - Humanities and Social Sciences* (2/61), *Journal of the Australian Library and Information Association* (12/61), and *Pakistan Library & Information Science Journal* (2/61). *IATUL Annual Conference Proceedings* is the only conference proceedings that had more than one paper published. The rest of the conference proceedings and journal titles had only one paper published in them. Most of the papers are focused on digital literacy and academic libraries, which is relevant to the study.

Many of the papers were published between 2019 and 2022, with fewer in 2013, 2015, and 2016. Surprisingly, there were no studies included that were published in 2014. Graph 1 below shows a breakdown of the papers by publication year.

The researchers were interested in knowing which countries and/or regions published studies related to the four concepts being investigated. This was in an attempt to see whether the definitions and characteristics that are to be identified were being formulated from a developed or developing country perspective. Surprisingly, the country that published the most studies was Nigeria (13/61; 21 %) which is a developing African country. Australia had the second most studies (10/61; 16 %), then

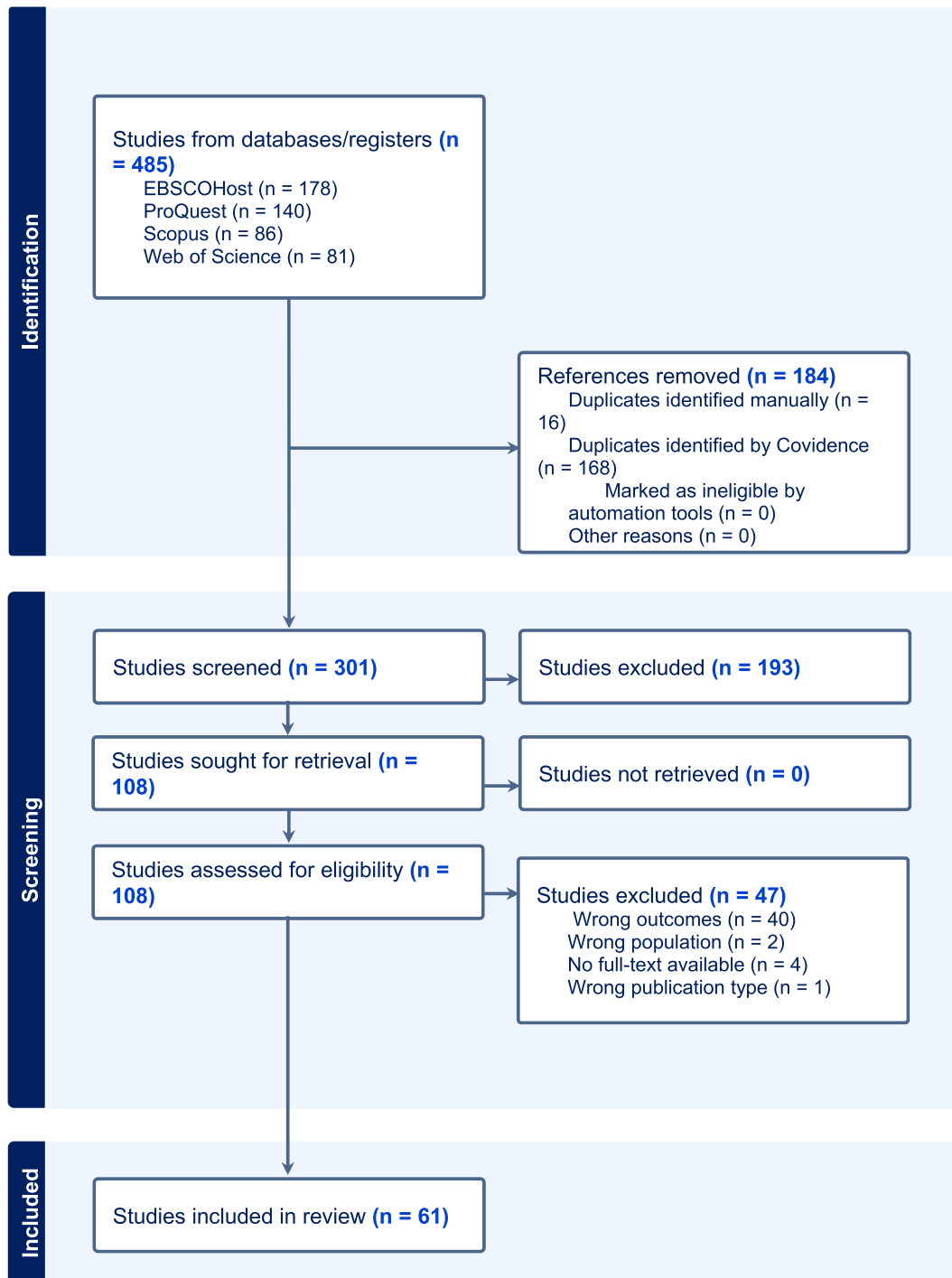


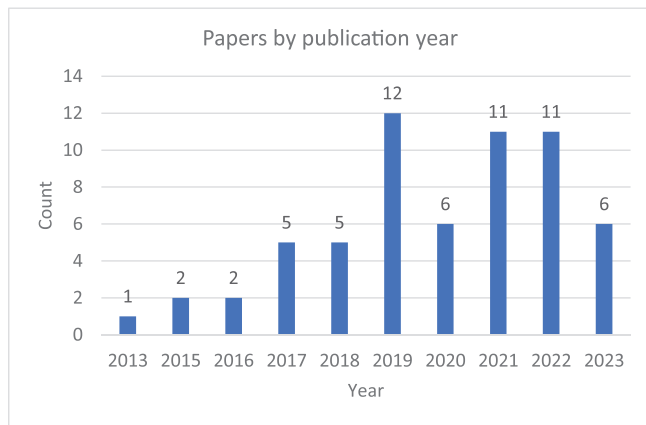
Fig. 1. PRISMA-ScR scoping review process.

India and the United Kingdom (5/61; 8 %), Pakistan (4/61; 7 %), United States of America (3/61; 5 %), Russia, Africa, Ukraine, Jordan, and Portugal (2/61; 3 %). Other countries that had papers published, had 1 paper each. 2 studies were unspecified. In total, 21 countries and regions were represented.

The most popular research design used in the studies was qualitative research (27/61; 44 %) followed by quantitative research (13/61; 21 %), and mixed methods research (9/61; 15 %). Other studies not included in the three mentioned designs were classified as unspecified as their designs were not made explicit in their methods by the authors of the papers. The data collection methods were online questionnaire (19/61; 31 %), print questionnaire (6/61; 10 %), literature review (4/61; 7 %),

semi-structured interviews (4/61; 7 %), online survey (3/6; 5 %), a combination of a questionnaire and interviews, and reflections (2/61; 3 %). The following methods were used only once: correlational research, descriptive study, experiment, focus groups, interviews and lab observations, online discussions, environmental scan, focus groups, and liaison, semi-structured interviews, focus groups, and observations, and interviews (unspecified). 12 studies had no data collection methods noted and were classified as unspecified.

In terms of the population, similar populations such as academic librarians, university librarians, higher education librarians, and library and information professionals, were grouped together as they refer to the same or similar populations. The population studied in the extracted



Graph 1. Extracted papers by publication year.

papers was mainly academic librarians (23/61; 38 %) followed by students (16/61; 26 %) who were also grouped into one for both undergraduate and postgraduate students as some populations only said university students. There were also academics (3/61; 5 %), teachers (3/61; 5 %), library staff and university community (1/61; 2 %), various experts (1/61; 2 %), tutors (1/61; 2 %), academic and professional staff (1/61; 2 %), academics and students (1/61; 2 %), and university staff (1/61; 2 %). There were studies whose population was unspecified (5/61; 8 %).

Most of the studies extracted primarily focused on the concept of digital literacy (48/61; 79 %), followed by digital competence (9/61; 15 %), digital fluency (2/61; 3 %), digital literacy skills and competencies (1/61; 2 %) and digital skills and competencies (1/61; 2 %). Unsurprisingly, there were no studies on digital dexterity included in the scope of academic libraries.

The main focus of each of the studies extracted were categorised by reading the aims and findings of each of the studies. These were grouped further where similar items were detected and only unique focus' were used in creating the categories, after which, the categories were presented visually as seen in Graph 2.

Digital literacy programme development and assessment was the most popular focus of the studies extracted (8/61; 13 %), followed by

digital competence development (7/61; 11 %), and levels of digital literacy of librarians (7/61; 11 %). Other popular study focus included digital literacy framework development (6/61; 10 %), digital literacy skills identification and assessment (5/61; 8 %) and levels of digital literacy of students (5/61; 8 %), 21st century librarianship skills (4/61; 7 %), and digital literacy skills for library use (3/61; 5 %). The remaining 16 studies' focus appeared once or twice and accounted for (16/61; 26 %) 26 % of the total studies. Although only one of the studies was primarily focused on defining digital competence which is a focus for the current study, the extracted data from the studies included definitions and characteristics to a great extent. Only (7/61; 11 %) of the studies did not include definitions while (3/61; 5 %) did not mention characteristics of the concepts.

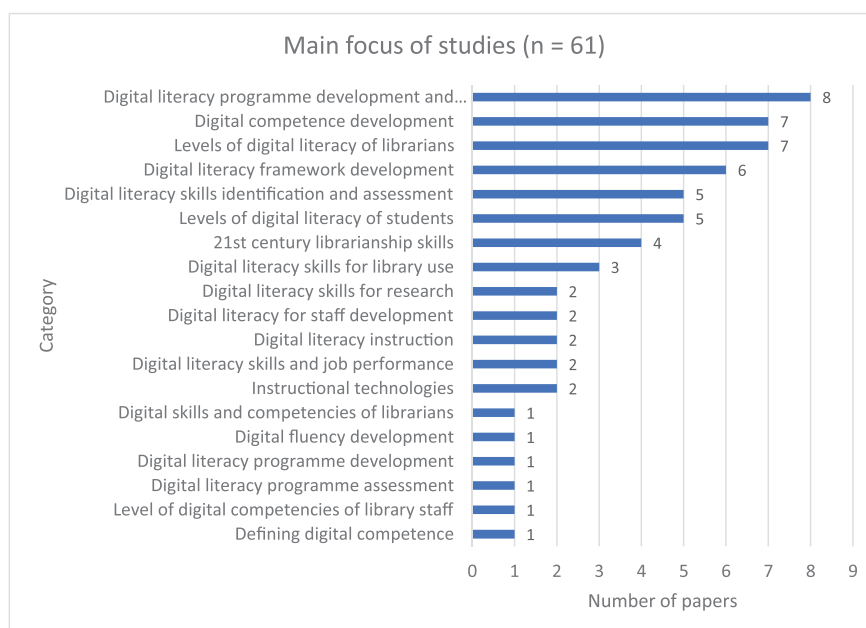
Definitions of the four identified digital concepts

Each paper was analysed to extract details about the definitions of the four concepts identified for the study. For each paper, the authors extracted definitions related to digital literacy, digital competence, digital fluency, and digital dexterity. This included definitions of digital skills, digital skills and competencies, information and digital literacy, digital literacies, and digital competencies.

Digital literacy definitions

It was noted that there is no clear distinction between digital literacy and digital competence (Alabi & Mutula, 2017), although Baro et al. (2019) and Okeji, Tralagba, and Obi (2019) regard them as two distinct concepts. Grant, Little and Horn (2017) acknowledge that there is no universally accepted definition of digital literacy. This is evident in the analysis of definitions of the concept that were found in the included studies. A few studies mentioned Gilster's, 1997 definition of digital literacy, which is "the ability to access networked computer resources and use them" (Gilster, 1997). Several definitions of digital literacy were found in several of the studies. The definitions are listed in Table 4 below.

Baro et al. (2019) and Okeji, Tralagba, and Obi (2020) define digital literacy as the ability to comprehend and use information in various formats from a variety of sources available on digital devices and effectively performing tasks in digital environments. Zan, Çolaklar, Altay, and Taskin (2021) defined it as the awareness, attitudes, and



Graph 2. Main focus of extracted studies.

**Table 4**  
Digital literacy definitions.

Definitions of digital literacy	Sources
The ability to search, locate, navigate, critically think, evaluate, create, and communicate information using various digital media	(Alfida et al., 2019; Breen, Waters, & O'Shea, 2023; Esh & Ghosh, 2021; Igbo, 2020; Krishnamurthy & Shettappanavar, 2019; Maharaj, Kanadia, & Tandel, 2021b; Obinyan & Ikechukwu, 2022; Wilkes, 2016)
The use and understanding of digital technologies	(Agina-Obu & Okwu, 2023; Kiel, O'Neil, Gallagher, & Mohammad, 2015)
Performing tasks effectively in digital environments	(George et al., 2022; Khan & Waheed, 2015; Subaveerapandiyam & Maurya, 2021)
Capabilities necessary for living, learning, and working in a digital society	(Shalavin, 2017; Wilkes, 2016)
The ability to discover and retain information critically, continuous development, and awareness of author rights and authoritative sources	(Fakunle, Bakare, & Adeyeye, 2022; Grant, 2017)
Information literacy using technologies	(Coldwell-Neilson & Cain, 2019)

ability to use digital tools and resources, construct new knowledge, create content, share information, critically appraise information using digital technologies, and critically reflect on the process. Chukwueke and Idris (2023) refer to it as “an umbrella framework of skills, knowledge and ethics” and further state that it encompasses other literacies such as photo-visual, reproduction, branching, information, and socio-emotional literacy. An example would be the ability to use the internet and access and retrieve information sources that exist online.

#### Digital competence definitions

Babina et al. (2022) describe competence as the knowledge and experience needed for effective professional activities, and it is linked to an individual's personal qualities. In analysing the papers, different descriptions of digital competence or digital competencies were also being described as digital skills and competencies (Ahmed & Rasheed, 2020; Ukwoma, Iwundu, & Iwundu, 2016; Usman, 2021). It was reported in some of the papers that there is no clear definition of digital competence (Freiman et al., 2017; Okeji et al., 2020) although there are common elements in the definitions. It was also noted that digital literacy and digital competence are sometimes used interchangeably (Alabi & Mutula, 2017; Coldwell-Neilson & Cain, 2019).

Despite this, several definitions were found in the papers that were analysed. These include the ability to use various technologies, understanding the critical and evaluative dimensions of their use, and creatively using the technologies to improve content management and communication skills (Freiman et al., 2017). Others mention a set of knowledge, skills, attitudes, capabilities, and awareness in using digital technologies for performing digital tasks and managing, creating, and sharing digital content (Khan & Bhatti, 2018; Martzoukou, Fulton, Kostagiolas, & Lavranos, 2020). Lastly, as the safe, critical, and creative use of technologies in everyday life and for participation in society (Sanches, 2022). This would include, for example, utilising digital tools and technologies to enhance productivity.

#### Digital fluency definitions

Only six of the 61 extracted studies mentioned digital fluency and contained usable information that could be used for this review. Only three of the papers described digital fluency. Digital fluency is described as the competence and confidence to use any digital technology and the understanding that digital skills obtained for participation in one environment can be transferred to another with ease (Coldwell-Neilson & Cain, 2019). It also relates to moving from being a consumer to a creator in digital environments. It is also reported that digital fluency is based on information features, its interpretation, and its good use (Sanches, 2022;

Sanches & Baptista Melo, 2022). An example of digital fluency is being able to evaluate digital tools and use them appropriately, as well as adapt to new technologies and apply them in various contexts.

#### Digital dexterity definitions

Three of the 61 studies had some descriptive information on digital dexterity. Two of the three papers provided a definition or description of the concept. Shalavin (2017) and O'Sullivan et al. (2019) highlighted that at face value, digital dexterity is seemingly the same as digital literacy and are sometimes used interchangeably. Digital dexterity is defined as “a learned ability that leads to fluency in collaboration, adaptability, analytical thinking, and creativity” (O'Sullivan et al., 2019). Digital dexterity for example allows can lead to innovation. This may be a product of having to use digital tools and technologies in complex situations and having to device a new solution for a problem.

#### Characteristics of the four digital concepts

The second part of this study was to look at the characteristics of the four identified digital concepts in the context of academic libraries. This led to the authors perusing the papers to identify characteristics, including knowledge, skills, competencies, and attitudes linked to the four concepts. The occurrence of each characteristic identified was counted, recorded, and analysed.

#### Characteristics of digital literacy

Several characteristics were reported in the papers which are linked to the concept of digital literacy. The identified characteristics we analysed thematically, and the occurrence of each characteristic was counted and is presented in Table 5 below.

A total of 58 characteristics related to digital literacy were identified. The characteristics with 3 or more occurrences are named in the results and are presented in Table 5 above with the sources which mentioned them. The use of digital technologies is reportedly the most important characteristic of digital literacy. This is followed by context-specific knowledge, searching, and content creation.

Evaluating, communication, computers, accessing information using digital technologies, information literacy, rights management, analysing information, innovation, and media literacy were also noted.

Participation, integration, retrieval, lifelong learning, management, metadata development, location, and interpretation of information were also noted, along with 29 other characteristics.

Table 6 summaries the skills and competencies mentioned above. The table also provides the proficiency level, and any pre-requisites for proficiency development.

#### Characteristics of digital competence

Several digital competence characteristics were recorded and analysed for the review. In total, there are 58 characteristics, with 36 being mentioned only once in the analysed papers. Only ten studies had words that appeared three or more times and 12 words appeared twice in the text. These results are presented in Table 7 below.

Knowledge-based competencies are the most important when becoming digital competent. This is followed by communication, effective use of digital technologies, lifelong learning, problem solving, personality, and collaboration.

The application and critical use of digital technologies also came across as important characteristics. Media literacy, security, digital content creation, application of digital technologies, leadership, continuous, evaluation of digital technologies, information literacy, awareness, and confidence, were also noted as crucial for digital competence.

Table 8 summarises the digital competence skills and competencies, the proficiency level, and the pre-requisites for development.

**Table 5**  
Characteristics of digital literacy.

Digital literacy characteristics	Sources
The use of digital technologies	(Agina-Obu & Okwu, 2023; Alfida et al., 2019; Baro et al., 2019; Friday & Onuh, 2022; Hallam, Thomas, & Beach, 2018; Harati, Rahmatizadeh, & Valizadeh-Haghi, 2018; Horn & Reynolds, 2018; Kelly, 2019; Khan & Bhatti, 2017; Khan & Waheed, 2015; Krishnamurthy & Shettappanavar, 2019; Lobo & Dhuri, 2021; Maharaj, Kanadia, & Tandel, 2021a; Munshi et al., 2023; Obinyan & Ikechukwu, 2022; Osinulu, 2021; Pendell, Withers, Castek, & Reder, 2013; Sanches, 2022; Shalavin, 2017; Soltovets, Chigisheva, & Dmitrova, 2020; Ukwoma et al., 2016; Zan et al., 2021)
Context-specific knowledge	(Alabi & Mutula, 2017; Baro et al., 2019; Chukwueke & Idris, 2023; Fakunle et al., 2022; Grant, Bazela, & Little, 2019; Horn & Reynolds, 2018; Khan & Waheed, 2015; Khumalo et al., 2022; Lobo & Dhuri, 2021; Munshi et al., 2023; Osinulu, 2021; Pendell et al., 2013; Shalavin, 2017; Soltovets et al., 2020; Ukwoma et al., 2016; Wilkes, 2016)
Searching	(Alabi & Mutula, 2017; Baro et al., 2019; Chukwueke & Idris, 2023; Harati et al., 2018; Horn & Reynolds, 2018; Ibacache, Koob, & Vance, 2021; Munshi et al., 2023; Pendell et al., 2013; Soltovets et al., 2020; Ukwoma et al., 2016; Wilkes, 2016)
Content creation	(Alabi & Mutula, 2017; Baro et al., 2019; Chukwueke & Idris, 2023; Harati et al., 2018; Krishnamurthy & Shettappanavar, 2019; Munshi et al., 2023; Soltovets et al., 2020; Wilkes, 2016)
Evaluating	(Breen et al., 2023; Chukwueke & Idris, 2023; Fakunle et al., 2022; Grant et al., 2019; Hallam et al., 2018; Harati et al., 2018; Ibacache et al., 2021; Krishnamurthy & Shettappanavar, 2019; Pendell et al., 2013; Shalavin, 2017; Subaveerapandiyani et al., 2022)
Communication	(Alfida et al., 2019; Fakunle et al., 2022; Harati et al., 2018; Ibacache et al., 2021; Krishnamurthy & Shettappanavar, 2019; Lobo & Dhuri, 2021; Maharaj et al., 2021a; Soltovets et al., 2020; Wilkes, 2016)
Computer literacy	(Ahmed & Rasheed, 2020; Kelly, 2019; Lobo & Dhuri, 2021; Osinulu, 2021; Pendell et al., 2013; Ukwoma et al., 2016)
Accessing information using digital technologies	(Ahmed & Rasheed, 2020; Grant et al., 2019; Maharaj et al., 2021a; Usman, 2021; Zan et al., 2021)
Information literacy	(Ahmed & Rasheed, 2020; Chukwueke & Idris, 2023; Coldwell-Neilson & Cain, 2019; Kelly, 2019)
Rights management	(Ibacache et al., 2021; Khumalo et al., 2022; Munshi et al., 2023)
Analysing information	(Hallam et al., 2018; Soltovets et al., 2020; Wilkes, 2016)
Innovation	(Alfida et al., 2019; Grant et al., 2019; Harati et al., 2018)
Media literacy	(Alfida et al., 2019; Pendell et al., 2013; Ukwoma et al., 2016)

**Table 6**  
Digital literacy skills and competencies.

Concept	Required skills	Required competencies	Level	Pre-requisite(s)
Digital literacy	Using digital technologies Creating content Searching and Evaluating information	Retrieving and Sharing information Communication Collaboration Critical thinking	Basic	Context-specific knowledge Computer literacy Information literacy Media literacy

**Table 7**  
Characteristics of digital competence.

Digital competence characteristics	Sources
Knowledge-based competencies	(Babina et al., 2022; Baro et al., 2019; Baryshev, Kasyanchuk, Tsvetochkina, & Babina, 2021; Breslavets & Hlavcheva, 2022; Hamad, Al-Fadel, & Shehata, 2023; Khan & Bhatti, 2017; Khan & Bhatti, 2018; Okeji et al., 2020; Osinulu, 2021)
Communication	(Babina et al., 2022; Baro et al., 2019; Baryshev et al., 2021; Freiman et al., 2017; Hlavcheva, Odnovolykova, & Novosolova, 2022; Joel & Ibrahim, 2021; Martzoukou, 2020; Sanches, 2022)
Effective use of digital technologies	(Freiman et al., 2017; Hamad et al., 2023; Khan & Bhatti, 2018; Khan & Waheed, 2015; Usman, 2021)
Lifelong learning	(Hlavcheva et al., 2022; Kelly, 2019; Khan & Waheed, 2015; Ukwoma et al., 2016)
Problem solving	(Freiman et al., 2017; Hlavcheva et al., 2022; Khan & Waheed, 2015; Martzoukou, 2020)
Personality	(Ahmed & Rasheed, 2020; Babina et al., 2022; Baryshev et al., 2021; Joel & Ibrahim, 2021)
Collaboration	(Freiman et al., 2017; Hlavcheva et al., 2022; Martzoukou, 2020; Sanches, 2022)
Application of digital technologies	(Babina et al., 2022; Khan & Waheed, 2015; Sanches, 2022)
Critical use of digital technologies	(Hlavcheva et al., 2022; Osinulu, 2021; Sanches, 2022)
Media literacy	(Hlavcheva et al., 2022; Martzoukou, 2020)
Security	(Hamad, Al-Fadel, & Fakhouri, 2021; Khan & Bhatti, 2017)
Digital content creation	(Freiman et al., 2017; Hlavcheva et al., 2022)
Application of digital technologies	(Babina et al., 2022; Hamad et al., 2023)
Leadership	(Babina et al., 2022; Joel & Ibrahim, 2021)
Continuous development	(Baryshev et al., 2021; Khan & Bhatti, 2018)
Evaluation of digital technologies	(Baro et al., 2019; Freiman et al., 2017)
Information literacy	(Hlavcheva et al., 2022; Martzoukou, 2020)
Awareness	(Igbo, 2020; Khan & Bhatti, 2018)
Confidence	(Hlavcheva et al., 2022; Osinulu, 2021)

*Characteristics of digital fluency*

Digital fluency had less identifiable characteristics compared to digital literacy and digital competence. There were only 12 unique characteristics that were found through the analysis of the papers. Half of the characteristics were mentioned once while the other 6 were mentioned twice. Table 9 shows the results of the thematic analysis of the content on digital fluency.

Ethical use of information, author rights, privacy rights, good interpretation and use of information, safety, and seamless participation in digital environments are recorded as being most important for one to be considered or to become digitally fluent. The other characteristics include digital collaboration (Sanches, 2022), intuitive use of technologies for content creation (Ince et al., 2019), adaptive use of digital skills in different environments (Ince et al., 2019), seamless and intuitive use of digital technologies (Sanches & Baptista Melo, 2022), and competence and confidence in using any technology (Ince et al., 2019).

Table 10 summarises the above-mentioned digital fluency skills and competencies, level, and pre-requisites for development.

*Characteristics of digital dexterity*

Only two of the three papers which were identified on digital dexterity, were analysed because only two of them contained some characteristics of digital dexterity. Ten characteristics were identified through the analysis of the papers, and these were grouped thematically and represented visually in Graph 3 below.

Personal and professional value optimisation (Coldwell-Neilson & Cain, 2019; O’Sullivan et al., 2019) and leveraging and innovating with media, information and technology (Coldwell-Neilson & Cain, 2019; O’Sullivan et al., 2019) are the most important characteristics of becoming digitally dexterous. Identifying and addressing gaps in digital

**Table 8**  
Digital competence skills and competencies.

Concept	Required skills	Required competencies	Level	Pre-requisite(s)
Digital competence	Communication Effective use of digital technologies Problem solving Application of digital technologies Critical use of digital technologies Evaluation of digital technologies Digital content creation	Lifelong learning Personality Collaboration Safety and security Leadership	Intermediate	Knowledge-based competencies Media literacy Information literacy Digital literacy Continuous development Situational awareness

**Table 9**  
Characteristics of digital fluency.

Digital fluency characteristics	Sources
Ethical use of information	(Sanches, 2022; Sanches & Baptista Melo, 2022)
Author rights	(Sanches, 2022; Sanches & Baptista Melo, 2022)
Privacy rights	(Sanches, 2022; Sanches & Baptista Melo, 2022)
Good interpretation and use of information	(Sanches, 2022; Sanches & Baptista Melo, 2022)
Safety	(Sanches, 2022; Sanches & Baptista Melo, 2022)
Seamless participation in digital environments	(Coldwell-Neilson & Cain, 2019; Ince, Hoadley, & Kirschner, 2019)

fluency, higher-order knowledge, digital fluency, forward thinking, fluency in critical thinking, fluency in analytical thinking, fluency in adaptability, and fluency in collaboration (O’Sullivan et al., 2019), have also been identified as characteristics of digital dexterity.

Table 11 summarises the above-mentioned digital dexterity skills and competencies, level, and pre-requisites for development.

Table 12 below summarises the characteristics, including distinctive features, skill level and pre-requisites of each of the four concepts being reviewed. The items with bold crosses indicate skills/competencies that

**Table 10**  
Digital fluency skills and competencies.

Concept	Required skills	Required competencies	Level	Pre-requisite(s)
Digital fluency	Ethical use of information Author and privacy rights Good interpretation and use of information Safety Digital collaboration Digital communication Intuitive use of technologies for content creation	Seamless participation in digital environments Adaptive use of digital skills in different environments Seamless and intuitive use of digital technologies	Advanced	Digital competence Confidence in using any technology Continuous professional development

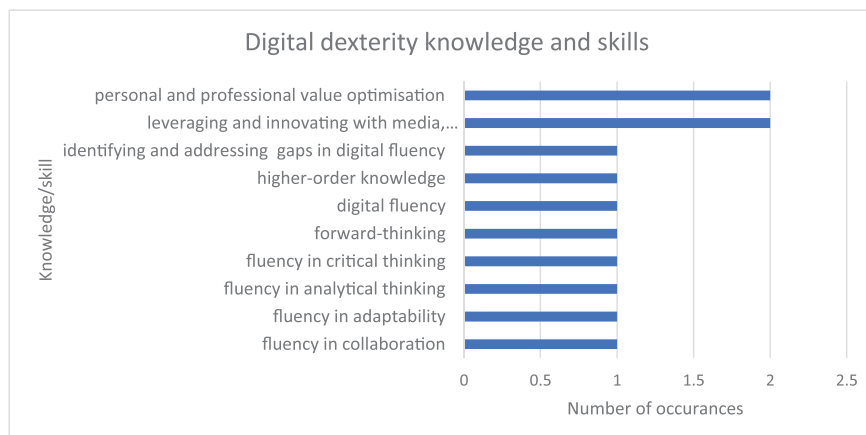
cut across two or more of the concepts, showing an overlap. These characteristics will be reported on in the ensuing discussion.

The matrix was further analysed to create a Venn diagram to show the skills and competencies that can only be developed for each concept, the overlapping skills and competencies for each of the concepts and how they integrate into the development of the next concept’s skills and competencies (Fig. 2).

**Discussion**

This scoping review intended to distinguish between digital literacy, digital competence, digital fluency, and digital dexterity. It was not possible to clearly distinguish between the concepts. For example, digital literacy and digital competence are used interchangeably by some authors, while others make a distinction between the two concepts. There is also no clear definition for digital literacy as its definition seems to be context-specific, as reported in the papers reviewed. A large number of the studies in academic libraries focused on digital literacy, fewer explored digital fluency, and none on digital dexterity. Digital literacy programme development and assessment were the most popular focus of the studies that were analysed.

When it came to defining the concepts, it was found that there are differences and overlaps between the four concepts studied, with the differences being crucial for creating targeted developmental



**Graph 3.** Characteristics of digital dexterity.

**Table 11**  
Digital dexterity skills and competencies.

Concept	Required skills	Required competencies	Level	Pre-requisite(s)
Digital dexterity	Leveraging and innovating with media, information and technology Fluency in critical thinking Fluency in analytical thinking Fluency in adaptability Fluency in collaboration	Identifying and addressing gaps in digital fluency Forward-thinking	Advanced	Digital fluency Personal and professional value optimisation Higher-order knowledge

**Table 12**  
Digital literacy, digital competence, digital fluency, and digital dexterity skills and competencies matrix.

Skills/competencies	Digital literacy (basic)	Digital competence (intermediate)	Digital fluency (advanced)	Digital dexterity (advanced)
Adaptability				X
Adaptive use of digital skills in different environments			X	
Analytical thinking				X
Collaboration	X	X	X	X
Communication	X	X	X	
Creating content	X			
Critical thinking	X			X
Critical use, evaluation, and application of digital technologies		X		
Digital content creation		X		
Effective use of digital technologies		X		
Ethical use of information			X	
Forward-thinking				X
Good interpretation and use of information			X	
Identifying and addressing gaps in digital fluency				X
Leadership		X		
Leveraging and innovating with media, information, and technology				X
Lifelong learning		X		
Problem solving		X		
Safety			X	
Safety and security		X		
Seamless and intuitive use of digital technologies			X	
Seamless participation in digital environments			X	
Searching, evaluating, retrieving, & sharing information	X			
Using digital technologies	X			

programmes and enhancing the skills and competencies of information professionals in academic libraries. The variances reflect the evolution of the digital landscape and the varying perspectives of researchers across different regions and countries of the world. Digital literacy definitions and descriptions were abundant, with reports of ambiguity between information literacy and digital literacy and no clear definition of digital literacy. The findings of this review echo the sentiment that there is no universally accepted definition of digital literacy and that it ranges from mere access and use of digital tools to more complex skills, such as critical thinking and content creation in digital environments. However, the characteristics of the concept are distinctive and will be discussed.

The authors acknowledge that it creates useful and functional educational and developmental frameworks in academic libraries. Digital competence was featured less than digital literacy in the studies, and it is defined similarly by different authors.

*Usable insights for practitioners*

Digital competence refers to the knowledge and skills required to utilize digital technologies effectively. Unlike digital literacy, which is often centred around operational skills, digital competence is more focused on the strategic and creative application of digital technologies. It is more aligned with professional and personal efficiency in performing tasks in digital environments. Although Digital fluency and digital dexterity are the least explored in relation to academic libraries. The two concepts imply an advanced integration and complexity in digital interactions. Digital fluency, from the papers reviewed, is the seamless and proficient use of technologies, and it suggests transitioning from being a user to a creator. Digital dexterity, although defined similarly to digital fluency, emphasises adaptability and innovative application of digital technologies, going beyond fluency and towards transformative digital engagement.

The characteristics of the four concepts were thematically analysed to enrich the understanding of each concept. Digital literacy characteristics include operational skills such as using digital technologies, searching, evaluating, retrieving, and sharing digital content, collaboration, communication, critical thinking and content creation. These fundamental skills are crucial for effective functioning in digital environments. In contrast, digital competence characteristics not only include operational proficiency but also strategic and creative capabilities such as problem-solving, leadership, and continuous development. These are especially important for career development and progression, as well as personal development in the digital age. The characteristics of digital fluency include ethical use and privacy rights, highlighting the importance of understanding and navigating digital environments in a responsible manner while demonstrating proficiency. On the other hand, digital dexterity's characteristics such as leveraging technology for innovation, and identifying and addressing digital fluency gaps, suggest a transformative approach to digital interactions, and moves beyond digital fluency.

Fig. 3 shows the progression from digital literacy up to digital dexterity and the roles which the information professionals would have when moving between digital literacy to digital dexterity, and digital dexterity to digital literacy.

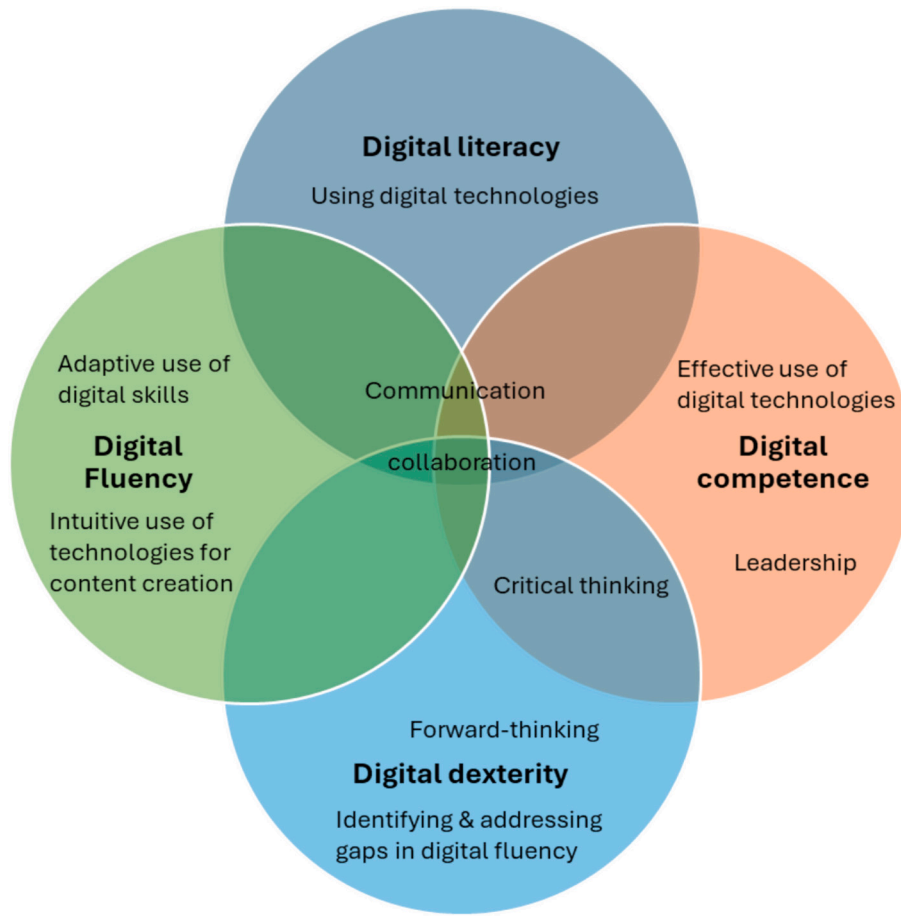


Fig. 2. Prioritisation of skills and competencies, and integration of the four digital concepts.

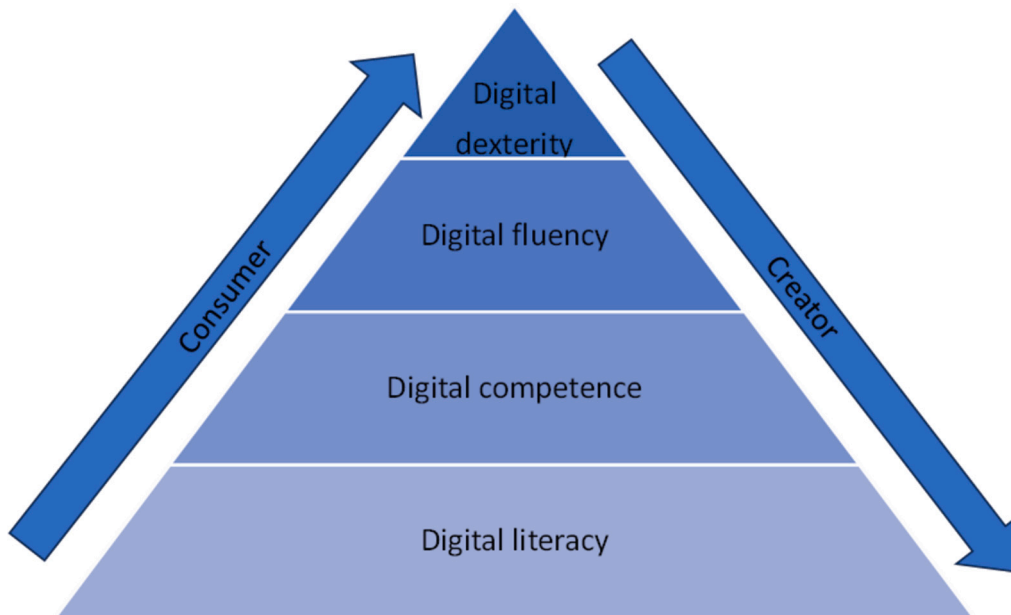


Fig. 3. Digital progression model.

**Limitations**

Several databases (Emerald Insight, ScienceDirect, and Taylor and Francis) were excluded due to their limited search functionality features,

which did not allow for the combination of searches, longer searches, and/or limited inclusion and exclusion functionality. This impeded the researchers from conducting proper searches and limiting the results according to the inclusion and exclusion criteria in the initial screening

phase, retrieving many results which would not have been possible to extract and analyse further. The researchers acknowledge that there may be potential biases in the selection of sources, the search strategy may be limited, and the exclusion of non-English results may result in the omission of relevant studies. However, the researchers are of the view that the limitations noted will not affect the study adversely.

## Conclusion

This scoping review was undertaken with the goal of differentiating and defining digital literacy, digital competence, digital fluency, and digital dexterity. From the findings, it is clear that although there is an overlap in the terminologies used and their use in different contexts, the inclusion of literature in non-library contexts has enhanced the comprehensiveness of delineating the concepts. For academic libraries, these findings have profound implications, clearly distinguishing between the four digital concepts. This allows for more targeted staff development interventions and resource allocation. This review further advances the information professionals in the academic library field's understanding of digital literacy, digital competence, digital fluency, and digital dexterity, providing a foundation for future educational initiatives, interventions, framework development, and policy making. Furthermore, through targeted staff development, information professionals can become digitally competent, fluent, and potentially dexterous, and move from being consumers to creators. By clarifying these concepts and identifying their related characteristics, including the skills, knowledge, attitudes, and competencies required, not only does the study aid curriculum development but also enhances the strategic professional development of information professionals. This will ultimately foster more effective and innovative digital engagements and programmes across academic libraries, leading to more digitally literate and capable users, and creators.

Future research can be focused on refining and operationalising the distinctions between the four digital concepts in academic library contexts. This can be done through targeted staff development interventions, curriculum design and redesign, and policy making that can help information professionals progress from digitally literate consumers to digitally dexterous creators.

## CRedit authorship contribution statement

**Lesego Makhafola:** Writing – original draft, Visualization, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Martha J. van Deventer:** Writing – review & editing, Validation, Supervision. **Marlene A. Holmner:** Writing – review & editing, Supervision. **Brenda van Wyk:** Writing – review & editing, Validation.

## Declaration of competing interest

We have nothing to declare.

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## Data availability

The data for this research is available open access at: <https://researchdata.up.ac.za>. DOI: 10.25403/UPresearchdata.28376330

[A scoping review of digital literacy, digital competence, digital fluency and digital dexterity \(Original data\) \(Figshare\)](#)

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