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Assessing digital preservation training needs in cultural heritage institutions in Saudi Arabia

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Abstract

Introduction. We discuss an investigation into the digital preservation training needs of Saudi Arabia's cultural heritage institutions, where digital preservation is in its infancy. Assessing training needs is vital to provide programmes tailored to digital preservation specialists' distinctive needs.

Method. An exploratory qualitative case study design was chosen, involving selected managers and practitioners from relevant Saudi cultural heritage institutions. In this paper we report on the online survey with King Abdulaziz Foundation for Research and Archives (Darah), King Abdul Aziz Public Library, King Fahad National Library, Saudi National Centre for Archives and Records, Makkah Centre for Archives and Records, King Abdullah University Library.

Analysis. Data from 37 survey respondents were analysed using the statistical package SPSS and Braun and Clarke's six steps for thematic analysis; NVivo software was used to assist with coding and themes development.

Results. Findings help fill a regional gap in a predominantly Western-centric literature on digital preservation training and offer insights for cultural heritage information management and international digital humanities research.

Conclusion. To safeguard long term preservation of cultural heritage, training needs of digital preservation specialists in Saudi Arabia and beyond must be adequately addressed, planned for, financially and institutionally supported, adequately communicated, and promoted.

Introduction

Digital preservation is about '*maintaining the semantic meaning of the digital object and its content, about maintaining its provenance and authenticity, about retaining its 'interrelatedness", and about securing information about the context of its creation and use*' (Ross, 2012, p. 45). Over the last thirty years various approaches, policies, technologies, and collaborations have been developed around this relatively new interdisciplinary area (Kilbride, 2019), including in the field of cultural heritage. Cultural heritage information is increasingly being digitised, created born-digital, accessed, and shared in digital forms (Ruthven and Chowdhury, 2014). However as noted by Rieger, Schonfeld, and Sweeney (2022), '*the diversity of approaches to ensure long-term access to digital content - while a strength - can challenge the imperative to maintain high standards*' (Rieger, Schonfeld, Sweeney, 2022, p. 5).

The importance of supporting documentary heritage preservation in Saudi Arabia and the wider Arab world is beginning to be recognised (UNESCO, 2019; UNESCO and Royal Commission for AIULA, 2023). Digital preservation in Saudi Arabia is at its initial development stages, but it is also aligned with the nation's Vision 2030 on digital transformation (Nurunnabi, 2017) and therefore of great importance. To achieve success in this area, it is important for cultural heritage institutions to address digital preservation specialists' training needs via training programmes in line with global standards (Ahmad & Rafiq, 2022). While Saudi Arabia cultural heritage institutions are striving to support such needs, due to the early stage of digital preservation in the nation there is currently an absence of standardised, specialised, periodic training programmes. Such limitations have led to significant gaps in skill enhancement among Saudi digital preservation specialists Alhaif (2023). The study presented here, part a larger investigation on digital preservation training needs in Saudi Arabia, explores and discusses existing digital preservation training practices, barriers, and enablers of skill enhancement across cultural heritage institutions in this country. Findings help fill a regional gap in a predominantly Western-centric literature on digital preservation training and offer insights for cultural heritage information management and international digital humanities research.

Method

An exploratory qualitative case study design (Yin, 2009) was chosen to investigate digital preservation training needs in Saudi Arabia's cultural heritage institutions, focusing on practitioners and managers involved in digital preservation activities. A systematic literature review (Albushra et al., 2025), an online survey, and in person interviews were used to collect data between 2023 and 2025. In this paper we report on the online survey data. This research was ethically approved by the institution of the authors.

The survey was developed to address one of the research questions ('*What are the existing digital preservation training practices, drivers, and barriers at Saudi Arabia's Cultural Heritage Institutions*?') and following findings from a systematic literature review (Albushra et al., 2025). It was created in both English and Arabic and distributed online in 2024 via Qualtrics software. The survey included demographic queries, open and closed-ended questions addressing current practices, drivers, and training needs in digital preservation. Participants were recruited using a purposive sampling criterion, selecting individuals working in Saudi Arabian cultural heritage institutions who are specifically involved in digital preservation practices. The participants involved have different roles in digital preservation, including archivists, librarians, IT experts, managers, and administrators (Table 1). The survey was piloted with a small group of information professionals at Imam Abdulrahman University library in Saudi Arabia. This pilot helped to clarify some of the wording and support the survey validity. Six cultural heritage institutions in Saudi Arabia were selected: King Abdulaziz Foundation for Research and Archives (Darah), the King Abdul Aziz Public Library, King Fahad National Library, Saudi National Centre for Archives and Records,

Makkah Centre for Archives and Records, King Abdullah University Library. Of the 43 invited participants, 37 fully completed the survey yielding a high response rate of 84.8%, which is considered robust for an online qualitative study (Livingston & Wislar, 2012). The relatively small sample for this survey is due to the emergent state of digital preservation in Saudi Arabia, with few employees involved in digital preservation activities across cultural heritage institutions. However, the survey included key representative cultural heritage organisations, and was subsequently complemented by follow-up, in-depth interviews.

Survey respondent's job title	Years in post	Education level
Director of Document and Archives Center	More than 10 years	PhD
Center Manager of Archive	More than 10 years	PhD
Library manager	Less than 5 years	PhD
Library manger	Less than 5 years	PhD
IT	5 to 10 years	Master's degree
Librarian	5 to 10 years	Master's degree
IT	More than 10 years	Master's degree
IT	Less than 5 years	Master's degree
Archivist	Less than 5 years	Master's degree
Archivist	5 to 10 years	Master's degree
Librarian	Less than 5 years	Master's degree
IT	More than 10 years	Master's degree
IT	Less than 5 years	Master's degree
Management	More than 10 years	Master's degree
Librarian	Less than 5 years	Master's degree
Librarian	Less than 5 years	Master's degree
Management	5 to 10 years	Master's degree
Archivist	Less than 5 years	Bachelor's degree
Administration	More than 10 years	Bachelor's degree
Administration	5 to 10 years	Bachelor's degree
Librarian	More than 10	Bachelor's degree
Archivist	Less than 5 years	Bachelor's degree
Archivist	Less than 5 years	Bachelor's degree

Table 1. Survey respondents' job title, years in post, and education level

Analysis and discussion

Quantitative data from closed-ended questions were analysed using descriptive statistics in SPSS (Version 29.0.1.0), focusing on frequencies to identify demographic trends and patterns. Responses in Arabic were translated into English before being processed. An inductive process of thematic analysis following Braun and Clarke's (2006) six steps was used, and data were processed using the NVivo software. Both sets of data are discussed in the following sections.

Quantitative data

In our survey, 46% of the participants had higher degrees in computer science and IT, 16% in business and management, and 11% in engineering and technology. The '*Other*' category comprises 27 participants who indicated different highest degrees, such as information science, library science and records management and digital preservation (Figure 1). The selection of category of disciplinary area of higher degree was mutually exclusive. This is a reminder of the multidisciplinary dimension of digital preservation, a complex area requiring a wide variety of expertise and skillsets. The predominant percentage of participants with computer science and IT degree is aligned with previous work on countries where digital preservation efforts are at a

nascent stage (David, 2021) suggesting how this remains largely anchored on database management, software implementation, and digital asset migration processes.

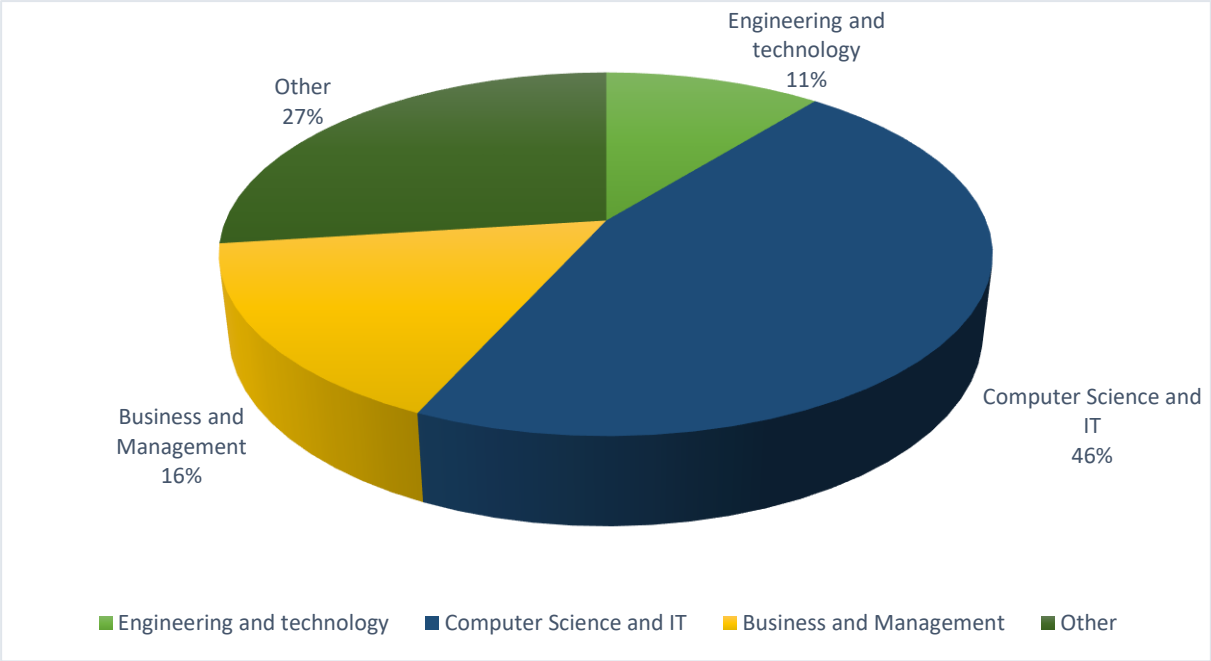

Figure 1. Disciplinary area of highest degree of survey participants.

Participants were also asked which digital objects they were directly responsible of preserving (Figure 2; multiple object types could be selected): 19% of respondents were directly responsible for preserving digital born materials, followed by 14% responsible for both transactional data and digitised materials respectively. This predominance of digital born objects echoes work by Corrado and Sandy (2017), who noted the importance for preservation specialists to have comprehensive knowledge of handling objects in digital format from inception.

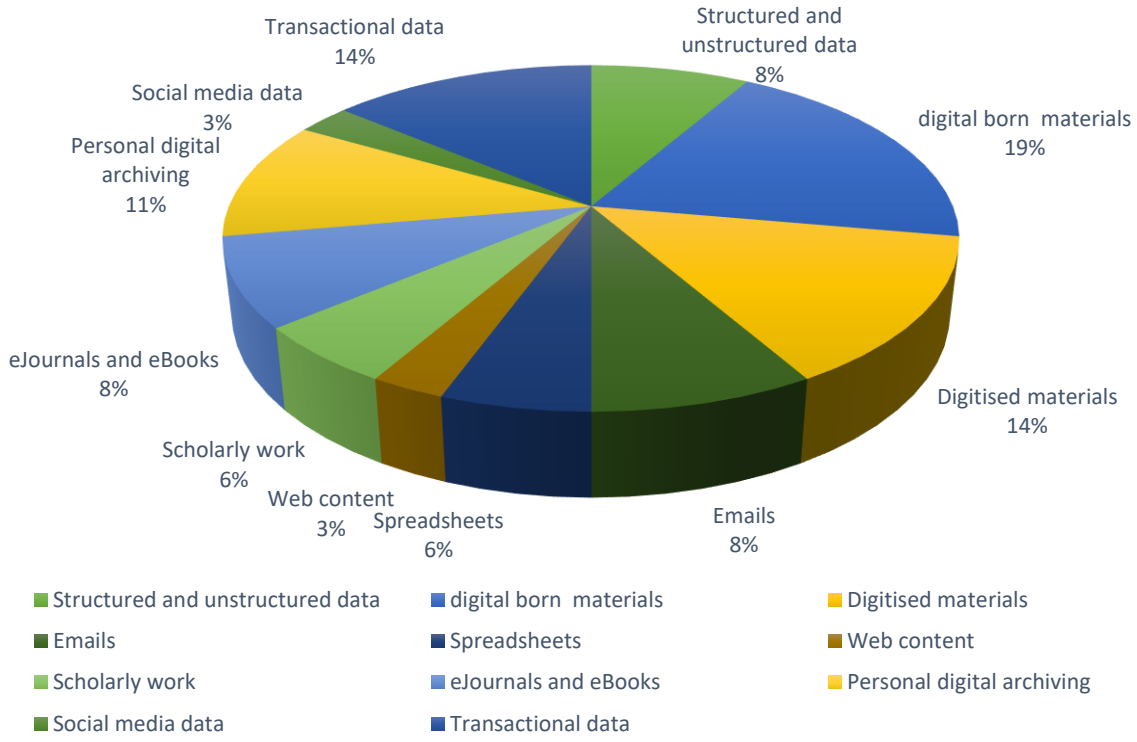

Figure 2. Object types which survey participants are responsible of digitally preserving.

As Figure 3 illustrates, in the past five years 47% of the respondents had attended between 1 and 4 training courses relevant to digital preservation, 28% more than 10 courses, 5% between 5 and 10 courses, while 20 % had not attended any training (only one response could be selected). This data suggests a promising, increasing digital preservation training trajectory undertaken by Saudi cultural heritage institutions. However, 20% of participants without any training over the last five years points to a critical gap on skills enhancement. This is also a call for cultural heritage institutions in Saudi Arabia to provide not only informal professional development opportunities but also in-depth and sustained training programmes - vital in skill enhancement as highlighted by Gorzalski (2018), Morandini et al., (2023) David, (2021) and Matlala et al., (2022).

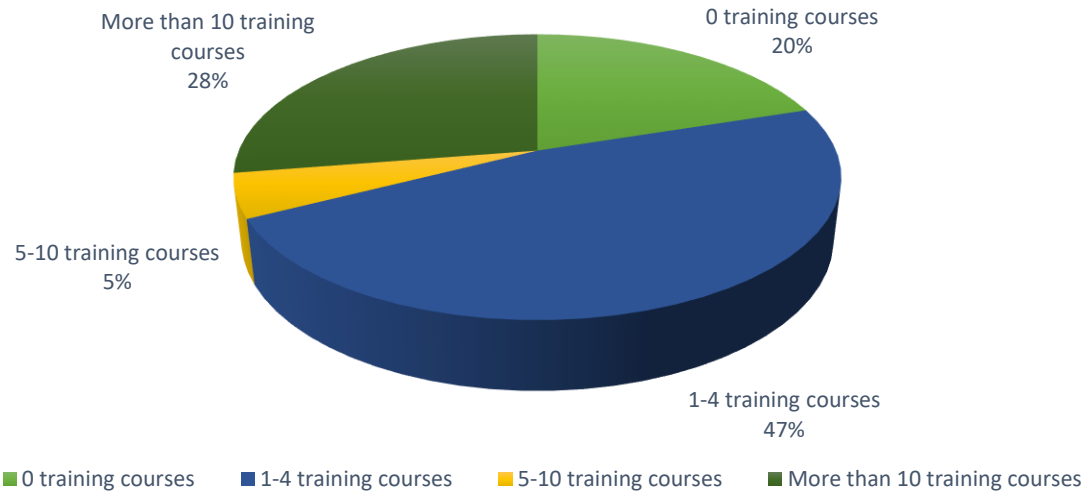

Figure 3. Training frequency in the past five years.

Training topics (Figure 4) confirm the complexity of digital preservation and the requirement to support diverse skills and competencies. Preservation specialists received training on storage devices (17%), file formats and metadata (13%), preservation planning (12%), and file migration (11%) amongst others (multiple options could be selected). This diversity aspect of digital preservation areas is supported by studies from David (2021), and Rasaki and Abioye (2018), who noted that it is important for preservation specialists to have knowledge of file formats, metadata creation, digital forensics, data recovery, digital storage systems, and access mechanisms amongst others.

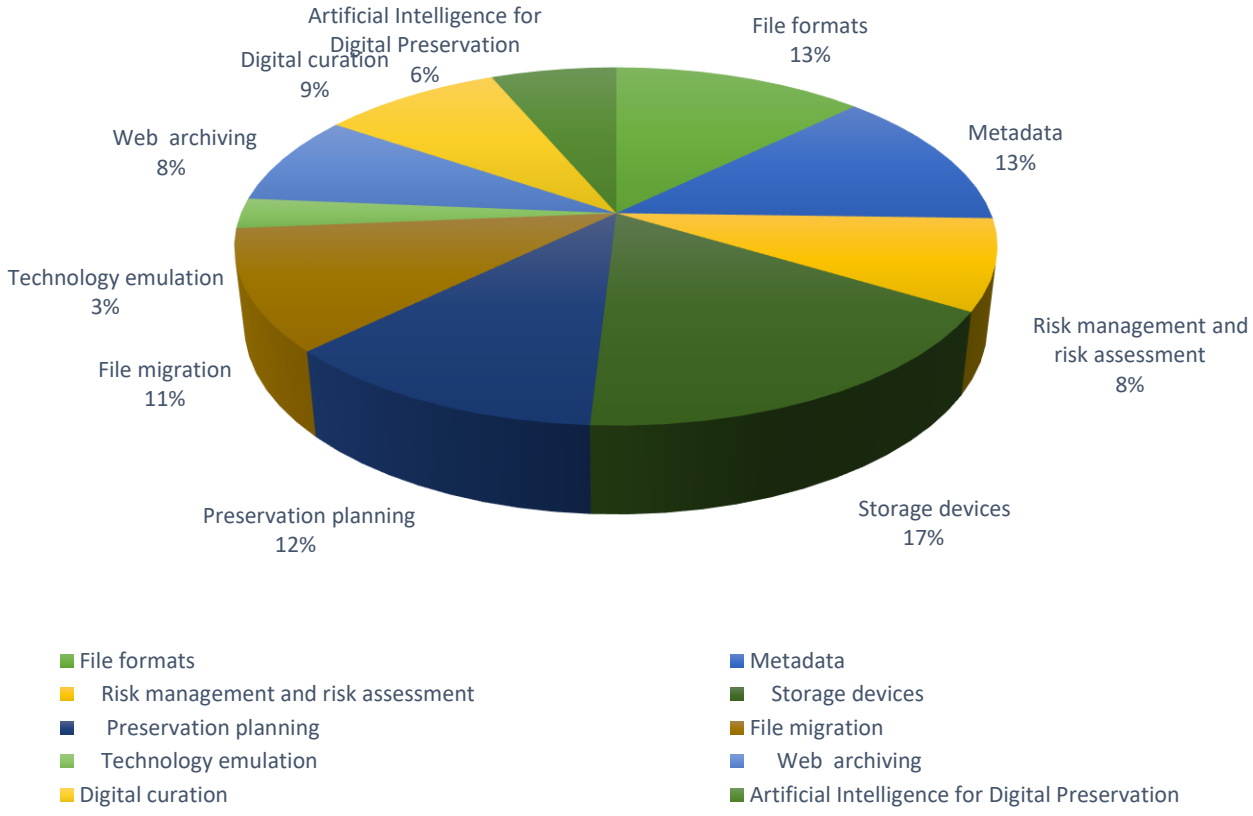

Figure 4. Topics on which survey participants received training.

Qualitative data

Survey qualitative data were thematically analysed following an inductive process (Braun and Clarke, 2006). The survey transcripts were first read multiple times to ensure familiarity; initial codes were then generated manually and Nvivo software was used to organise and manage data. These codes were reviewed, refined, and grouped into broader categories to identify patterns. Through this process, the following themes were generated (Figure 5): essential digital preservation skills, training and capability building, governance and policy frameworks, technological infrastructure, and collaboration. Each theme is discussed below.

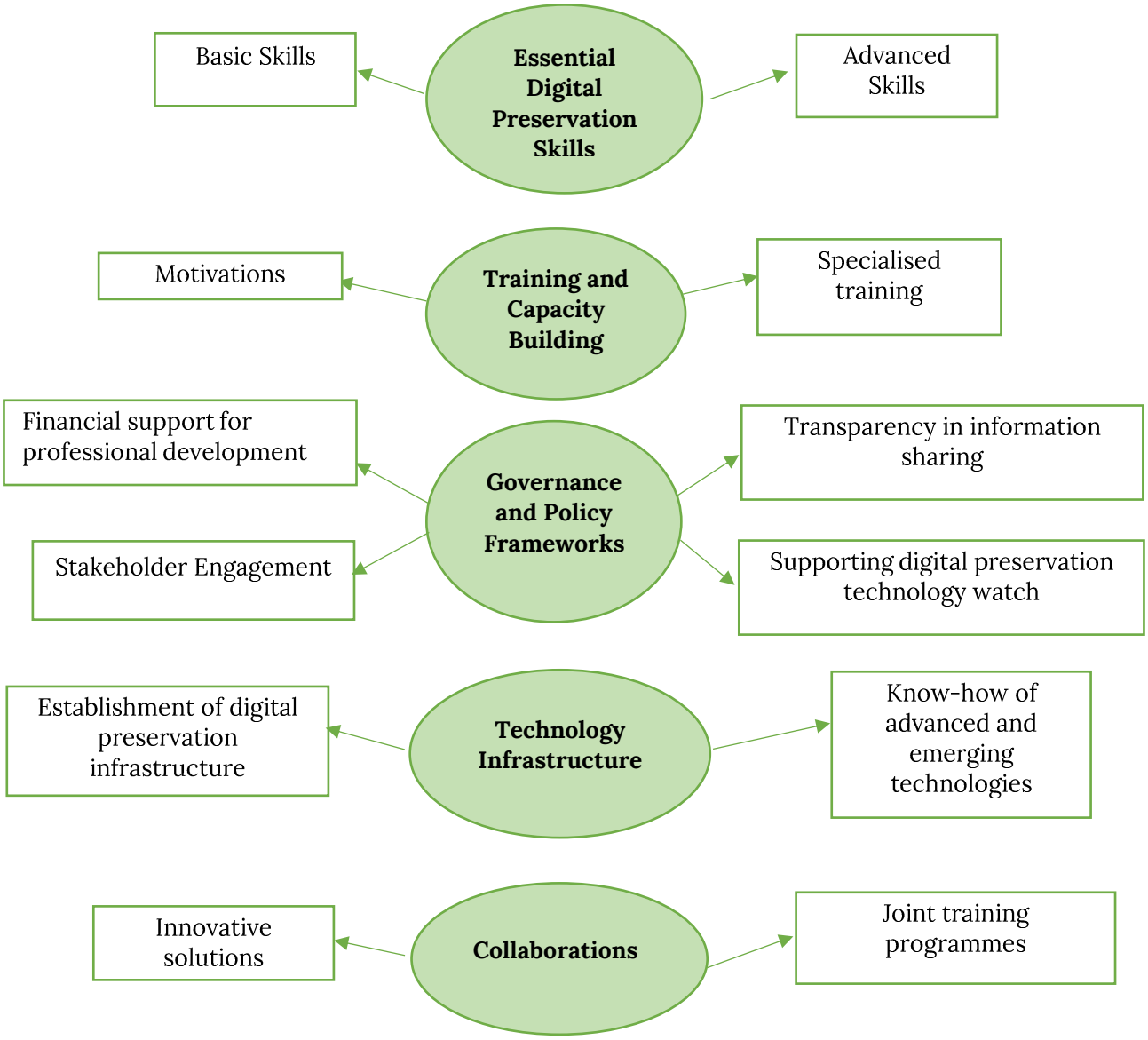

Figure 5. Survey themes and subthemes.

Essential digital preservation skills

Survey data suggest the need for preservation specialists to have a diverse, rich palette of skills enabling them to perform different digital preservation activities over time. Digital preservation is a multidisciplinary domain, requiring both technical and soft competencies, and skills to enable specialists to manage, preserve and ensure long term access of digitised content (David, 2021; Rasaki & Abioye, 2018; Feng and Richards, 2018). Due to its complex nature, it is important to ensure that preservation specialists acquire both basic and advanced skills (Alghamdi et al, 2023). A practitioner stated that '*it is important to receive training on skills such as excel, cloud storage, electronic archiving, robotic archiving, data generation, and transfer.*' Respondents also recognised the importance of effective searchability and discoverability of digitised content and noted the need to have metadata skills. In the words of one participant, '*I was trained on [...] how to represent*

digital objects in a correct way so that they may be stored, searched, and retrieved in the long term.' This aligns with the Digital Preservation Coalition (DPC) Competency Framework, which highlights information management and metadata standards as vital domain specific skills (McMeekin, 2022; Digital Preservation Coalition, 2025) and the UNESCO Digital Competence Frameworks, which identify information management, data literacy and content creation skills as foundational competencies for citizens, learners, and educators (Choudhary, 2024; UNESCO-UNEVOC, n.d.).

Research by Aljalahmah and Zavalina (2024) discusses the enhancement of metadata standards in the Arabian Gulf, proposing transcription of current guidelines into Arabic language to further support regional use. Having skills to adequately maintained the authenticity, integrity, and safety of digital objects is also important; one participant noted '*my training included skills for enhancing the safety of digitised content*' such as '*the management of government documents and cybersecurity training programme tailored to maximising security of digitised materials from external alteration and cyber-attacks.*'

Addressing skill gaps calls for a structured skills assessment framework such as the DPC Competency Framework, which offers pre-formatted survey tools and rapid assessment models to systematically gauge organisational competency (McMeekin & Currie, 2022; Digital Preservation Coalition, 2025). Integrating such structured frameworks alongside international standards could be beneficial to cultural heritage institutions in Saudi Arabia.

Training and capability building

In a highly dynamic sector characterised by constant technological changes, new challenges, and opportunities, training, and capacity building help digital preservation specialists to acquire relevant, updated skills aligned with global standards and best practices. Digital preservation training encompasses different methodologies that entail both formal and informal learning formats. Formal training is typically offered through education programmes, certification training, and well-structured workshops, while informal training is often achieved through communities of practice, learning from colleagues, and self-learning (Carr et al, 2020; Cook and Smith, 2004). Both approaches have been prevalent in the field of digital preservation, offering complementary benefits for organisations and practitioners. Our survey respondents highlighted some interesting aspects related to training and capacity building. In a dynamic sector like digital preservation necessitating continuous and often specialised training, it is central to understand how professionals' commitment to training programmes can be supported. A participant highlighted the need for cultural heritage institutions to provide both tangible and intangible motivations: '*I believe staff need both material and moral incentives. Financial rewards are helpful, but recognition and appreciation are equally important to keep people motivated*'. The importance of specialised training programmes was also noted. The provision of specialised training programmes and opportunities is important in digital preservation and is in line with global standards with IFLA's Guidelines for Professional LIS Education Programmes (2021), underscoring the need to enable professionals to acquire specialised knowledge and develop competencies that meet local, national, and regional context requirements (IFLA, 2022). The provision of customised training programmes is discussed by Jalamneh and Khder (2021) and David (2021), who noted that those are effective in bridging skill gaps. In Saudi Arabia, formal training has been recently employed to enhance preservation specialists' skills as cultural heritage institutions like King Salman bin Abdul Aziz Centre for Historical Materials, who has partnered with institutions such as the US Library of Congress and Naif Arab University for Security Sciences to provide training programmes on digital preservation (Gassem, 2025).

Governance and policy frameworks

Survey participants highlighted the need for effective governance and policy frameworks supporting transparency in sharing information, participation by all stakeholders, financing of

training initiatives, and development of sustainable digital preservation practices. Emphasising the importance of good governance, one practitioner highlighted the need for cultural heritage institutions to support training programmes and cater for training fees : '*Sometimes the barrier is the cost. Institutions should pay the training fees so staff can attend without worrying about expenses.*' Unaffordable training costs may indeed be a hindrance to skill enhancement and lead to skill gaps. Therefore, as noted by Matlala (2022), financing training programmes is conducive to bridging skill gaps. Inclusive governance and stakeholder engagement is important for the success and sustainability of digital preservation practices and our participants expressed the desire to be fully engaged and updated on yearly institutional objectives. In addition, as digital preservation is an ever-evolving field with emerging issues, solutions, policies and activities, the respondents in our survey highlighted the need for institutions to raise awareness of the best practices and trends in digital preservation through internal communications. These comments are aligned with the DPC Competency Framework, which values raising awareness and creating tailored advocacy messages for different stakeholders, together with the establishment of policies for governance, resourcing, and management (Digital Preservation Coalition, 2025).

Strategic policies addressing resource planning, training needs assessment, competency standards, and institutional collaborations ensure that preservation professionals are equipped with relevant skills while institutions attain viable preservation capabilities (Lefurgy 2007). Comprehensive policies such as those used in the Library of Congress enable staff members to act appropriately at all stages in the preservation process, from acquisition to long-term storage. Policies also play a key role in minimising risks associated with digital preservation practices (Ahmad and Rafiq (2023). Policy frameworks directly affect training methods, in that they dictate competencies that are required and offer channels for continuous professional development. The National Diet Library of Japan is an example of this approach: its extensive training programmes are founded upon national priorities that promote skills development in the application of modern preservation methods (Kinoshita and Onuma, 2022). However, various cultural heritage institutions globally still lack clear and well-structured digital preservation policies, which hinders the development of standardised training programmes. In Saudi Arabia, where digital preservation is at an early stage, key policies in this area are yet to be developed. As recommended by Alhaif (2023) establishing key digital preservation policies will help cultural heritage institutions in Saudi Arabia in improving their preservation practices and becoming compliant with global standards such as ISO.

Technology infrastructure

Technology infrastructures are the collections of hardware, software, networks, data, and other physical and virtual components that support an organisation's information technology operations and services. They represent the foundational framework for managing and delivering technology, enabling an organisation to process, store, and communicate information to achieve its business goals, and therefore play a key role in digital preservation. In the words of a survey practitioner, it is important to '*establish archiving centers in all institutions*'. Respondents further commented on advanced technologies and systems employed in digital preservation endeavours, and the need to acquire know-how for using such technologies. One respondent noted that '*technologies like AI are important in digital preservation practices as they enable digitisation of huge volumes of information through automation*' and that '*Having skills on their utilisation will enable us improve efficiency in preservation activities.*' Another wrote that '*another important skill nowadays in the era of technological advancements is robotic archiving.*' These comments suggest the need to foster skills on new emerging technologies, as also highlighted by the Digital Preservation Coalition (2025).

Advanced technologies like artificial intelligence and machine learning are being adopted in digital preservation with positive results in enhancing efficiency of preservation practices while reducing manual labour (Ali et al., 2024; Kragelj & Kljajić Borštnars, 2021). Robotic archiving has been successfully used in Belgium, enhancing searchability and access to digitised historic newspapers

(Ali et al. 2024). Smart record archive robots have been adopted in Chinese cultural institutions for navigation, recording, and record checking, creating a sustainable operational model (Wang et al, 2020). Cultural heritage institutions in Saudi Arabia are yet to implement such technologies- an issue largely attributable to limited awareness and lack of professional expertise (Alhaif, 2023; Alghamdi et al, 2023; Ahmad, Ameen, Ahmad, 2021). However, as noted by Kaluvilla (2024), AI adoption has begun among neighbouring United Arab Emirates libraries. This suggests a gradual diffusion within the Arab world, which may spearhead preservation practice in cultural heritage institutions in the Gulf region.

Collaborations

Collaboration is a vital aspect of digital preservation, involving multiple actors within and outside an organisation, joining both forces and expertise to address preservation challenges and opportunities. Collaboration in digital preservation may occur through events (e.g., seminars, workshops, conferences), formal initiatives such as the UK Digital Preservation Coalition (DPC) and Digital Curation Centre (DCC), informal networks, and projects enabling knowledge flow and skill uptake by preservation specialists. The European Commission has funded several key collaborative digital preservation research projects since the early 2000s, including but not limited to Electronic Resource Preservation and Access Network of Excellence (ERPANET), Digital Preservation Europe (DPE), Preservation and Long-term Access through Networked Services (Planets), and Living Web Archives (Liwa). Collaboration enhances sharing of resources and knowledge, standards creation, helps to overcome technical and financial limitations, and supports overall sustainability of digital preservation initiatives (da Silva, 2024). Survey respondents recognised the vital role of collaboration in digital preservation, how institutions may leverage it, and how they may develop joint innovative solutions and collaborative training opportunities and programmes. For instance, one participant highlighted the synergy of pooling diverse ideas in developing creative solutions: '*collaboration of institutions is necessary in order to create innovative digital solutions for employees and such can be achieved through meetings, workshops, special training sessions, and more.*' Another respondent noted that '*it is important to have joint cooperative training programmes amongst cultural heritage institutions which offer training on different areas of digital preservation.*' The vital roles of collaboration highlighted by participants in our study echoes a study of three German specialist libraries by Zarnitiz et al. (2019): libraries gained benefits in cost saving by sharing knowledge and resource, better work distribution, and joint training opportunities through a shared archiving system. In Saudi Arabia, the King Abdulaziz Foundation for Research and Archives (Darah) and the US Library of Congress have collaborated to create knowledge exchange channels for preservation specialists (Gassem, 2025). However, despite the diverse benefits of collaboration, varying technological capabilities and differences in organisational culture among other constrains limit the establishment of successful partnerships. To address these barriers, Zarnitz et al. (2019) suggested establishing a clearly defined system and using harmonised platforms to allow resource sharing and bridge institutional disparities.

Conclusion

To safeguard long term digital preservation of cultural heritage, training needs of digital preservation specialists must be adequately addressed. This study examined digital preservation training needs in Saudi Arabia cultural institutions, investigating a variety of aspects shaping the skill enhancement of digital preservation specialists. The success and sustainability of digital preservation efforts call for Saudi cultural heritage institutions to support essential digital preservation skills, training and capability building, governance and policy frameworks, technological infrastructure, and collaboration within and beyond institutional boundaries. Through effective training programmes, enabling policies, and collaborative approaches, cultural heritage institutions will have more means to preserve their assets and ensure that '*we pass our information heritage to future generations in viable form*' (Ross, 2012).

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