



Artificial Intelligence and Documentary Systems for University Library Management: Global and Arab Experiences

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Abstract

Our world is currently witnessing significant advancements in scientific and technological publishing, resulting in a major shift in university library operations. It has become essential for these libraries to abandon traditional methods of managing tasks and offering services and move towards more modern and effective solutions. This transformation is driven by the adoption of advanced documentary software and the use of artificial intelligence technologies and applications that contribute to creating a more integrated environment among various systems in libraries. It also enhances the efficiency of library operations, such as collecting, processing, and storing information in a way that facilitates fast and accurate retrieval, while maintaining innovation and modernity that meet the expectations of users. This study aims to highlight the role of documentary software supported by artificial intelligence technologies in improving the efficiency and accuracy of library operations, providing advanced services, and enabling intelligent interaction with users. The paper introduces some of the most well-known documentary software, outlines their advantages, and discusses the use of artificial intelligence applications in these systems. Additionally, it presents global and Arab experiences that have successfully implemented these technologies and achieved significant progress in library services.

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1. *Introduction*

With the advancement of information technology and its growing application in various practical and scientific fields, university libraries have started to benefit from these advancements to improve their performance and enhance their services, particularly in terms of accuracy and speed. Documentary software is one of the key technological solutions that help university libraries meet the growing needs of their users. This is especially important as the number of users continues to increase. These systems operate according to a methodology that takes into account the continuous growth of intellectual production and the variety of documentary and scientific resources.

The use of documentary software has become an essential part of library work, and it is indispensable because of the advantages it provides. These systems oversee and manage all technical operations, and it is important to become familiar with these systems before using them to select the most suitable one and understand the advantages and disadvantages of each. As a result, there is a growing need to understand the suitability of these systems for practical use. Some widely used systems in university libraries include SYNGEB, CDS/ISIS, MINIISIS, WINISIS, ALIS, PMB, and others.

Artificial intelligence (AI) is a transformative force in the field of technology. It is a branch of computer science aimed at developing systems and technologies that can simulate human intelligence. AI depends on algorithms and

learning models that enable devices and software to think, make decisions, and solve problems in a way similar to the human brain. The impact of AI spans various aspects of daily life, and its applications are increasingly influencing various fields, including university libraries. Libraries can benefit from AI technologies to enhance the quality of services offered, such as improving search efficiency, information retrieval, and user interaction.

AI applications can also help university libraries organize and execute tasks such as classifying documentary materials, recommending resources, and personalizing content according to users' interests. Thus, AI contributes to increasing the effectiveness of university libraries and improving the overall user experience.

Therefore, the integration of AI into documentary software represents an innovative step that can lead to a radical transformation in facilitating library work, improving overall efficiency, and providing a smoother experience for users. This integration can significantly boost productivity by reducing the burden of routine and repetitive tasks, allowing university libraries and staff to focus more on priority and important tasks. In this way, AI becomes a powerful tool that supports the improvement of work quality and effectiveness in university libraries.

In this context, this study aims to introduce the most important and widely used documentary software in university library management, explore AI and investigate the areas of its application in documentary

software to enhance efficiency and innovation in these institutions, and review the most prominent global and Arab experiences in utilizing these modern technologies.

1.1 Research Problem

With the increasing volume of intellectual production, the responsibility of university libraries in preserving and organizing information has become more complex and crucial. Libraries must ensure effective organization of documentary materials to achieve the highest levels of efficiency in management, facilitate their classification, and make them accessible to researchers and scholars. This enables users to quickly and accurately retrieve the information they need. Given the massive amount of knowledge and the library's desire to meet its objectives effectively, it has become essential for libraries to rely on modern technologies that save time and effort and ensure greater accuracy in delivering services.

Among these modern technologies, documentary software and artificial intelligence stand out as some of the key technological advancements that have helped university libraries achieve their goals. These technologies have contributed to the improvement and development of services and library activities and have significantly facilitated library work, especially in reducing research time and minimizing the effort involved in processing, retrieving, and managing data and information.

Thus, this study aims to answer the following central question: What are the

areas of artificial intelligence application in documentary software for managing university libraries? And how does this impact library work and user services? Preface on the first topic and the issues to be addressed.

1.2 Research Question

- What are the most important and well-known documentary software systems for managing university libraries?
- What are the main benefits of using the documentary software systems examined in this study?
- What role do artificial intelligence applications play in documentary software to improve and develop library work and user services?
- What are the leading global and Arab experiences in integrating artificial intelligence applications into documentary software for managing their university libraries?

2. Documentary Software

The term documentary software refers to: "All programs designed to process documents, which are organized and specialized for handling information related to the documentary field. These programs manage, process, store, and retrieve information. Thus, all the functions of the software are related to the various operations of the documentary chain, from reserving documents to processing and enabling their retrieval." (Boukerzaza & Ghazal, 2006, p. 151)

It is also defined as: "Software designed to manage all the functions of a library or information center. It helps maintain a database of new books and books borrowed

by users, and it fully automates all library activities." (Sudarasan & Thirshala Nandhini, 2023)

It is further described as: "Informational software capable of automating one or all functions of the documentary chain, managing, processing, and retrieving information within the documentary unit." (Ghrarami Saidi, 2008, p. 67)

Based on these definitions, we can conclude that documentary software consists of a set of programs specialized in processing documents. These software systems are used to organize information related to the documentary field. The software works to process data, store it, and retrieve it as needed by users. The primary goal of documentary software is to improve the management of documentary resources and make it more efficient by providing technological solutions that ensure quick access to information and organize it in a way that is easy to use at the appropriate times.

2.1 Importance and objectives of using documentary software in university libraries

Documentary software has played a significant role in developing the technical processes within university libraries, with some of the most notable contributions being as follows (Ghrarami Saidi, 2014, p. 54):

- Linking bibliographic databases related to the lending system and making them available across different networks.

- Automating purchase procedures, claims, returns, and deliveries, among others.
- Providing computerized catalogs and assisting in controlling the lending process in libraries.
- Enabling electronic technical processing.
- Automating the information services system, including selective information retrieval services and current awareness services.

Regarding its objectives, they can be summarized as follows (Ben Amira, 2013, p. 256):

- Reducing the costs and efforts involved in manual operations.
- Standardizing the cataloging process through the use of automated cataloging.
- Making the online catalog available via direct access and providing multiple search options.
- Facilitating cooperation with other library systems and sharing collections.
- Training and preparing staff to work in an electronic information environment.
- Providing information to as many users as possible.
- Addressing and controlling the information explosion.

3. Most important and well-known documentary software used in university libraries

To compile and present the most important and well-known documentary software

used in university libraries, the following sources were relied upon:

- ✓ Results from the TECHJOCKEY website, which listed the ten (10) most widely used documentary software until April 2023 (Basu, 2023).
- ✓ Previous studies that addressed this topic from different perspectives.

3.1 ALIS - Advanced Library Information System:

ALIS is a proprietary, integrated, closed-source Arabic system developed by the Information and Decision Support Center of the Egyptian Cabinet. It was designed in line with the latest global standards in library and computer systems. This system caters to the needs of Arabic libraries and includes the ability to search and retrieve information using both the Gregorian and Hijri calendars. It is specifically designed to provide library managers with technical support in all stages of daily operations (El-Sayed, 2012).

ALIS offers several advantages for library management and operation, including:

- Easy registration, classification, cataloging, and organizing of materials, which helps ensure quick and efficient access to library resources for users.
- Providing advanced and user-friendly search services for users.
- Supporting easy and efficient access to digital resources, allowing users to browse, download, and read them on various devices.
- Assisting in managing subscription processes, tracking current

subscriptions, renewals, cancellations, and more.

3.2 CDS/ISIS - Computerized Documentation Service/Integrated Set of Information Systems:

CDS/ISIS is a free, closed-source general-purpose system designed for data storage and retrieval. It was specifically created to manage non-digital databases within the field of computerized management. However, it can also be generalized for use in managing non-bibliographic data such as directories (individuals and organizations), correspondence lists, full-text documents, and press archives, among others. It does not require specialized programming to create databases and allows the creation of an unlimited number of databases. The acronym CDS stands for "Computerized Documentation Service," and ISIS stands for "Integrated Set of Information Systems." This system was developed by the International Labour Organization (ILO) in the early 1960s. The CDS/ISIS system is multilingual, as it adopts the ISO 2709 standard for data exchange between information banks (Ben Sebti, 2011, p. 153).

CDS/ISIS offers several advantages in library management, including:

- An easy-to-use interface suitable for users with varying levels of skill, allowing them to perform searching, data entry, querying, and retrieval tasks effortlessly.
- Organizing library resources in a structured and logical manner.
- Classifying resources according to a defined classification system, which

facilitates library management and rapid retrieval.

- Enhancing collaboration and scientific exchange between different libraries.

3.3 DSpace System

DSpace is a free, open-source system for managing digital repositories to publish academic or institutional digital content. DSpace shares functionalities with content management systems and document management systems. It offers a range of services, including digital archive management with a focus on long-term storage, accessibility, and preservation of digital content. It also provides digital content to end-users and offers a complete suite of tools for content management. DSpace is widely used for building digital repositories in academic institutions due to its customizable structure and ability to meet the evolving needs of users. The software helps in creating, indexing, and retrieving all forms of digital content and is highly compatible with most operating systems, adhering to international metadata standards (Dspace, 2024)

The advantages of this system include:

- DSpace is an open-source project, meaning it is freely available for anyone to use, modify, and distribute.
- It provides a robust framework for managing digital repositories, allowing digital resources to be organized efficiently.
- It facilitates easy searching, browsing, and access to these resources.
- DSpace features an intuitive and user-friendly interface, enabling users to

browse and search the repository efficiently.

- The system includes a variety of technologies that ensure the security and protection of digital resources stored in the repository.

3.4 Horizon System

Horizon is an integrated, open-source library system that covers all internal technical and administrative operations within the library. Developed by the American company Ameritech, it was later localized in collaboration with the Advanced Arab Systems Company to make it suitable for use in the Arab environment. It supports an Arabic version of the MARC format, which complies with Anglo-American cataloging rules, allowing for the management of cataloging books, journals, maps, audiovisual materials, and more. It includes many unique features that have made it one of the most popular systems worldwide (Zinhom & Abdeljawad, 2004, p. 50).

This system offers many advantages, including:

- Flexibility and compatibility with the devices used to access and navigate applications and the virtual desktop from anywhere at any time.
- Users can access their virtual environment from any internet-connected network and any device.
- The system ensures high levels of security and data protection, such as encryption and multi-factor authentication, to protect sensitive information and ensure data integrity.

- It provides centralized management of applications, resources, and virtual desktop environments.
- A variety of Arabic-language guides are available, with subsystems for cataloging, searching, borrowing, journal control, acquisition, and inventory management.

3.5 Koha System

Koha is a comprehensive, free, open-source Integrated Library System (ILS) that is widely used worldwide. Although it was initially suitable for small to medium-sized libraries, it is now gaining popularity among larger libraries as well. Koha was developed in 1999 by a group of developers working for a consulting company in New Zealand called Katipo Communication Ltd. The name "Koha" is derived from the Māori language, meaning "gift" or "donation."

Koha is one of the best and most widely used free software solutions for library management and is considered a complete library management system, incorporating all known documentary applications. It was awarded the Best Free Software in 2003. The purpose of Koha is to provide a tool that covers all the core functions of a library, such as database management, user management, collection development, acquisitions, journal control, and real-time online searching by end-users in both the library's gateway and its local and external bibliographic databases.

The advantages of this software include (Ali, 2022, p. 177):

- It is free and open-source, based on a web interface.

- It is an integrated system that ensures all modern library functions and activities are carried out and complies with library standards.
- It supports working within the international information network environment.
- Koha is known for its speed, flexibility, openness, and scalability, with the ability to provide new versions with added features.
- It can manage user categories, branches, barcode printing, and more.
- It integrates with Web 2.0 features, such as tagging and RSS feeds.
- It provides an easy-to-use unified catalog.

3.6 MINISIS System

MINISIS is a software package specifically designed for managing bibliographic databases. It is a relational, integrated, closed-source, multilingual system (English, French, Arabic, Spanish, etc.), developed to manage information systems in libraries and information centers (Ghrarami Saidi, 2008, p. 77). It is one of the most widely used systems and can be operated on PACKARDHEWLETT 3000 computers. It requires continuous monitoring by an IT specialist and is available in multiple languages, allowing it to manage large amounts of data (Ben Sebti, 2011, p. 153). This system was developed by the International Development Research Centre (IDRC) of the Canadian Parliament to assist developing countries in dealing with information technology. Initially designed for DOS in 1979, it was later migrated to Windows in 1996. The system is widely used in many countries, particularly in

Asia, Africa, the Caribbean, Latin America, Canada, and the Arab world, including educational institutions, universities, government and private museums, libraries, and more (Ghrarami Saidi, 2008, p. 78).

The advantages of the MINISIS system include:

- High flexibility in its configuration and customization to meet the specific needs of an institution.
- Easy modification of data, fields, templates, and interfaces to align with institutional requirements.
- It supports resource management in various domains, such as libraries and other information organizations.
- Provides robust security features to protect the stored data.
- Enables comprehensive management of content, including documents, archives, databases, images, and more.
- Allows efficient and organized classification, storage, and retrieval of content.

3.7 PMB (*Pour Ma Bibliothèque*) Software

PMB is a free, open-source, multilingual, integrated library system (ILS) that falls under the category of advanced systems for library management (SIGB). It includes all the administrative and technical functions performed by a library and relies on web-based applications like Apache server, PHP programming language, and MySQL for database management. It was designed by French librarian Lemarchand François in 2002, with ongoing development and maintenance by the French company

Services PMB. The full name of the software is PHP MyBiblio, and it is also known as Pour Ma Bibliothèque (Lucretse & Balifoune, 2022, p. 9).

PMB offers several advantages that make it an excellent choice for managing libraries, including:

- Being open-source software, meaning it is free to use and its source code is accessible, allowing institutions and developers to customize, modify, and expand the system to suit their specific needs.
- Features an intuitive and easy-to-use user interface, with access available from anywhere at any time.
- Provides great flexibility in configuring and customizing the system to meet the needs of individual institutions, making it easy to modify fields, forms, reports, and functions.
- Supports managing a wide range of resources, including books, articles, digital documents, archives, and electronic resources.
- Allows for the creation of detailed reports and statistics regarding resource usage and library activities.

3.8 Unicorn Integrated Library System (UNICO-RN):

UNICORN is a closed-source integrated library system developed by the American company SIRSI. It operates using a client/server architecture and is one of the most widely implemented systems in libraries worldwide. This system includes all library functions and is known for its abundant reporting capabilities. It operates on an ISAM database engine, which is part

of the system's components, and it also supports the Oracle database engine. The system is in use in the Arab world and is managed using Windows. UNICORN includes several subsystems such as cataloging, authority files, borrowing, and acquisitions (Al-Samrati & Abu Aja, 2005, p. 155).

The advantages of the UNICORN system include:

- Data can be accessed and utilized across all systems, with controlled access for authorized personnel to ensure system security.
- Manages acquisition processes and handles various sources for library procurement.
- Supports authority control for all types of subject headings.
- Provides a full-text database for various types of information resources.
- Allows users to search the library catalog and its databases online.
- Supports automated searching for retrieving required data and records.
- Enables library staff to perform all borrowing operations quickly and easily.
- Generates reports according to the library's needs, with automatic scheduling for regular, periodic generation.

3.1 Winisis System (Windows Integrated Set of Information Systems)

Winisis is an open-source proprietary system designed for storing and retrieving information. It is specifically built to manage structured, non-digital bibliographic data, most of which is in text format. It is an extension of the CDS/ISIS

system. This system was released by the International Labour Organization (ILO) in Geneva in 1985, and in 1995, after the widespread adoption of the Windows operating system, UNESCO developed the system to function within the Windows environment. The term "Winisis" became widely used to refer to CDS/ISIS for Windows. The system provides a complete software package that offers many functions and sub-programs that integrate seamlessly to manage databases built within the system. Additionally, the system was localized into Arabic by the Documentation and Information Center of the Arab League, with several editions reflecting the focus of these entities to develop the system for use in information centers and institutions (Ghrarami Saidi, 2008, p. 71).

The advantages of the Winisis system include:

- Durability, adaptability, and multilingual support.
- Technical support from UNESCO and the Arab League's Documentation Center.
- Fast adoption due to its open-source nature and free availability.
- The ability for multiple users to access the system simultaneously.

3.10 Summary and Conclusions on the Most Important and Widely Used Documentary Software Systems:

- Many documentary software systems have emerged from various institutions around the world to keep pace with technological advancements and to manage the massive growth of

documentary resources by collecting, processing, storing, and disseminating them. However, some systems are more widely used and recognized than others.

- The documentary software systems in this study include both open-source systems like DSpace, which offers free and open access to information, and proprietary or commercial systems, which are designed for profit, such as ALIS, Horizon, MINISIS, and Winisis.
- There are also Arabic-designed documentary software systems aimed at fulfilling various library tasks according to international standards and professional practices, such as the ALIS system.
- The documentary software systems studied share key characteristics, including providing databases for both print and digital resources, advanced and fast search capabilities, and dedicated sections for services like borrowing, returns, task tracking, and reporting.
- Most documentary software systems can handle data in multiple languages, particularly Arabic and English.
- Multiple users within the same institution can use the documentary software simultaneously to perform different tasks, with suitable mechanisms for locking access to ensure data security and integrity.
- These systems enable a variety of functions, such as information retrieval via simple and advanced search methods, using relevant vocabulary in multiple languages.
- The key functions allowed by documentary software in libraries include acquisition, inventory,

cataloging, classification, organization, searching, reserving, and printing, all of which are executed quickly and efficiently.

- Horizon is one of the most prominent and widely used documentary software systems worldwide. Its unique and continually evolving features make it one of the best systems for information management and library automation on a global scale.
- Koha is also considered one of the best and most widely used open-source software systems globally. It serves as a comprehensive library management system containing all known documentary applications, with the added benefit of web services.

4. Artificial intelligence

The term artificial intelligence was first used in 1956 by American researcher John McCarthy, who chose the term Artificial Intelligence as the title for a conference at Dartmouth College in the United States. This marked the beginning of research in AI as a separate field distinct from computing and automation sciences. McCarthy initially defined AI as: "The science and engineering of making intelligent machines," but in 2007, he revised his definition to: "The science and engineering of making intelligent machines, particularly computer programs."

Many researchers have contributed definitions of AI, and these definitions vary based on scientific backgrounds and interpretive contexts. For example, Boden (1978) defined AI as: "The science of

getting machines, or computer systems, to perform tasks that would require intelligence if done by humans."

Patterson, on the other hand, provided a more detailed definition when he outlined the characteristics of AI, saying: "AI is concerned with the study and design of computer systems that display forms of intelligence, enabling them to: learn new concepts and tasks, analyze and draw useful conclusions, understand natural language, perceive visual fields, and perform other types of activities that require specific levels of human intelligence." (Sardouk, 2020, p. 4)

AI can also be defined as: "A collection of techniques and tools aimed at producing or surpassing the capabilities of computer systems that would require human intelligence if performed by humans. This may include the ability to learn, adapt, understand, interact, think, plan, work autonomously, or even innovate. AI also allows us to use and understand data." (UKRI, 2021).

AI encompasses a wide range of techniques and methods, including machine learning, natural language processing, computer vision, and robotics, all designed to enable machines to perform tasks that would typically require human intelligence. AI systems are also built to analyze data, recognize patterns, make decisions, and continually improve performance.

From the above definitions, we can conclude that artificial intelligence is the intelligence exhibited by machines and software that simulate human cognitive abilities and patterns of operation. It is the

science and engineering of designing systems and creating intelligent machines that understand their environment and take actions to increase their chances of success. It aims to create self-learning systems that derive meanings from input data, which can then be applied to solve new problems in ways similar to human beings. Examples include responding to human conversations, creating original images and texts, making decisions, perceiving and learning, thinking, understanding ambiguity, problem-solving, handling complex data, fast response, linguistic interaction, creative work, and more.

4.1 Artificial intelligence and documentary software

Artificial intelligence is a relatively recent field, and the 1970s saw the early development of AI-based systems. During this period, documentary software was developed that utilized knowledge bases, events, and inference engines to simulate human behavior in information retrieval and extraction tasks. In 1967, AI-based documentary software was applied in libraries, particularly for reference services and responding to user inquiries. Later, it was used in acquisitions and supply processes and then in online data retrieval. This enabled intelligent systems to search bibliographic databases and control terminology, improving the efficiency of search and text retrieval.

These systems were considered part of documentary artificial intelligence, a type of AI focused on supporting and organizing information and knowledge within libraries. Through these applications, the actual impact of AI in fields such as

research and machine learning began to emerge, marking the progress of this technology in recent decades.

4.2 Integration of artificial intelligence applications with documentary software for managing university libraries

There are many artificial intelligence applications that can be integrated with documentary software systems and used to bring significant changes to the daily operations of university libraries. This integration contributes to enhancing their future prospects, positioning them as leaders in modernization, creativity, and innovation. These applications cover various areas, some of which are outlined below:

- **Improving Cataloging and Classification Systems:** AI applications can help update and enhance cataloging and classification systems within university libraries. Intelligent cataloging systems can classify books, articles, and other materials according to multiple criteria, making information retrieval easier. These systems can also use natural language processing (NLP) techniques to analyze the content of intellectual materials more deeply, recognizing key terms related to specific topics. This enables more accurate and effective classification, thus allowing the library to better meet the needs of its users.
- **Generating Document Summaries:** Generative AI can enhance the productivity of university libraries by creating document summaries using NLP techniques and deep learning. This process helps effectively convey information to various researchers, saving time while ensuring accuracy and objectivity in summaries. Tools like OpenAI's GPT, Summarize Bot, and TextTeaser are examples of AI-powered document summarizers.
- **Supporting Literature Reviews:** Many AI tools support effective literature reviews by using AI techniques to analyze research and extract relevant data. This assists university libraries in managing and processing large volumes of literature quickly and accurately. Examples of these tools include OpenRead, Elicit, and ResearchRabbit.
- **Library Marketing:** Generative AI tools can adapt text and advertisements according to the needs of specific audiences, enhancing library marketing efforts. AI can also be used to create personalized content for email marketing campaigns or social media platforms, increasing communication effectiveness with the target audience. Tools like Feedly and CuratorsEye exemplify AI applications in marketing.
- **Automation and Data Analysis:** By automating routine tasks and analyzing data such as processing records, usage statistics, and trends, AI helps improve services and resources, providing valuable insights for strategic decision-making. AI can also free up library staff to focus on more complex tasks. Smart tools can handle functions like tracking loan and return processes, sending reminders, managing waitlists, and overseeing inventory quickly and accurately. Examples include LibraryH3lp and LibInsight.

- **Training Content Design and Production:** AI tools for designing and producing training content are vital for university libraries. They enable libraries to create interactive and diverse educational content that meets staff needs and enhances their skills. These tools also analyze data to provide insights into trainee performance, helping improve the quality of training and making data-driven decisions. These technologies contribute to increasing efficiency and productivity within libraries and create a sustainable and evolving learning environment. Examples include Articulate 360 and other similar tools (Hayek, 2024).
- **Smart Search and Content Exploration:** By using AI techniques such as NLP and intelligent inference, libraries can develop search systems that interact more precisely and effectively with users' complex queries and various phrasing. NLP applications can understand the style of queries and analyze text content, allowing systems to guide users to the correct resources based on their actual needs. Intelligent inference can also enhance the search experience by offering smart suggestions and deep insights into proposed results. These technologies help users quickly find relevant resources, saving time and enhancing the user experience. AI can also improve content discovery within libraries by identifying related or similar resources through big data analysis and using machine learning techniques to find relationships between materials. Popular AI applications for voice search and image search can also be integrated for more intuitive user interaction.
- **Intelligent Assistance Systems (Collection Management):** AI technologies like machine learning can improve resource management in university libraries by analyzing borrowing data and usage statistics to identify high-demand books and materials. This data allows libraries to refine their acquisition strategies and prioritize purchases. It also helps predict future library needs, contributing to sustainable and efficient resource provision.
- **Providing Virtual Support for Users:** AI enables libraries to offer real-time support that answers user inquiries and directs them to the appropriate resources. For example, AI-powered chatbots can handle user queries instantly, eliminating the need for direct interaction with library staff. AI can also be used to provide personalized virtual support, offering recommendations and guiding users toward resources that best meet their research needs.
- **Preservation and Maintenance of Library Materials:** AI provides innovative and effective solutions for monitoring and maintaining library materials in ways that were not possible before. AI-driven systems like computer vision can detect damage in library materials such as books, manuscripts, and photographs. AI-powered software can analyze images to identify signs of deterioration and take necessary actions for repair, whether by direct restoration or rehabilitation. Additionally, AI systems can predict the

lifespan of materials based on historical data and conditions like humidity, temperature, and light exposure. By analyzing this data, AI can forecast when materials might begin to degrade, allowing libraries to take preventive measures, such as adjusting temperature and humidity in storage environments or applying preservation treatments.

- **Collaboration Between Libraries:** AI can develop knowledge management systems and virtual collaboration platforms that connect university libraries, enabling them to share resources, exchange information about best practices in organizing cultural and educational events, and collaborate on developing digital services and updating automation systems. Libraries can also share digital books, databases, and research projects. This collaborative effort provides a wide range of resources to readers regardless of their geographical location, enhancing the reach and impact of academic libraries. AI is a powerful tool for analyzing data and generating insights, allowing libraries to contribute effectively to research and strategy development. This helps them design plans for service improvement and infrastructure development in a sustainable and efficient way. (Hayek, 2024)

In conclusion, using AI applications enables library staff to improve efficiency and achieve better results in their daily and professional tasks. It allows them to focus on more strategic and creative aspects of their work. Despite the many benefits of using AI applications, challenges must be addressed, such as ensuring the accuracy of

information and handling linguistic diversity. It is crucial to integrate human review to avoid errors and maintain quality. AI models must also be trained on a wide range of specialized texts to ensure better performance.

Based on the above, it can be concluded that integrating AI applications into documentary software leads to higher efficiency in managing library collections and improves the user experience by providing advanced, innovative services.

4.3 Global and Arab models

4.3.1 The British Library and the "Living with Machines" Project (2018-2023): The British Library is a vast research library with collections that include up to 200 million items, with more than 3 million new physical and digital items added annually. One of the challenges in managing these enormous collections is that the items are spread across different locations, making it difficult to search across all collections. This led to the creation of the "Living with Machines" project, a collaboration between the British Library, the Alan Turing Institute, and several partner universities. The project aims to innovate new methods in AI, data science, machine learning, and computational analysis tools to analyze massive historical digital collections and examine the impact of machines and technology on life during the 19th century (1780-1920). The team developed the MapReader program, a computer vision model that can break scanned maps into smaller sections and manually highlight the railway infrastructure. This has opened new horizons for historical research, as it is

now possible to ask questions about how railway infrastructure affected the lives of people living near the railway lines. Additionally, the team developed DeezyMatch, a flexible deep neural network approach to match fuzzy sequences, which can be used in tasks such as expanding research queries, selecting and refining results, and matching geographic names despite poor automatic transcription and digitization performed decades ago.

- Other GLAM (Galleries, Libraries, Archives, and Museums) Initiatives:

Several initiatives are focused on using machine learning and AI to improve access to, organize, and preserve cultural heritage materials. These initiatives include:

- Pixplot (Yale University), which uses machine learning and data visualization to group images by similarity.
- A partnership between the National Library of Sweden and Nvidia to train AI models on 500-year-old Swedish texts to support research in the humanities.
- The Human-Machine Culture project at the Berlin State Library, aiming to use AI to analyze documents and search for image similarities by involving expert specialists.
- The Annif project, a Finnish initiative for automatic subject indexing and classification.
- Matt Miller's project to produce structured data from unstructured text using ChatGPT to extract people, places, and dates from daily diaries, despite inconsistent date entries.
- The Humans-in-the-Loop initiative by the Library of Congress, aimed at improving the accuracy of machine learning models used to transcribe historical texts by integrating human expertise and feedback. (Gu, 2023)

4.3.2 Innovation Culture at the National Library of Singapore:

In 2021, the National Library Board (NLB) launched the LAB25 plan (Libraries and Archives Blueprint 2025), outlining the board's approach to innovation and experimentation in the era of increasing digital transformation. In April 2023, NLB collaborated with public and private sector partners to leverage technology to enhance user engagement with rich digital repositories. They launched three prototypes using generative AI to enhance their service offerings, including two focused on local and historical content related to Singapore. In developing these prototypes, NLB adopted a rapid prototyping approach to ensure flexibility and adaptability in the development process. This approach allowed the library to smoothly measure both user demand and product desire before committing to more comprehensive resources. In December 2023, NLB launched its first new-generation AI prototype, ChatBook, which allowed users to have conversations with authors by asking questions through a microphone or typing on an attached typewriter, based on the book *Seven Hundred Years: A History of Singapore* (2019). ChatBook was also supplemented with selected digital resources from NLB, providing visitors with an immersive exploration of Singapore's history. Furthermore, NLB completed an interactive digital platform, Singapore

Memory Archive, and the National Museum developed a digital platform offering visitors an inctive virtual forest experience. (Gurung & Upadhy, 2024)

4.3.3 The Finnish National Library: The Finnish National Library integrated two AI tools into its information technology system. The first tool is Named Entity Recognition (NER) using StanfordNER software to recognize persons and place names from historical Finnish newspapers. The first dataset for training and evaluation was created from pages of magazines and newspapers dated between 1836 and 1918. The system was trained using 220 pages and evaluated on 34 pages, with results showing a 71% recognition rate for persons' names and a 79% recognition rate for place names in the evaluation data. The second tool involves classifying images (ads, illustrations, maps, paintings, photographs, etc.) using Google TensorFlow. A training dataset was created to train a classification model, which was then used to classify 50,000 images, achieving an accuracy of 70-75% when 10,000 images were manually classified. Additionally, a user interface was created to allow easier monitoring of results. (AI tools integrated in the National Library of Finland, 2020)

4.3.4 Experience of the Amsterdam Public Library: In October 2005, the Amsterdam Public Library decided to begin implementing RFID technology in the central library and 21 branch libraries. The goal was to provide modern applications for managing and protecting its collections and to offer advanced services such as self-checkout and return of

materials, as well as utilizing the technology for inventory control. The library collaborated with the French supplier TAGSYS for the RFID technology components and also worked with Smartag and UPM Rafsec for the supply of RFID tags compliant with the ISO 15693 standard, operating at the popular and widely used 13.56 MHz frequency in libraries. This allowed the library to enhance the quality of services offered to users, improving efficiency and user experience (Abdelmokhtar, 2022, p. 186).

4.3.5 My Library Application at King Abdulaziz Public Library in Riyadh: In April 2017, the King Abdulaziz Public Library launched a new smart application called "My Library" to celebrate World Book and Copyright Day. This was the first free application for Arabic-speaking users, allowing them to organize and classify library collections through a simple, practical application. University library systems can also integrate with this app to benefit from the services it provides and offer feedback to improve future versions of the app. This initiative marks an important step in modernizing library services in the region (Sebti, 2, p. 491).

4.3.6 Hamdan Bin Mohammed Smart University Library in Dubai: The Hamdan Bin Mohammed Smart University Library is one of the modern and innovative libraries reflecting the university's vision to provide an innovative learning environment relying on modern technologies and artificial intelligence. Established as part of the digital transformation of academic institutions worldwide, it aims to achieve academic

excellence by offering advanced information services. The library allows users to easily access information and educational resources through digital platforms and conduct searches within large databases. It also provides a smart and integrated user experience based on voice and text interaction and AI, offering interactive interfaces that facilitate search operations and navigation between various digital materials

4. CONCLUSION

Artificial intelligence and documentary software in university libraries represent a significant step toward improving the effectiveness of knowledge management and facilitating access to information. These technologies have become a fundamental pillar in the development of university libraries both globally and within the Arab world. The integration of these technologies enhances the ability of researchers to access academic resources easily and efficiently. Considering the rapid developments in this field, there remain ample opportunities to expand the use of AI technologies and applications, integrating them with documentary software for managing university libraries, especially in the Arab world. This will contribute to enhancing the status and future prospects of these libraries as vital centers for research and education, positioning them as leaders in modernization, creativity, and innovation. Although challenges may arise in adopting these technologies, the successful foreign and some local Arab experiences reviewed here offer models that can be leveraged to improve performance and enhance the user experience.

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