
Examining AI-Assisted Digital Preservation Systems: Impact on Archival Decision-Making, Content Selection, and Long-Term Access in Special Collections

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DOI: <https://doi.org/10.70670/sra.v4i1.1958>

Abstract

This study examined the impact that the application of AI-based digital preservation systems can have on the decision-making process, selection of content and exclusive access to the archival sources in special collections in Pakistan. The researcher adopted mixed-methods research design and collected data on 150 archivists, librarians, and other information professionals working in libraries, museums, and other culture institutions in Indonesia and Pakistan, namely, Islamabad, Lahore, Karachi, Peshawar and Quetta. Online structured survey and virtual semi structured interviews were used to collect data on 25 senior archivists. Quantitative data analysis was performed on the SPSS-V-26 software and descriptive statistics, correlation analysis, and chi-square tests, and qualitative one on the thematic analysis. It was established that the AI-assisted systems proved to be significantly more effective at the archival workflow with the help of metadata quality, and also assisted in finding the content. However, the biasing of algorithms applied in content selection, lack of adequate technical infrastructure, inadequate training, and lack of professional autonomy in decision-making process were the issues. The study identified five main themes such as barriers to technological integration, professional role redefinition, quality versus automation, and ethical considerations of utilizing AI as well as resource limitations. The findings have shown that even though AI technologies have the major potential related to the digital preservation, implementation is to be supported by the strategic planning, building of professional skills, and the possibility to take into account the ethical issues associated with the implemented solution to ensure the equal access and integrity of arches in the Pakistani special collections.

Keywords: Impact, Application, AI-based Digital Preservation Systems, Decision-Making Process, Selection Of Content, Archival Sources, Pakistan.

Introduction

Digital revolution has transformed the manner through which cultural heritage organizations maintain, organize and make historical collections available (Pouloupoulos and Wallace 2022). In the digital age, special collections were under threat of being lost in rare manuscripts, photographs, audiovisual materials, and unique archival documents (Barone 2024). The traditional preservation policies failed to cope with the vast rate of expansion in the digital resources besides making them accessible in the long run. This became a very urgent challenge in developing countries like Pakistan where special collections were made up of priceless cultural

heritage resources that required instant preservation actions. The advent of the technologies of artificial intelligence offered certain positive chances to address these preservation challenges through automated workflow, improved metadata creation, and improved content discovery procedures (Siliutina, Tytar et al. 2024).

The special collections Pakistan had been a good source of cultural, historical and intellectual heritage of the country (Ahmad and Azeem 2024). National Library of Pakistan, the university libraries and provincial archives and museum depositories among others saved the materials that documented the history of the country since independence to the present day. They were also made of collections of rare manuscripts and documents of the colonial period, photographic archives and audio-visual recordings. Most of these materials were however also destroyed due to environmental reasons, bad storage facilities and bad reserves of preservation (Asif, Yang et al. 2022). The advent of digital preservation technology meant that it was possible to have long-term access to such materials and avoid destruction of the originals (Shah and Sahito 2024).

The artificial intelligence made a groundbreaking force in the sphere of the archaeological science and the opportunities it opened extended beyond the sphere of digitization (Argyrou and Agapiou 2022). AI-assisted systems demonstrated the possibilities in content analysis automation, descriptive metadata generation, setting preservation priorities, and user finding the relevant materials. Thousands of documents could be analyzed within a limited time and recognized the patterns, information, and help the archivists make well-informed choices about how the collections were managed with the help of machine learning algorithms (Meesad and Mingkhwan 2024). The technologies were meant to address the resource constraints, which used to limit the preservation activities of the Pakistani institutions, where in most cases the professional staff members were often overwhelmed by the stack of unprocessed materials in their backlog (Haider, Ya et al. 2023).

The implementation of AI technologies in the archival working process also raised the most important questions related to the essence of the human choice in the working process and the principle based on which the material is chosen and whether the process of preservation is human-related. Previously, archivists would rely on their professional judgment, interpretation of the context, and ethics to come up with collection policies and access. These practices could have been altered by the introduction of the algorithmic decision-making systems which give the conflicts between the professional autonomy and the efficiency of the automation (Pavlidis 2023). The awareness of the effects of AI technologies on the process of making decisions in archives was essential in the development of the implementation plans that would not disrupt the existing professional values but instead leverage the power of technologies (Wajid, Kumar et al. 2025).

Special challenges and opportunities were presented to AI-assisted digital preservation by the Pakistani case (Fatima, Memon et al. 2025). Inadequate technological facilities, inadequate training opportunities and resources and diversification of institutional support variables resulted in a scenario where the use of technology had to be strategized and accommodated (Raza, Moroojo et al. 2023). The problem of algorithmic bias, cultural sensitivity, and equitable access turned into a particularly significant matter as the application of AI systems that are developed predominantly in the Western context was applied to the collections that are supposed to represent the cultural heritage of the South Asian nations. These causes made it necessary to analyze the impact of AI technologies on the previously mentioned content selection processes and the question of whether the utilization of automated mechanisms indicated the diversity and complexity of Pakistani special collections (Min 2023).

Archival access as a long-term goal was a major archival responsibility, and under digital preservation the technical and organizational problems of digital preservation became complex. AI-assisted systems offered format migration and content validation tools and preservation planning, which may lead to the enhancement of the sustainability of digital collections. However, some questioned the possibility of being technologically addicted, obsolescence of the system, and ability of later users to access the materials that are stored in proprietary AI systems. The discussion of the implications of AI technologies on the long-term access strategy was in a position to assist in reading the way of balancing the innovation and sustainability in preservation

(Matlala, Ncube et al. 2022).

The present research covered significant gaps in the literature of the impacts of AI-based systems of digital preservation to the archival practices of the Pakistani special collections. Despite the reports of AI applications in the international literature with well-equipped institutions, the international adoption experiences have not been studied in the context of developing countries where technologies were implemented under diverse limitations depending on the resource deficiencies, infrastructure disadvantages, and the needs of professional growth. The present study was based on evidence-based findings and investigated the implications on archival decision making, selection of content and longevity of access that may guide policy makers, professional education and strategic planning of digital preservation activities in Pakistan cultural heritage sector.

Research Objectives

1. To establish how AI enabled digital preservation systems can affect the process of making decisions in special collections within archives in Pakistan.
2. To evaluate the impacts of AI technologies on the content selection criteria and practice of the archivists working in the Pakistani libraries, museums, and other cultural institutions.
3. To research on the effectiveness of AI-assisted solutions in supporting access to digital collections in the long term and the issues that are linked to sustainable preservation.

Research Questions

1. How do AI-based digital preservation systems impact the process of archival decision-making of special collections in Pakistan?
2. What are the effects of the AI technologies on the content selection procedures and practice of the archivists in the Pakistani cultural heritage institutions?
3. What do you view as the perceived advantages and disadvantages of AI-assisted systems to the long-term accessibility to the digital collections in Pakistan?

Significance of The Study

The study provided the necessary data regarding the adoption of AI technologies in the cultural heritage industry in Pakistan and presented evidence-based concepts to educate archivists, administrators, and policymakers. The findings aided to understand how the developing countries can effectively introduce AI-based preservation systems and how to address the country-specific challenges. The results were applied in the professional educational schemes, the selection of technology and the creation of the digital preservation program policies. The study has touched crucial gaps in literature on the topic of AI use in South Asian archival procedures and presented a framework of the evaluation of the impact that technology has on the professional activity. There was also a favor of the argument to preserve the cultural heritage of the country through development of informed, ethical, and sustainable digital preservation in Pakistan.

Literature Review

The intersection of artificial intelligence and archival science emerged as a significant field of study in the early twenty-first century, because the discipline signifies the existence of even greater technological transformation throughout information professions (Memon, Paracha et al. 2025). The literature at the time showed little concern with the processes of digitization, and the creation of digital repositories, but there was little that was done regarding intelligent systems capable of making autonomous decisions. However, with the maturity of machine learning, natural language processing and computer vision technology, researchers began to consider how the technologies can offer answers to the old challenges in archival work, including processing of the backlog, metadata generation and finding content. The experiences of successful AI application reported in large cultural heritage institutions demonstrated the efficiency increase and positive

user experience. These traditional works established the principles of understanding the potential implementation of AI to the preservation process without neglecting the problem of professional displacement and algorithmic bias (Sabol 2025).

Professional judgment, ethical principles and contextualized knowledge as the factors of collection management received traditionally much attention in the studies of the archival decision-making (Huda 2022). Historians argued that decisions of the archivists in the maintenance, description of materials and the availability provided to the materials used were complicated ones according to the evidences, cultural and ethnic values, scarcity of resources and social needs. The adoption of AI systems into such processes of decision-making raised certain fundamental questions about the nature of archival activity and professional identity (Tennent and Gillett 2023). Studies on human-AI partnership in archival have shown that there are issues in terms of human-AI collaboration as archivists found that algorithmic recommendations were in contrast to the professional experience and others were afraid of losing the power to make this or that vital decision. Other researchers defended the idea of perceiving AI as a supplement, rather than a replacement, to human judgment and claimed the threat of gradual depletion of professional control by increasing reliance on technology, although others said that it would be dwindled over time (Freeman 2023).

One of the most debatable aspects of the discussion concerning AI-aided archiving was the choice of content in particular. The classical methods of appraisal were concerned with various approaches including evidential, informational and societal values and this required subtle appraisal as viewed by many scholars to be part and parcel of the human nature. The research works of the automated content analysis demonstrated that AI systems could point out patterns, categorize materials, and designate items of potential interest based on the precalculated criteria (Mabapa and Ngoepe 2025). Critics indicated the risks of algorithm bias, that the training data were more likely to replicate prior injustices and dominant cultural worldviews. Based on the studies of applying AI to non-Western contexts, it was discovered that there existed certain anxieties about the importation of the systems that were designed primarily with English language messages and the Western cultural heritage to the assorted collections. These findings showed the importance of applying culturally responsive methodologies during the application of AI that did not ignore the local knowledge systems and values of the local communities (Pillen and Eckard 2023).

The efficiency of the digital preservation became one of the most important themes of the archival literature and the researchers attempted to explore technical, organizational, and financial issues of the long-term availability. Early designs of digital preservation were on migration plans, emulation and stable metadata models to ensure that information could not be lost in the transformation (Barrueco and Termens 2022). The use of AI technologies promised to enhance the preservation powers by offering automated format recognition, format validation, and preservation planning. Research enrolled AI application in file corruption detection, format obsolescence prediction, and ranking preservation actions. However, some potential dangers of the AI dependency were also found by researchers, including proprietary systems lock-in, secrecy of algorithms, and even a potential loss of materials in case of breakdown of AI-based workflows. These contradictory findings meant that despite the preservation benefits of AI, risks should be thought through and planned beforehand (Lischer-Katz 2022).

The digital preservation in third-world countries discussed in the literature review has identified the particular problems of infrastructure limitation, resources limitation and capacity building necessity. Cases of research among the Africans, Asians, and Latin Americans established that they had inappropriate technological infrastructure, lacked opportunities to carry out professional training, and funds to help in the preservation process. In some studies, the international standards and best practices were found to make unrealistic assumptions concerning availability of the resources in the institutions that operated within the environment of resource leanness (Wong and Chiu 2025). The view of the solutions being contextualized to the local context rather than straightforwardly transplanted as the practices that well-endowed institutions are espousing was made apparent in technology transfer and adaptation literature. The solutions put forth in this

literature suggested that adoption of AI in developing countries archives should take into account solutions to the key infrastructure and capacity issues besides implementation of technology (Thibodeau 2024).

The Pakistani archival literature was a comparatively limited one, and the bulk of the publications was devoted either to the description of collections, historical processes or preservation issues in general, and technological innovations in particular. The existing literature stated that, preservation needs were high in the Pakistani special collections that included disintegrating collections, environmental control, and no professional expertise in digital preservation (Khan and Shahzad 2024). The digitization of libraries and archives in Pakistan has been examined where digital libraries have achieved different developments with some institutions completing the digit repository creation projects and some have challenges with the technological infrastructure. The literature gap on the AI applications within the Pakistani archival environments showed the need to conduct a qualitative study on the work of the technologies in the country that boasts of a unique environment in terms of culture, organization, and resources (Khan, Khatoon et al. 2025).

Theoretical notions of the responses of archivists to the introduction of AI had been provided by global research on professional identity and technological change in archives (Nawaz, Akhtar et al. 2024). The study based on technology acceptance model, innovation diffusion theory, and professional boundary work concepts demonstrated that the determinants influencing the adoption of technology are many and complex as they include perceived usefulness, organizational support, professional values, and matters of deskilling. Research has revealed that the incorporation of technology was not possible to be made effective without incorporating technical and organizational management, professional growth and the workplace culture. These findings indicated that the introduction of AI was a change and not simply a technical adoption to the organization, and this initiative was to be calculated and include stakeholders so that the desirable outcomes would be achieved without failure in the professional integrity and provision of services.

Research Methodology

Research Design

The researcher adopted mixed methods research design to investigate the AI-based digital preservation solutions in special collections in Pakistan. This methodology incorporated both quantitative and qualitative data collection to provide elaborate information on the impact on archival decision-making, content choice and future availability.

Population and Sample

The sample consisted of 40 archivists, librarians and information professionals in large libraries, museums and cultural institutions in Pakistan in the special collections departments. The researcher used a purposive sample of 150 respondents who had been employed in the Islamabad, Lahore, Karachi, Peshawar and Quetta institutions. The sample included the professionals of the National Library of Pakistan, special collections of the universities, provincial archives, and museum repositories.

Data Collection Instruments

The two primary instruments that were used by the researcher were online structured questionnaire and online semi-structured interviews. The questionnaire was divided into four stages and had 35 questions, yet it was designed to cover the following information: demographics, the current practices of preservation, experience of AI implementation, and decision making. The scholar conducted online interviews (via video conferencing) with 25 older archivists in order to receive information on the content selection guidelines and digital access issues over the long time.

Data Collection Procedure

The researcher used the online questionnaire by email and institutional mailing lists within a span of three months. The study participant also gave informed consent and received ethical approval of all participants through digital consent forms prior to data collection by the researcher. The researcher arranged the virtual

interviews on Zoom and Microsoft Teams and each session took approximately 45-60 minutes. The interviews were all digitally recorded and transcribed to be analyzed.

Data Analysis

To test the relationship among variables, SPSS software was applied by the researcher whereby descriptive statistics, correlation analysis and chi-square tests were used to test the quantitative data. In the qualitative information case, the researcher had to use thematic analysis to establish recurring patterns and themes of the AI impact on archival practices. The author contrasted the outcome of the two sources of data in such a way that he would possess validity and reliability of the results.

Results and data analysis

Quantitative analysis

Table 1: Demographic Characteristics of Respondents

Characteristic	Category	Frequency	Percentage
Gender	Male	98	65.3%
	Female	52	34.7%
Age Group	25-35 years	45	30.0%
	36-45 years	62	41.3%
	46-55 years	31	20.7%
	Above 55 years	12	8.0%
Education	Master's Degree	89	59.3%
	MPhil/MS	47	31.3%
	PhD	14	9.3%
Experience	1-5 years	38	25.3%
	6-10 years	54	36.0%
	11-15 years	35	23.3%
	Above 15 years	23	15.3%

The demographic analysis showed that majority of respondents were male professionals at 65.3 with 34.7 being female. The professionals aged 36-45 years (41.3%), and 25-35 years (30.0%) formed the largest age groups. The majority of the respondents possessed master degrees (59.3%), a large proportion of MPhil/MS degrees (31.3%). The professional experience was very diverse, the majority of them had 6-10 years of experience (36.0%), which demonstrates that they did not have a workforce full of theory about archival operations.

Table 2: Current AI Implementation Status in Institutions

Implementation Level	Frequency	Percentage
Fully implemented AI systems	18	12.0%
Partially implemented	47	31.3%
Planning implementation	52	34.7%
No implementation plans	33	22.0%

The statistics showed that 12.0 percent of institutions had implemented AI-assisted digital preservation systems in full with 31.3 percent having partial implementation. A big percentage (34.7) was still on the planning and 22.0% had no plans of implementation. These results proved that the adoption of AI in the Pakistani special collections was still at an initial level with the majority of the institutions examining the opportunities or starting small-scale implementation. The somewhat low full implementation rate indicated major obstacles to the wholesome integration of AI.

Table 3: Impact of AI on Archival Decision-Making Processes

Decision-Making Aspect	Strongly	Agree	Neutral	Disagree	Strongly
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	Agree				Disagree
AI improved efficiency	42 (28.0%)	76 (50.7%)	18 (12.0%)	10 (6.7%)	4 (2.7%)
AI enhanced accuracy	38 (25.3%)	69 (46.0%)	25 (16.7%)	13 (8.7%)	5 (3.3%)
AI reduced processing time	51 (34.0%)	72 (48.0%)	15 (10.0%)	8 (5.3%)	4 (2.7%)
AI maintained professional judgment	15 (10.0%)	41 (27.3%)	37 (24.7%)	43 (28.7%)	14 (9.3%)

Findings indicated that AI systems increased efficiency (78.7% agreed or strongly agreed) and shortened processing time (82.0% agreed or strongly agreed). Accuracy in the field of archival work was also seen as a positive effect of AI on respondents (71.3% agreed or strongly agreed). Yet there was some division on whether AI was keeping professional judgment with only 37.3% agreeing and 38.0% disagreeing. This trend implied that, although the use of AI was seen as advantageous by professionals in the field, the issue with the use of AI remained in the question of influence of AI on professional autonomy and authority in making decisions.

Table 4: AI Influence on Content Selection Practices

Content Selection Factor	Very Positive	Positive	Neutral	Negative	Very Negative
Metadata quality	47 (31.3%)	68 (45.3%)	23 (15.3%)	9 (6.0%)	3 (2.0%)
Content discoverability	52 (34.7%)	71 (47.3%)	18 (12.0%)	6 (4.0%)	3 (2.0%)
Selection bias concerns	8 (5.3%)	19 (12.7%)	31 (20.7%)	67 (44.7%)	25 (16.7%)
Cultural sensitivity	11 (7.3%)	28 (18.7%)	42 (28.0%)	51 (34.0%)	18 (12.0%)

Most of the respondents perceived the influence of AI on metadata quality (76.6% and content discoverability (82.0% positively. Nevertheless, 61.4% had negative or very negative concerns about selection bias in AI systems, and 46.0% rated AI negatively about cultural sensitivity. These results pointed to one paradox: AI improved technical issues of the content management process, and it also questioned the validity of fair representation and cultural competence of automated selection technologies in the context of diverse cultures, especially in Pakistan.

Table 5: Challenges in AI-Assisted Digital Preservation

Challenge	Major Challenge	Moderate Challenge	Minor Challenge	Not Challenge ^a
Limited technical infrastructure	89 (59.3%)	41 (27.3%)	15 (10.0%)	5 (3.3%)
Inadequate training	82 (54.7%)	48 (32.0%)	16 (10.7%)	4 (2.7%)
Financial constraints	94 (62.7%)	38 (25.3%)	13 (8.7%)	5 (3.3%)
Lack of institutional support	67 (44.7%)	53 (35.3%)	22 (14.7%)	8 (5.3%)
Algorithmic bias concerns	58 (38.7%)	62 (41.3%)	24 (16.0%)	6 (4.0%)

The major challenge was financial constraints (62.7% rated it major), then limited technical infrastructure (59.3 percentage) and insufficient training (54.7). The institutional support was a primary barrier to 44.7% of the respondents, whereas 38.7% were worried with algorithmic bias. These results depicted that effective implementation of AI demanded consideration of various interrelated issues across financial resources, technical capacity, development of human capital and organizational commitment to facilitate significant technology integration.

Table 6: Perceived Benefits for Long-Term Access

Benefit	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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Improved preservation planning	44 (29.3%)	73 (48.7%)	21 (14.0%)	9 (6.0%)	3 (2.0%)
Enhanced format migration	39 (26.0%)	68 (45.3%)	28 (18.7%)	11 (7.3%)	4 (2.7%)
Better content validation	48 (32.0%)	71 (47.3%)	19 (12.7%)	8 (5.3%)	4 (2.7%)
Sustainable access strategies	35 (23.3%)	59 (39.3%)	34 (22.7%)	18 (12.0%)	4 (2.7%)

The respondents showed favorable attitudes towards the advantages of AI on long-term access with 78.0% and 79.3% agreeing that AI enhanced preservation planning and content validation respectively. Nonetheless, there was less consensus on sustainable strategies of access (62.6%), where 22.7% were indifferent and 14.7% were disagreeing. This implied that although AI, experts recognized that it would contribute to preservation activities at the technical level, the question of whether AI-supported systems actually provided sustainable long-term access or could create new points of dependence and vulnerability continued to be unanswered.

Qualitative Analysis

Theme 1: Technological Integration Barriers

The technological obstacles to integration were always identified by their participants as the most critical obstacles to the adoption of AI in Pakistani special collections. The respondents justified that they lacked a good internet connection, the old hardware systems and software platforms that could not support AI implementation. Many archivists also lamented about the poor IT infrastructure of their organization that could not allow them to run more advanced AI applications and they had to have to rely on manual processes, despite their awareness that AI was capable of performing such tasks. Other respondents added that even when even AI tools were available, it was technically challenging to connect them to an existing digital preservation system without any expert knowledge. The disparity in the adoption of AI in Pakistan in cultural heritage sector was premised on the digital divide between urban high-tech archives and repositories on smaller areas.

Theme 2: Transforming Profession Roles and Identity

The introduction of AI technologies helped the archivists have much to consider when it comes to the evolving professional roles and identity. The participants described the clash between the old archival knowledge where they focused on the contextual knowledge and the new requirements of the technical abilities to deal with AI systems. The worry of numerous archivists was that automation will cause the reduction of the professional judgment, and that will transform the work of an archivist into a machine operation. However, other participants considered AI as a source of no longer forcing professionals to deal with menial labor but rather allowing them to do a complex intellectual task which implies human thought. One can say that younger professionals were more interested in the integration of AI, but older archivists reported the concern about the maintenance of professional norms and values of more automated workflows.

Theme 3: Quality versus Automation Balance

The challenges that respondents emphasized to be active include ensuring efficiency by automation and control over quality in applying artificial intelligence in preservation work. The participants acknowledged that AI systems were faster than human archivists but were also concerned with the quality particularly one requiring materials in a regional language or those required to be an expert in the area. Some of the archivists described how hybrid procedures were used where data was initially processed by AI and human review was later used, although the financial resources often could not allow human review to be used extensively. Part of the participants have mentioned that there was a need to automate in order to increase productivity at some instances which had an impact on the quality of the descriptions and contextual records. The discrepancy of

the quantity and the quality became a constant issue which was to be addressed with the assistance of the structure of the workflow and reality of the performance demands.

Theme 4: Ethical Considerations and AI Implementation

The lack of consideration of the issue of AI-enhanced digital preservation has been ethically infiltrated, and the respondents of the discussion were worried about the issues of algorithm bias, privacy concerns, and equitable accessibility. Archivists said that AI that is trained on Western collections fail to identify and categorize Pakistani cultural material adequately and might have failed to recognize valuable material. The question of privacy was also posed in the context of AI analysis of sensitive materials, in particular, the material containing personal information or the vulnerable groups. Respondents claimed the necessity to maintain ethical practices in the exact same way through the necessity to have transparent AI decision-making processes and human control over them. There were suggestions by some of the respondents to develop culturally relevant AI systems, which would be developed to cater to the South Asian heritage material.

Theme 5: Resource Constraints and Sustainability

The sustainability of the AI implementation at the Pakistani institutions was still in the debate that involved financial and human resources shortages. The respondents said that they were not able to afford commercial AI platforms and had to resort to open-source ones that consumed technical expertise that is not accessible in the majority of repositories. The opportunities of professional growth were limited by AI skills as the archivists developed themselves in the Internet resources where the institutional training was not provided. A number of the respondents have been concerned about embarking on AI projects without a sustainable funding that may see the projects fail and lose the investment. The dependency of external funding and donor aid on preservation projects resulted in the feeling of uncertainty with long term maintenance of the AI system whether the adoption of AI actually increased or weaken the sustainability of preservation.

Theme 6: User Access and Discovery Enhancement

Despite some difficulties the process of introducing AI technologies has, AI technologies were perceived by the participants as a good opportunity to display the user access and discovery of content within the special collections. Respondents clarified that AI generated metadata expanded the search abilities and enabled a user to locate the pertinent materials in a more efficient way. Technologies like the automatic transcription and the optical character recognition turned previously unreadable and unsearchable sources like the handwritten ones, and the audiovisual data into the opportunities to be accessed and utilized by the researcher. Other archivists have remarked that AI-based recommendation systems have helped users to identify materials that can support their studies, hence improving research experiences. However, the respondents cautioned that more discoveries required corresponding improvement of digital infrastructure and user service to transform the discoverability into meaningful access, particularly to the less digitally literate or technologically empowered users.

Discussion

The findings indicated that the AI implementation process in the Pakistani special collections is rather complex and offers both new opportunities and harsh threats. The quantitative results confirmed the efficiency of operations, metadata and content discovery that are greater with the help of AI technologies, that is what follows the international studies of AI use in cultural heritage organizations. However, the data also indicated the problems of professional freedom, the biasness of algorithms and cultural sensitivity which were to be approached with immense care during the implementation. These findings were supplemented by the qualitative themes which have contributed to the contextual organizational factors that define the adoption of AI within resource-constrained environments, including infrastructure limitations, insufficient training, and sustainability. The dissonance between the awareness of the possible benefits of AI and the sense of challenges on the way to successful implementation was the new reality of the case of AI-facilitated digital preservation in Pakistan. The implications of these findings were that successful implementation of AI entailed not only

the acquisition of technology but coordinated strategies to manage the expansion of infrastructural development, capacity building, ethical governance and sustainable ways of financial practices that were required to be localized to the Pakistani institutional circumstances.

Conclusion

The study revealed that digital preservation systems that apply artificial intelligence can significantly contribute to better archival decision making, content selection, and access in the long term in archives in Pakistani special collections, yet continued to be stalled by a host of associated challenges. Their view of the success of AI in efficiency, metadata quality, and user discovery was unenthusiastic, but the apprehensions of algorithm bias, cultural competence, and professional rights curtailed the enthusiasm. The paper had observed that the successful application of AI required alleviation of the underlying infrastructure limits, provision of adequate professional training, sustainable funding, and development of ethical governance frameworks to ensure that there were culture responsive applications. The findings emphasized that AI technologies were the tool that should be introduced in the bigger digital preservation initiatives but not the single-purpose archival issues because its functionality depended on the adaption to the circumstances and its further control by experts.

Recommendations

The initial field in the broader application of AI must be the infrastructure building and the advancement of professional capability before long-term implantation can be incorporated as a constituent of the infrastructure and human capabilities must be supported to render the AI application sustainable. The policymakers should come up with national standards of digital preservation and a moral AI-related guideline to counter the aspect of algorithmic discrimination and cultural sensitivity to Pakistani heritage environments. Professional associations will develop training programs that will provide AI literacy to the archivists and at the same time will emphasize the need to retain the usefulness of professional judgment and contextual knowledge. The hybrid workflows that companies will implement the effective and efficient automation must be of high quality and professional control. The future research should be able to take into account the effects of AI use in the long run and devise AI systems that would be culturally specific to the collections in South Asia.

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