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LIS211

INTRODUCTION TO ICT IN LIBRARY AND INFORMATION SERVICES

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COURSE CODE: LIS 211
COURSE TITLE: Introduction to ICT in Library and Information Services
COURSE UNIT LOAD: (2 Units C:)

- **Series 1: Basic Concepts in Information and Communication Technology**
- **Series 2: Library Automation and ICT Applications in Services**
- **Series 3: Information Seeking, Databases, and the Internet as Resources**
- **Series 4: Web Page Concept, Design, and Management Applications**
- **Series 5: Digital Libraries, Open Access, and ICT Challenges in Nigerian Contexts**

Proposed Outline for Series 1

- **1.1 Defining Information and Communication Concepts**
  - 1.1.1 Definition of information
  - 1.1.2 Definition of communication
  - 1.1.3 Definition of technology
- **1.2 Understanding Information and Communication Technology (ICT)**
  - 1.2.1 Definition of ICT
  - 1.2.2 Components of ICT
  - 1.2.3 Role of ICT in information services
- **1.3 ICT in the Library Context**
  - 1.3.1 Importance of ICT in libraries
  - 1.3.2 Examples of ICT tools used in libraries
  - 1.3.3 Benefits of ICT adoption in library services
- **Introduction**
- Every day, libraries and information centres rely on the effective use of information and communication technologies to deliver services. Before exploring advanced applications such as automation or digital libraries, it is important to first understand the fundamental concepts that underpin ICT. This Series sets the foundation by clarifying what we mean by information, communication, technology, and ICT, and by showing how these concepts connect directly to library practice.
- The aim of this Series is to introduce you to the basic concepts of ICT and to equip you with the knowledge needed to recognise its role and importance in library services.
- We shall commence this Series by defining information, communication, and technology as separate but related concepts. Next, we will move on to understanding ICT itself, examining its components and role in information services. Finally, we will wrap up by considering ICT in the library context, highlighting its importance, examples of tools, and the benefits of adoption. This progression will ensure you build a clear and practical understanding of ICT fundamentals before moving on to more advanced topics in later Series.

Series Learning Outcomes 1

Upon completing this Series, you should be able to:

- **SLO 1.1** define the concepts of information, communication, and technology,

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- **SLO 1.2** explain the meaning and components of information and communication technology (ICT),
- **SLO 1.3** describe the role of ICT in information services, and
- **SLO 1.4** analyse the importance, tools, and benefits of ICT in the library context.

1.1 Defining Information And Communication Concepts

In this Part, we will lay the foundation for understanding ICT by clarifying the meaning of **information**, **communication**, and **technology**. These concepts are central to library and information services, and grasping them will help you appreciate how ICT supports the work of libraries.

1.1.1 Definition of information

Information refers to processed data that is meaningful and useful to its recipient. Unlike raw data, which may be unorganised facts or figures, information has context, relevance, and purpose. In libraries, information is what users seek when they consult catalogues, databases, or reference materials.

Fill in the blank: Information is processed _____ that is meaningful and useful to its recipient.

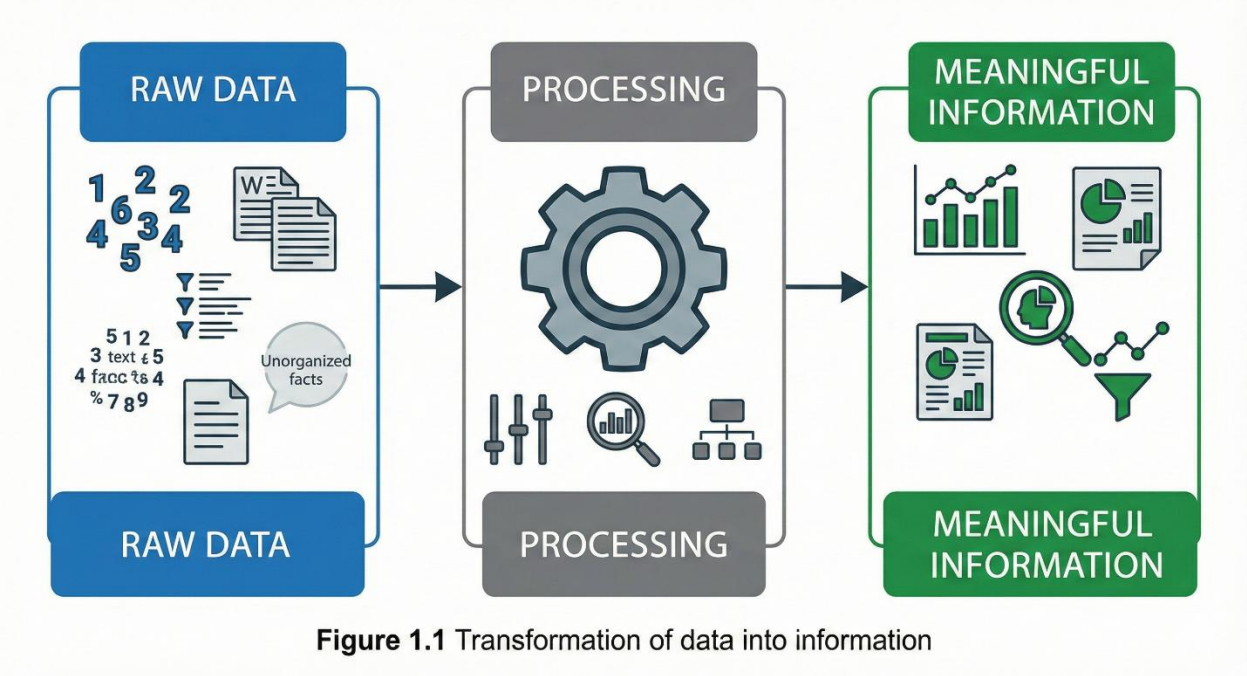


Figure 1.1 Transformation of data into information

1.1.2 Definition of communication

Communication is the process of transmitting information from one person or system to another. It involves a sender, a message, a medium, and a receiver. Effective communication ensures that information is not only delivered but also understood. In libraries, communication occurs when staff assist users, when catalogues present search results, or when notices are shared with patrons.

Fill in the blank: Communication involves a sender, a message, a medium, and a _____.

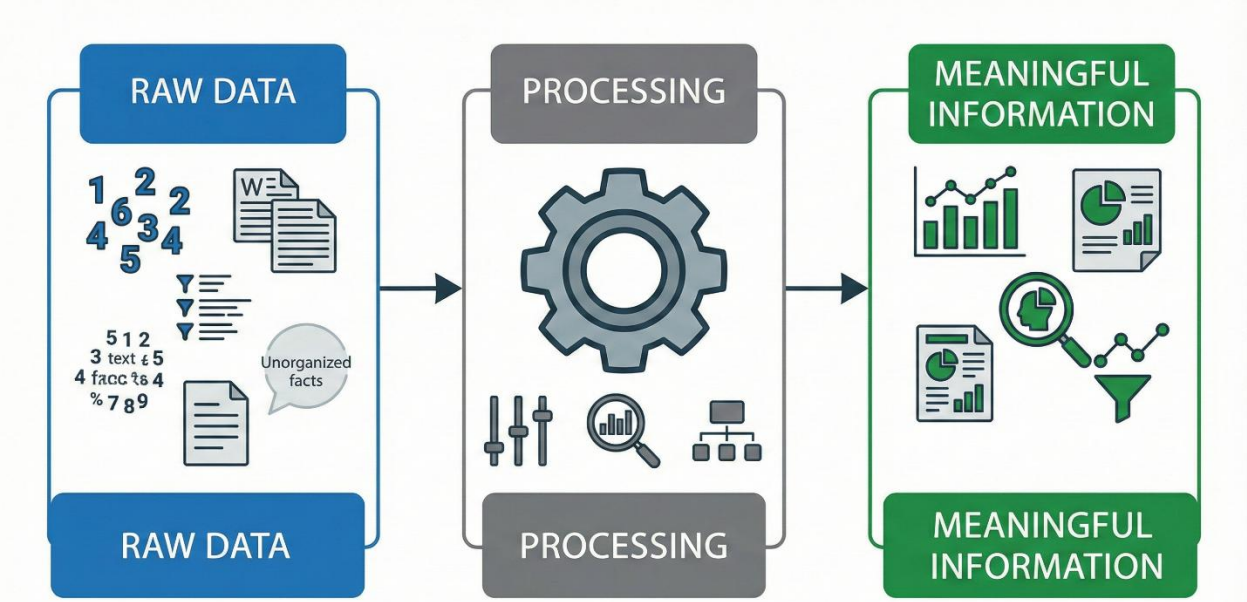
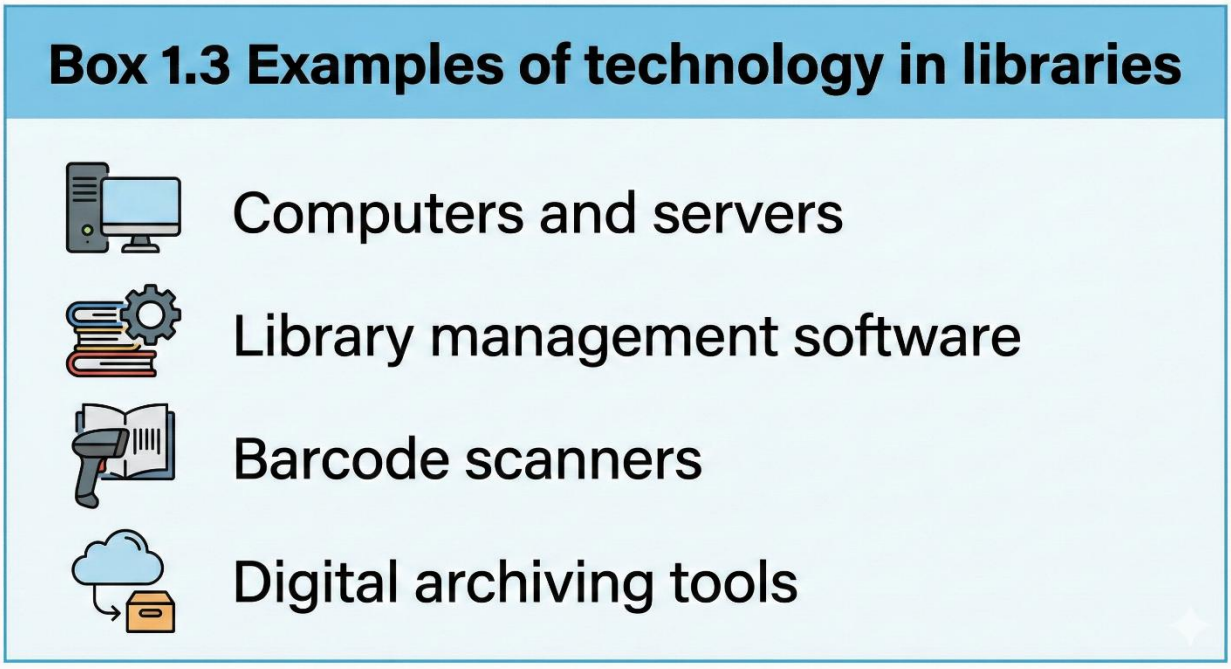


Figure 1.1 Transformation of data into information

1.1.3 Definition of technology

Technology refers to the tools, systems, and methods developed to solve problems or achieve specific goals. In the context of libraries, technology includes hardware such as computers and scanners, software such as cataloguing systems, and processes such as digital archiving. Technology enables libraries to deliver services more efficiently and to reach wider audiences.

Fill in the blank: Technology refers to the tools, systems, and _____ developed to solve problems or achieve goals.



Pilot questions 1.1

1. Information is best defined as: a. Raw data without context b. Processed data that is meaningful and useful c. Random facts and figures d. None of the above
2. Communication involves: a. A sender, a message, a medium, and a receiver b. Only a sender and a message c. Only a medium and a receiver d. None of the above
3. Technology in libraries refers to: a. Tools, systems, and methods used to deliver services b. Colour coding shelves c. Cancelling subscriptions d. None of the above
4. Which of the following is an example of technology in libraries? a. Barcode scanners b. Library management software c. Digital archiving tools d. All of the above
5. The transformation of data into information requires: a. Processing b. Colour coding c. Cancelling subscriptions d. None of the above

1.2 Understanding Information And Communication Technology (ICT)

Having defined information, communication, and technology separately, we now bring them together to understand **information and communication technology (ICT)**. ICT is the integration of tools and systems that enable the collection, processing, storage, and dissemination of information through effective communication channels. This Part will help you appreciate what ICT means, its components, and its role in information services.

1.2.1 Definition of ICT

Information and communication technology (ICT) refers to the combined use of hardware, software, networks, and processes to manage and share information effectively. It encompasses everything from computers and mobile devices to internet services and specialised library applications. ICT is not just about machines; it is about how these tools are used to support communication and information flow.

Fill in the blank: ICT refers to the combined use of hardware, software, networks, and _____ to manage and share information.

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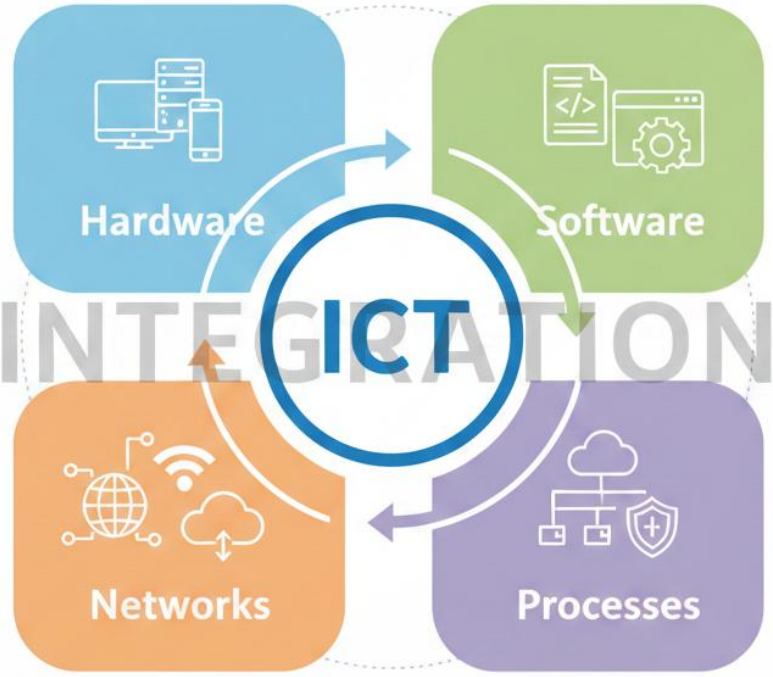

Figure 1.4 Components of ICT

1.2.2 Components of ICT

The **components of ICT** include hardware (computers, servers, scanners), software (applications, operating systems), networks (internet, intranet, wireless connections), and processes (methods of managing and delivering information). Each component plays a distinct role but works together to ensure that information is accessible and communication is effective.

Fill in the blank: The components of ICT include hardware, software, networks, and _____.

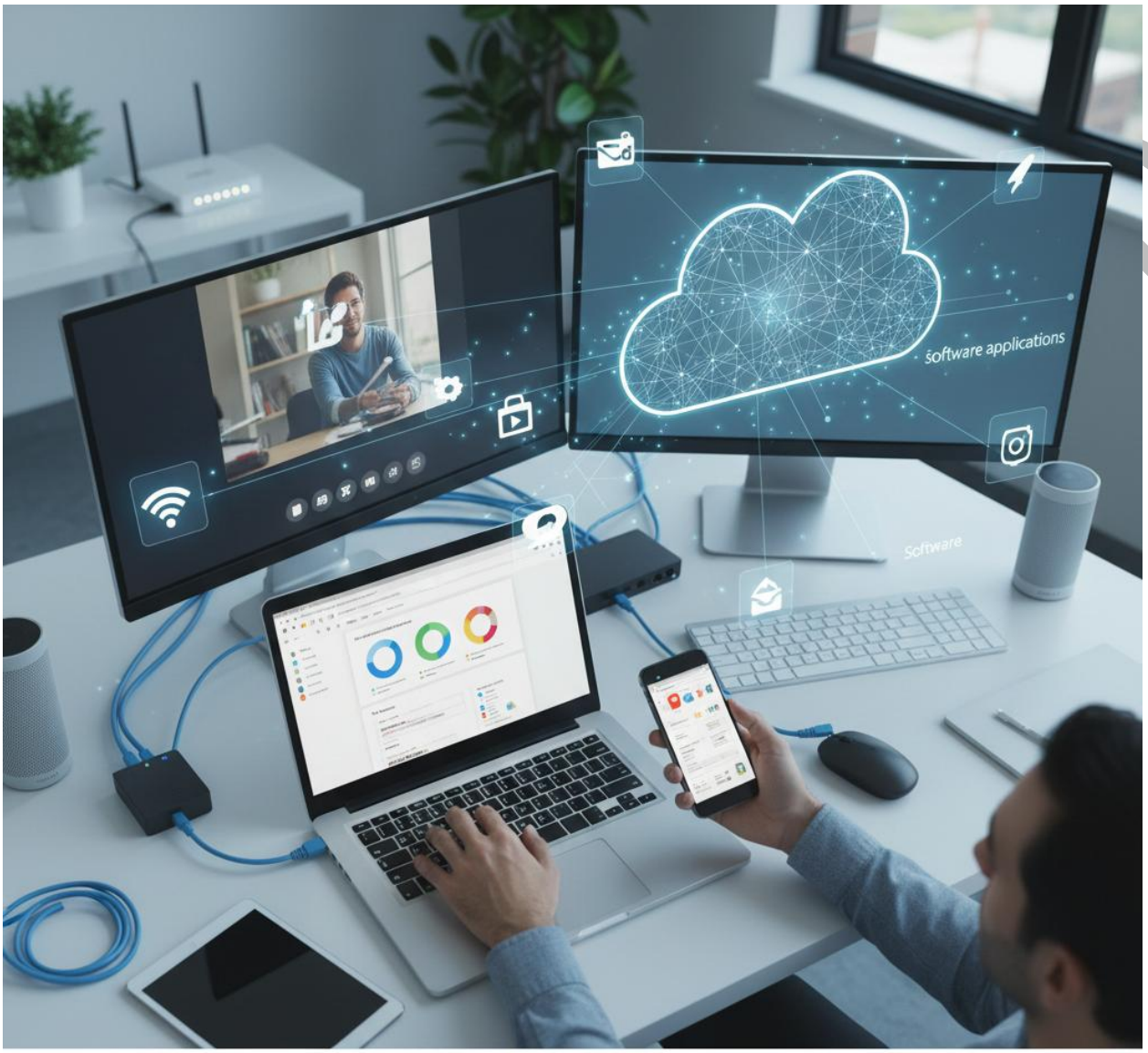

Plate 1.5 ICT components in practice

1.2.3 Role of ICT in information services

The **role of ICT in information services** is to enhance efficiency, accessibility, and communication. ICT enables libraries to automate cataloguing, provide online access to resources, support digital reference services, and facilitate collaboration among staff and users. By integrating ICT, libraries can deliver services faster, reach wider audiences, and adapt to changing information needs.

Fill in the blank: ICT enables libraries to automate _____, provide online access, and support digital reference services.

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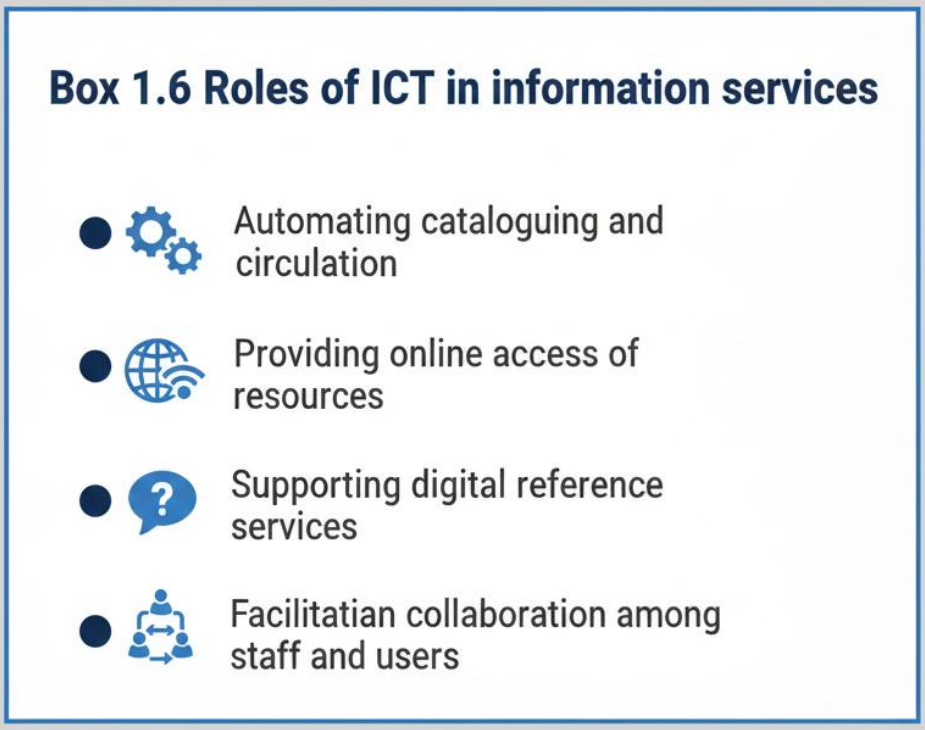

Pilot questions 1.2

1. ICT refers to: a. The combined use of hardware, software, networks, and processes b. Only hardware and software c. Only communication tools d. None of the above
2. Which of the following is a component of ICT? a. Hardware b. Software c. Networks d. All of the above
3. The role of ICT in information services includes: a. Automating cataloguing and circulation b. Providing online access to resources c. Supporting digital reference services d. All of the above
4. ICT in libraries helps to: a. Enhance efficiency and accessibility b. Colour code shelves c. Cancel subscriptions d. None of the above
5. Processes in ICT refer to: a. Methods of managing and delivering information b. Colour coding shelves c. Cancelling subscriptions d. None of the above

1.3 ICT In The Library Context

Having explored the meaning and components of ICT, we now turn to its application within libraries. Libraries are information-rich environments, and ICT provides the tools and systems that make it possible to manage, deliver, and promote services effectively. This Part will help you see how ICT is embedded in everyday library operations and why it is essential for modern information services.

1.3.1 Importance of ICT in libraries

The **importance of ICT in libraries** lies in its ability to improve efficiency, expand access, and support innovation. ICT enables libraries to automate repetitive tasks such as cataloguing and circulation, making staff more productive. It also allows users to access resources remotely, breaking down geographical barriers. Furthermore, ICT supports new services such as digital reference and online learning, ensuring that libraries remain relevant in the digital age.

Fill in the blank: ICT enables libraries to automate repetitive tasks such as _____ and circulation.

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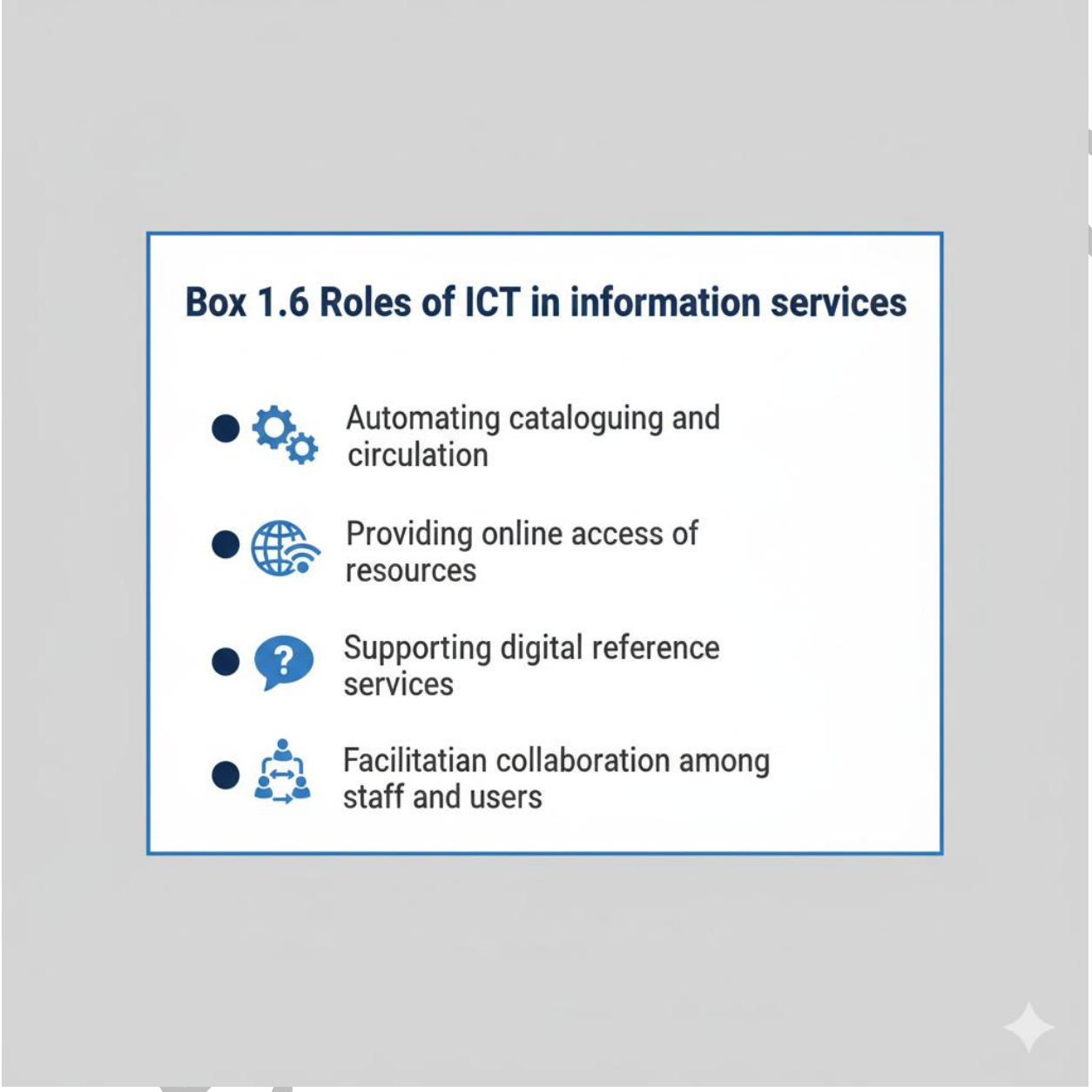


1.3.2 Examples of ICT tools used in libraries

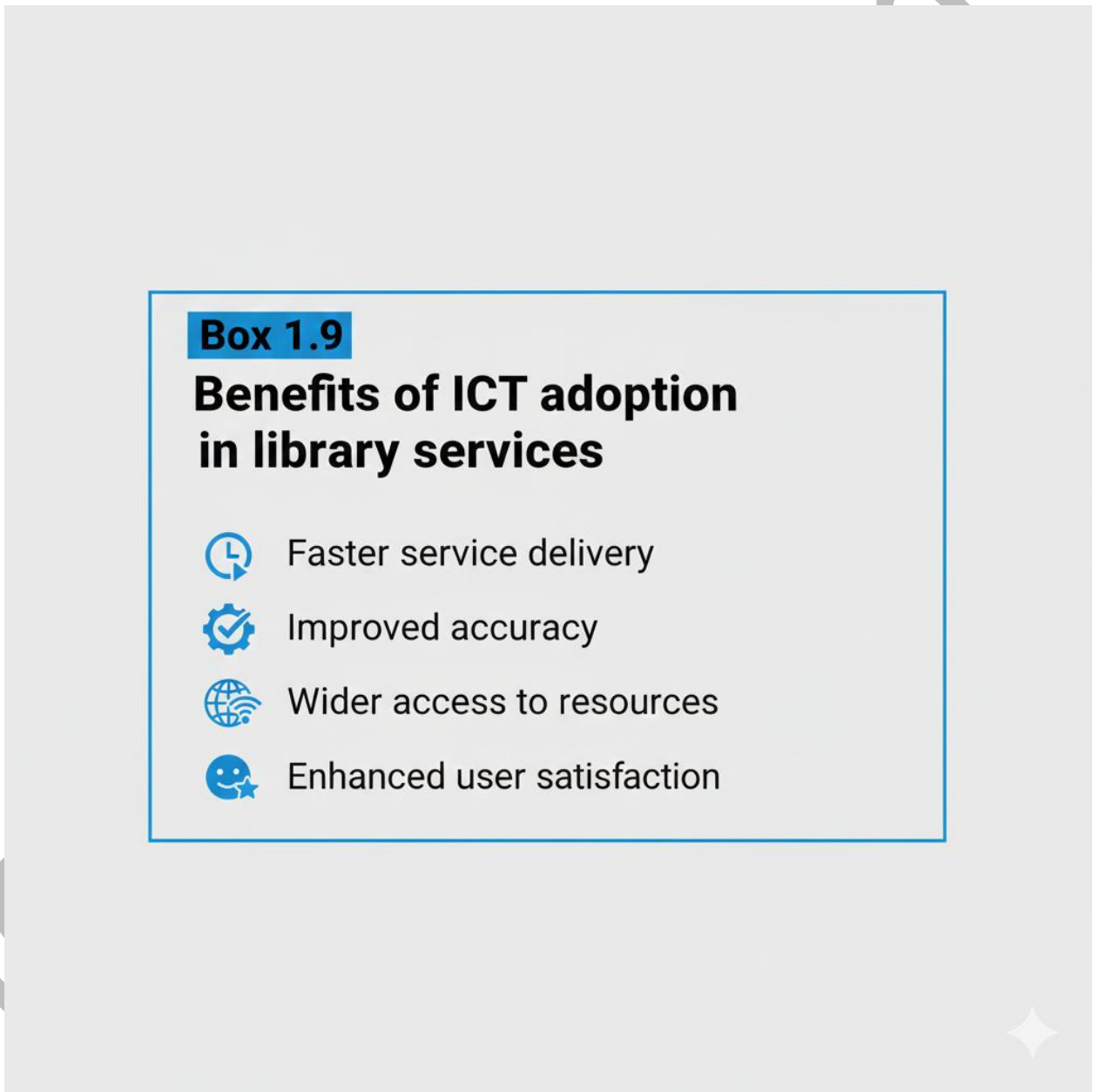
Libraries use a wide range of **ICT tools** to deliver services. These include library management systems for cataloguing and circulation, digital repositories for storing research outputs, barcode scanners for tracking items, and online databases for information retrieval. Each tool contributes to making library services more organised, accessible, and user-friendly.

Fill in the blank: Barcode _____ are ICT tools used in libraries to track items.

[Insert plate here] Image showing ICT tools in libraries (computers, barcode scanners, library management software) Caption: Plate 1.8 ICT tools commonly used in libraries AI prompt suggestion: “Generate an image showing ICT tools in libraries such as computers, barcode scanners, and library management software.” Search string: “ICT tools used in libraries OER”

1.3.3 Benefits of ICT adoption in library services

The **benefits of ICT adoption** include faster service delivery, improved accuracy, wider access to resources, and enhanced user satisfaction. ICT reduces human error in cataloguing, allows users to search and retrieve information instantly, and supports remote access to digital collections. By adopting ICT, libraries can meet the evolving needs of their communities and remain competitive in the information environment.



Pilot questions 1.3

1. ICT enables libraries to: a. Automate cataloguing and circulation b. Provide remote access to resources c. Support digital reference services d. All of the above
2. Which of the following is an ICT tool used in libraries? a. Barcode scanners b. Library management systems c. Digital repositories d. All of the above
3. Benefits of ICT adoption in libraries include: a. Faster service delivery and improved accuracy b. Wider access to resources c. Enhanced user satisfaction d. All of the above

4. ICT adoption reduces: a. Human error in cataloguing b. Colour coding of shelves c. Cancelling subscriptions d. None of the above
5.

Series Summary

This Series was designed to establish a clear foundation for understanding ICT in the context of library services. By beginning with the definitions of information, communication, and technology, you were guided to see how these concepts interrelate and why they are essential for modern information environments. The Series then introduced ICT as a combined framework of hardware, software, networks, and processes, before moving on to its specific role in supporting information services.

We started by defining the basic concepts, then examined ICT itself and its components, and finally explored its importance, tools, and benefits within libraries. In line with the Series Learning Outcomes, you should now be able to define information, communication, and technology (SLO 1.1), explain the meaning and components of ICT (SLO 1.2), describe its role in information services (SLO 1.3), and analyse its importance and benefits in the library context (SLO 1.4). This ensures you are well prepared to progress into later Series where ICT applications will be studied in greater depth.

Glossary of Terms 1

- **Information**: Processed data that is meaningful and useful to its recipient, often providing context and relevance.
- **Communication**: The process of transmitting information from a sender to a receiver through a chosen medium.
- **Technology**: Tools, systems, and methods developed to solve problems or achieve specific goals.
- **Information and communication technology (ICT)**: The combined use of hardware, software, networks, and processes to manage and share information effectively.
- **Hardware**: Physical devices such as computers, servers, and scanners used in ICT systems.
- **Software**: Applications and operating systems that enable tasks and processes within ICT.
- **Networks**: Systems of interconnected devices that allow information to be shared, including internet and intranet connections.
- **Processes**: Methods and procedures used to manage, deliver, and communicate information.
- **Library management systems**: Software applications that automate cataloguing, circulation, and other library functions.
- **Digital repositories**: Online platforms for storing and providing access to research outputs and digital collections.
- **Barcode scanners**: Devices used in libraries to track items and manage circulation efficiently.

Objective Questions

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1. Information is best defined as: a. Raw data without context b. Processed data that is meaningful and useful c. Random facts and figures d. None of the above *(Linked to SLO 1.1)*
2. Communication involves: a. A sender, a message, a medium, and a receiver b. Only a sender and a message c. Only a medium and a receiver d. None of the above *(Linked to SLO 1.1)*
3. Which of the following is a component of ICT? a. Hardware b. Software c. Networks d. All of the above *(Linked to SLO 1.2)*
4. The role of ICT in information services includes: a. Automating cataloguing and circulation b. Providing online access to resources c. Supporting digital reference services d. All of the above *(Linked to SLO 1.3)*
5. Benefits of ICT adoption in libraries include: a. Faster service delivery and improved accuracy b. Wider access to resources c. Enhanced user satisfaction d. All of the above *(Linked to SLO 1.4)*

Short-Answer Questions

6. Define information in your own words. *(Linked to SLO 1.1)*
7. Explain one way communication supports library services. *(Linked to SLO 1.1)*
8. State one component of ICT and describe its role. *(Linked to SLO 1.2)*
9. Identify one role of ICT in information services. *(Linked to SLO 1.3)*
10. Mention one benefit of ICT adoption in libraries. *(Linked to SLO 1.4)*

Long-Answer Questions

11. Analyse the importance of ICT in libraries, giving examples of tools and services. *(Linked to SLO 1.4)*
12. Evaluate the role of ICT in information services, highlighting its impact on efficiency and accessibility. *(Linked to SLO 1.3)*

Answers to Concept Check Questions 1

Objective Questions

1. b. Processed data that is meaningful and useful
2. a. A sender, a message, a medium, and a receiver
3. d. All of the above
4. d. All of the above
5. d. All of the above

Short-Answer Questions

6. Information is processed data that has meaning and usefulness.
7. Communication supports library services by enabling staff to guide users and share information effectively.
8. Hardware is a component of ICT; for example, computers allow cataloguing and access to digital resources.
9. One role of ICT is providing online access to resources.
10. One benefit of ICT adoption is faster service delivery.

Long-Answer Questions

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11. *Basic response*: ICT is important in libraries because it improves efficiency, expands access, and supports innovation. Tools such as library management systems, barcode scanners, and digital repositories make services more organised and accessible. *Value-added response*: Outstanding learners may add that ICT also supports remote learning, enhances collaboration, and ensures libraries remain relevant in the digital age. They may discuss how ICT reduces human error and supports inclusive services through accessibility features.

12. *Basic response*: ICT plays a role in automating cataloguing, providing online access, and supporting digital reference services, which improves efficiency and accessibility. *Value-added response*: Outstanding learners may expand by explaining how ICT enables real-time collaboration, supports global resource sharing, and enhances user satisfaction. They may also highlight how ICT helps libraries adapt to changing information needs and integrate with broader educational platforms.

Answers to Pilot Questions 1

Part 1.1 Defining Information and Communication Concepts

- Processed data that is meaningful and useful
- A sender, a message, a medium, and a receiver
- Tools, systems, and methods used to deliver services
- All of the above
- Processing

Part 1.2 Understanding Information and Communication Technology (ICT)

- The combined use of hardware, software, networks, and processes
- All of the above
- All of the above
- Enhance efficiency and accessibility
- Methods of managing and delivering information

Part 1.3 ICT in the Library Context

- All of the above
- All of the above
- All of the above
- Human error in cataloguing
- Efficiency, access, and innovation

References and Attributions 1

This section compiles references and attributions for *Series 1: Fundamental Concepts of ICT in Library Services*. References are presented in APA style, and illustration prompts are included for clarity.

General References

- Bawden, D., & Robinson, L. (2012). *Introduction to information science*. Facet Publishing.
- Case, D. O. (2016). *Looking for information: A survey of research on information seeking, needs, and behaviour*. Emerald Group Publishing.
- Ghosh, S. B. (2019). *Open source library management systems: Current trends and future directions*. Information Development, 35(4), 345–356.

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- OER Commons. Retrieved from https://www.oercommons.org
- Taylor, A. G. (2016). *Introduction to cataloguing and classification*. Libraries Unlimited.

Illustration Attributions

- *Figure 1.1 Transformation of data into information*
- *[Insert figure here]*
- *Diagram showing the transformation from data to information (data → processing → information)*
- *AI prompt suggestion: "Create a diagram showing the transformation from raw data to meaningful information through processing."*
- *Suggested OER search: "data to information transformation diagram OER"*
- *Plate 1.2 Basic communication model*
- *[Insert plate here]*
- *Image showing a simple communication model with sender, message, medium, and receiver*
- *AI prompt suggestion: "Generate an image showing a simple communication model with sender, message, medium, and receiver."*
- *Suggested OER search: "basic communication model diagram OER"*
- *Box 1.3 Examples of technology in libraries*
- *[Insert box here]*
- *Text-based infographic listing computers, servers, barcode scanners, and digital archiving tools*
- *AI prompt suggestion: "Generate a text-based infographic listing examples of technology used in libraries."*
- *Suggested OER search: "library technology examples infographic OER"*
- *Figure 1.4 Components of ICT*
- *[Insert figure here]*
- *Diagram showing ICT as the integration of hardware, software, networks, and processes*
- *AI prompt suggestion: "Create a diagram showing ICT as the integration of hardware, software, networks, and processes."*
- *Suggested OER search: "ICT components diagram OER"*
- *Plate 1.5 ICT components in practice*
- *[Insert plate here]*
- *Image showing ICT components: hardware devices, software applications, and network connections*
- *AI prompt suggestion: "Generate an image showing ICT components such as hardware devices, software applications, and network connections."*
- *Suggested OER search: "ICT components hardware software networks OER"*
- *Box 1.6 Roles of ICT in information services*
- *[Insert box here]*
- *Text-based infographic listing automation, online access, digital reference, and collaboration*

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- *AI prompt suggestion: "Generate a text-based infographic listing roles of ICT in information services such as automation and online access."*
- *Suggested OER search: "roles of ICT in library information services OER"*
- *Figure 1.7 Importance of ICT in libraries*
- *[Insert figure here]*
- *Diagram showing ICT benefits in libraries (efficiency, access, innovation)*
- *AI prompt suggestion: "Create a diagram showing ICT benefits in libraries such as efficiency, access, and innovation."*
- *Suggested OER search: "importance of ICT in libraries diagram OER"*
- *Plate 1.8 ICT tools commonly used in libraries*
- *[Insert plate here]*
- *Image showing ICT tools in libraries (computers, barcode scanners, library management software)*
- *AI prompt suggestion: "Generate an image showing ICT tools in libraries such as computers, barcode scanners, and library management software."*
- *Suggested OER search: "ICT tools used in libraries OER"*
- *Box 1.9 Benefits of ICT adoption in library services*
- *[Insert box here]*
- *Text-based infographic listing faster service delivery, improved accuracy, wider access, and enhanced user satisfaction*
- *AI prompt suggestion: "Generate a text-based infographic listing benefits of ICT adoption in library services."*
- *Suggested OER search: "benefits of ICT adoption in libraries OER"*

COURSE CODE: LIS 211
COURSE TITLE: Introduction to ICT in Library and Information Services
COURSE UNIT LOAD: (2 Units C:)

- **Series 1: Basic Concepts in Information and Communication Technology**
- **Series 2: Library Automation and ICT Applications in Services**
- **Series 3: Information Seeking, Databases, and the Internet as Resources**
- **Series 4: Web Page Concept, Design, and Management Applications**
- **Series 5: Digital Libraries, Open Access, and ICT Challenges in Nigerian Contexts**

Series 2: Library Automation and ICT Applications in Services

Proposed Outline for Series 2

- **2.1 Introduction to Library Automation**
  - 2.1.1 Definition and concept of library automation
  - 2.1.2 Historical development of library automation

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- 2.1.3 Objectives and scope of automation in libraries
- **2.2 ICT Application to Technical Services**
  - 2.2.1 ICT in cataloguing and classification
  - 2.2.2 ICT in acquisition and processing
  - 2.2.3 ICT in serials management
- **2.3 ICT Application to Readers' Services**
  - 2.3.1 ICT in circulation services
  - 2.3.2 ICT in reference services
  - 2.3.3 ICT in information retrieval and user access
- **2.4 Benefits and Challenges of ICT in Library Services**
  - 2.4.1 Benefits of automation and ICT applications
  - 2.4.2 Challenges in implementing ICT in libraries
  - 2.4.3 Future prospects for ICT in library services

Introduction

- Libraries today are increasingly shaped by automation and the application of ICT across their services. Tasks that once required extensive manual effort, such as cataloguing or circulation, can now be streamlined through technology, allowing staff to focus more on supporting users. This Series builds on the foundational concepts of ICT and introduces you to how automation and ICT are transforming both technical and readers' services in libraries.
- The aim of this Series is to familiarise you with the concept of library automation and to show how ICT is applied to different areas of library services, highlighting both the benefits and the challenges involved.
- We shall commence this Series by examining the concept, history, and objectives of library automation. Next, we will explore ICT applications in technical services such as cataloguing, acquisitions, and serials management. Following that, we will move on to ICT applications in readers' services, including circulation, reference, and information retrieval. Finally, we will wrap up by considering the benefits and challenges of ICT adoption in library services, as well as future prospects.

eries Learning Outcomes 2

Upon completing this Series, you should be able to:

- **SLO 2.1** define the concept of library automation and explain its objectives and scope,
- **SLO 2.2** describe how ICT is applied to technical services such as cataloguing, acquisitions, and serials management,
- **SLO 2.3** explain how ICT supports readers' services including circulation, reference, and information retrieval, and
- **SLO 2.4** analyse the benefits and challenges of ICT adoption in library services, highlighting future prospects.

2.1 Introduction To Library Automation

Library automation is one of the most significant transformations brought about by ICT in the information environment. It refers to the use of technology to perform library functions that were

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traditionally carried out manually. In this Part, we will explore the definition and concept of library automation, trace its historical development, and examine its objectives and scope.

2.1.1 Definition and concept of library automation

Library automation is the application of computers and related technologies to perform library operations such as cataloguing, circulation, acquisitions, and serials control. It involves replacing manual processes with automated systems that improve efficiency, accuracy, and accessibility. Automation does not eliminate the role of librarians but enhances their ability to deliver services more effectively.

Fill in the blank: Library automation refers to the application of _____ and related technologies to perform library operations.

[Insert figure here] Diagram showing manual library processes versus automated processes (cataloguing, circulation, acquisitions) Caption: Figure 2.1 Manual versus automated library processes AI prompt suggestion: “Create a diagram comparing manual library processes with automated processes such as cataloguing and circulation.” Search string: “library automation manual vs automated processes diagram OER”

2.1.2 Historical development of library automation

The **historical development of library automation** can be traced back to the mid-20th century when libraries began experimenting with punch cards and early computer systems. By the 1960s and 1970s, integrated library systems (ILS) emerged, allowing libraries to automate cataloguing and circulation. The advent of the internet in the 1990s expanded automation further, enabling online catalogues and digital repositories. Today, automation encompasses cloud-based systems, mobile access, and integration with global databases.

Fill in the blank: Integrated _____ systems (ILS) emerged in the 1960s and 1970s to automate cataloguing and circulation.

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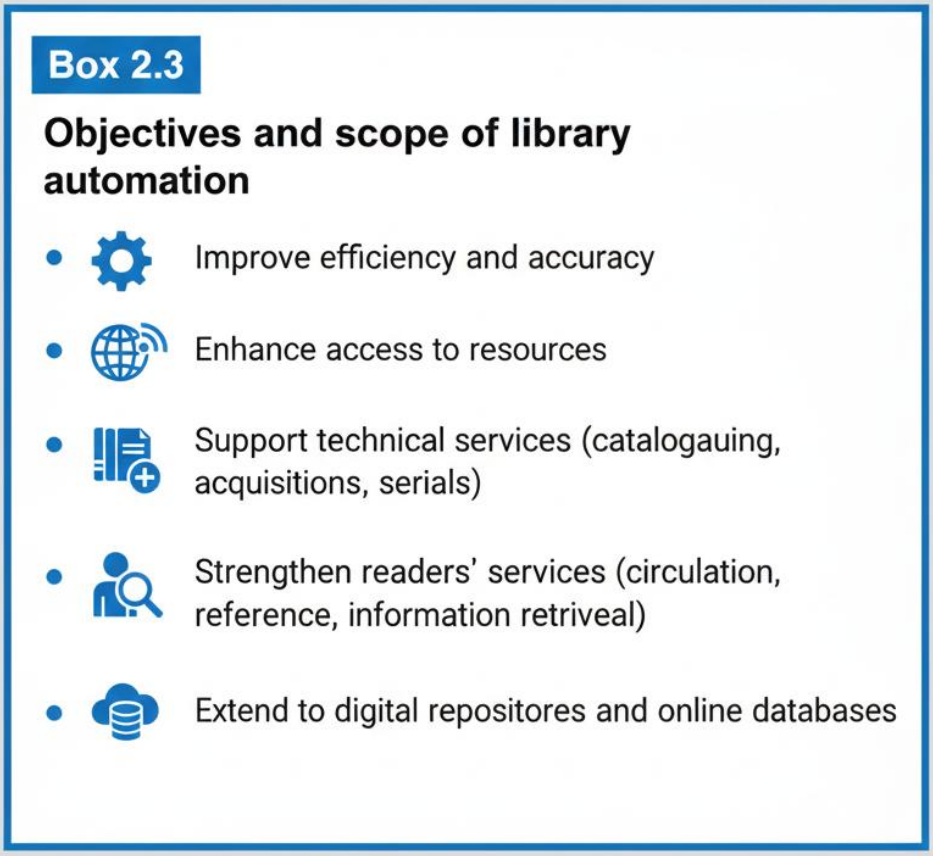
Plate 2.2 Early tools used in library automation

2.1.3 Objectives and scope of automation in libraries

The **objectives of library automation** include improving efficiency, reducing human error, enhancing access to resources, and supporting better user services. The **scope of automation** covers technical services such as cataloguing, acquisitions, and serials management, as well as readers' services like circulation and reference. Automation also extends to digital repositories, online databases, and remote access systems, ensuring that libraries remain relevant in the digital age.

Fill in the blank: The objectives of library automation include improving efficiency, reducing _____ error, and enhancing access to resources.



Pilot questions 2.1

1. Library automation refers to the application of: a. Computers and related technologies to perform library operations b. Manual filing systems c. Colour coding shelves d. None of the above
2. Integrated library systems (ILS) first emerged in: a. The 1940s b. The 1960s and 1970s c. The 1990s d. None of the above
3. One objective of library automation is to: a. Reduce human error b. Cancel subscriptions c. Colour code shelves d. None of the above
4. The scope of library automation covers: a. Technical services and readers' services b. Only technical services c. Only readers' services d. None of the above
5. The advent of the _____ in the 1990s expanded library automation to include online catalogues and digital repositories.

2.2 ICT Application To Technical Services

Technical services form the backbone of library operations, dealing with the organisation, acquisition, and management of resources. ICT has transformed these services by introducing automation, digital tools, and online systems that make processes faster, more accurate, and more accessible. In this Part, we will explore how ICT is applied to cataloguing and classification, acquisitions and processing, and serials management.

2.2.1 ICT in cataloguing and classification

Cataloguing is the process of creating bibliographic records for library materials, while **classification** involves arranging these materials according to subject categories. ICT supports these functions through integrated library systems (ILS), online cataloguing tools, and metadata standards such as MARC (Machine-Readable Cataloguing). These systems ensure consistency, reduce human error, and allow users to search and retrieve materials more efficiently.

Fill in the blank: ICT supports cataloguing and classification through integrated _____ systems and metadata standards such as MARC.

[Insert figure here] Diagram showing ICT in cataloguing and classification (metadata standards, online catalogues, subject categories) Caption: Figure 2.4 ICT in cataloguing and classification AI prompt suggestion: “Create a diagram showing ICT in cataloguing and classification using metadata standards and online catalogues.” Search string: “ICT cataloguing classification MARC diagram OER”

2.2.2 ICT in acquisition and processing

Acquisition refers to the process of selecting and purchasing library materials, while **processing** involves preparing these materials for use. ICT streamlines acquisitions by enabling electronic ordering, online vendor catalogues, and automated invoicing. Processing is enhanced through barcode generation, digital labelling, and automated entry into library databases. Together, these applications save time and ensure that resources are quickly available to users.

Fill in the blank: ICT streamlines acquisitions by enabling electronic _____, online vendor catalogues, and automated invoicing.

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Plate 2.5 ICT in acquistions and processing

2.2.3 ICT in serials management

Serials management involves handling journals, magazines, and other periodicals. ICT applications include electronic subscription management, automated check-in systems, and digital access to e-journals. Libraries can track subscriptions, manage renewals, and provide users with online access to current and archived issues. This reduces delays, improves accuracy, and ensures that users have timely access to scholarly content.

Fill in the blank: ICT applications in serials management include electronic subscription management and automated _____ systems.

Plate 2.5 ICT in acquistions and processing

Pilot questions 2.2

1. ICT supports cataloguing and classification through: a. Integrated library systems and metadata standards b. Colour coding shelves c. Cancelling subscriptions d. None of the above
2. Acquisition in libraries refers to: a. Selecting and purchasing materials b. Colour coding shelves c. Cancelling subscriptions d. None of the above
3. ICT streamlines acquisitions by enabling: a. Electronic ordering and automated invoicing b. Colour coding shelves c. Cancelling subscriptions d. None of the above
4. ICT in serials management includes: a. Electronic subscription management b. Automated check-in systems c. Digital access to e-journals d. All of the above
5. Processing in libraries is enhanced through: a. Barcode generation and automated database entry b. Colour coding shelves c. Cancelling subscriptions d. None of the above

2.3 ICT Application To Readers' Services

Readers' services are the most visible part of library operations because they directly involve interaction with users. ICT has greatly enhanced these services by introducing automation, digital tools, and online platforms that make access faster, more reliable, and more user-centred. In this Part, we will explore ICT applications in circulation services, reference services, and information retrieval.

2.3.1 ICT in circulation services

Circulation services involve lending and returning library materials, managing user accounts, and tracking borrowed items. ICT supports these functions through automated circulation systems, barcode scanners, and online renewal platforms. These tools reduce queues, minimise errors, and allow users to manage their accounts remotely.

Fill in the blank: ICT supports circulation services through automated circulation systems, _____ scanners, and online renewal platforms.

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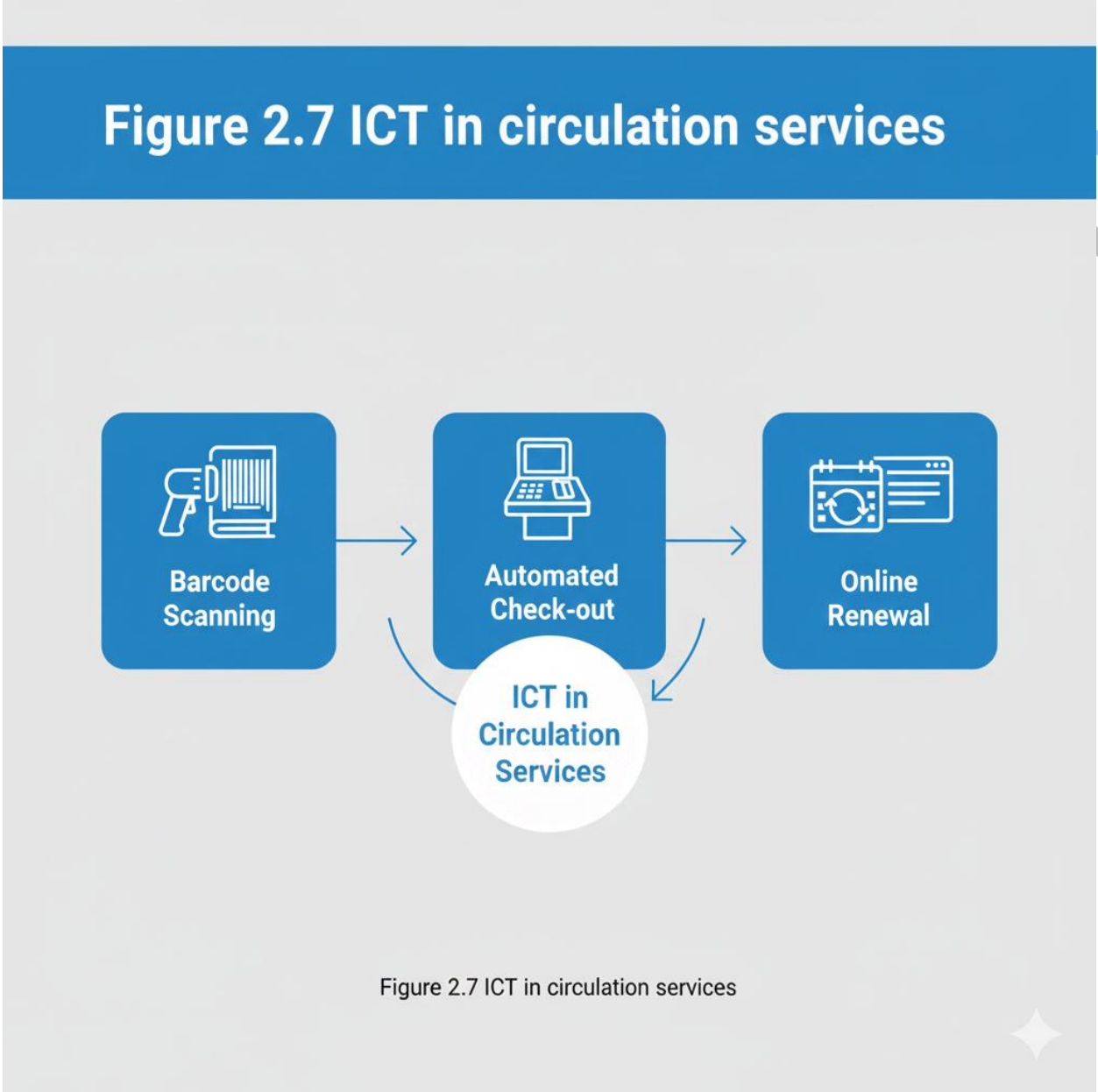


Figure 2.7 ICT in circulation services

2.3.2 ICT in reference services

Reference services provide users with assistance in finding information and answering queries. ICT enhances these services through digital reference platforms, online chat systems, and email-based enquiry services. Libraries can now offer virtual reference desks, enabling users to receive support without being physically present. This ensures wider access and faster responses.

Fill in the blank: ICT enhances reference services through digital reference platforms, online chat systems, and _____ enquiry services.

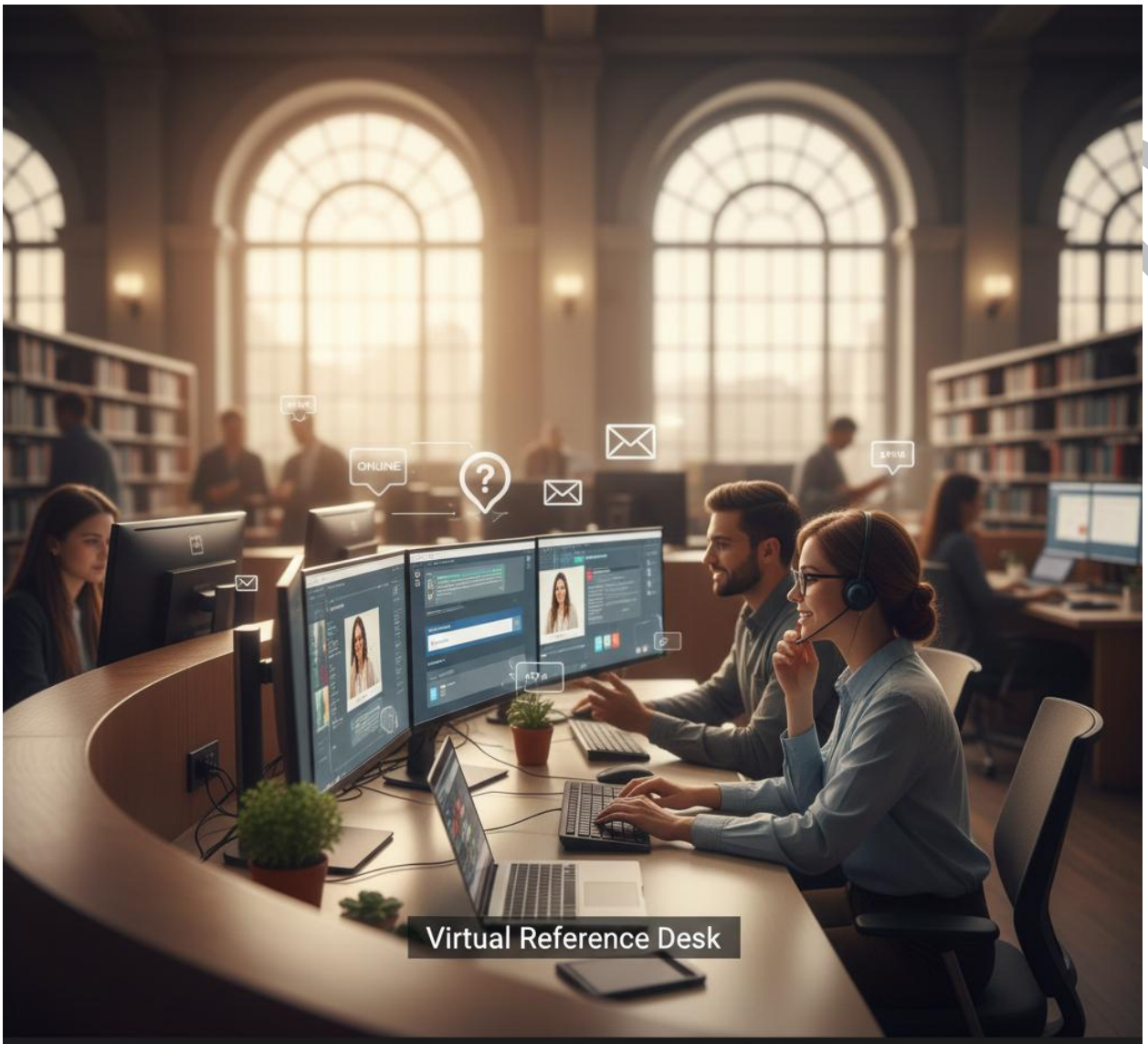
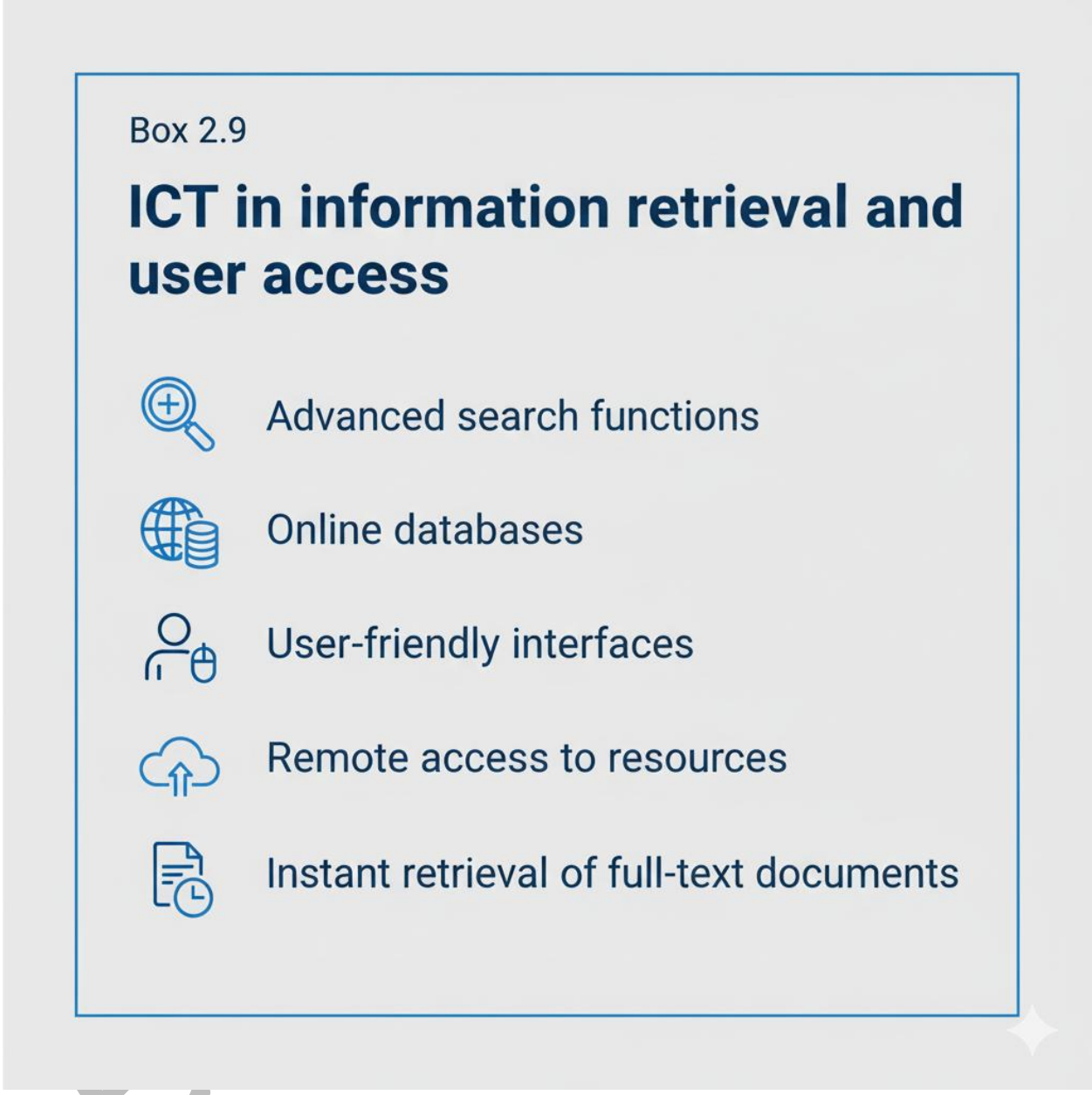


Plate 2.8 ICT in reference services

2.3.3 ICT in information retrieval and user access

Information retrieval refers to the process of searching for and obtaining information from databases, catalogues, or repositories. ICT enables advanced search functions, online databases, and user-friendly interfaces that make retrieval faster and more accurate. Users can access resources remotely, customise searches, and retrieve full-text documents instantly. This has transformed the way libraries deliver information.

Fill in the blank: ICT enables advanced _____ functions, online databases, and user-friendly interfaces for information retrieval.



Pilot questions 2.3

1. ICT supports circulation services through: a. Automated circulation systems b. Barcode scanners c. Online renewal platforms d. All of the above
2. Reference services in libraries are enhanced by: a. Digital reference platforms b. Online chat systems c. Email enquiry services d. All of the above
3. ICT in information retrieval enables: a. Advanced search functions b. Online databases c. User-friendly interfaces d. All of the above
4. One benefit of ICT in circulation services is: a. Reduced queues and minimised errors b. Colour coding shelves c. Cancelling subscriptions d. None of the above
5. Virtual reference desks allow users to: a. Receive support without being physically present b. Cancel subscriptions c. Colour code shelves d. None of the above

2.4 Benefits And Challenges Of ICT In Library Services

Having examined how ICT is applied to technical and readers' services, it is important to reflect on the overall impact of these technologies in libraries. ICT adoption brings significant benefits, but it also presents challenges that libraries must address to remain effective. In this Part, we will explore the benefits, challenges, and future prospects of ICT in library services.

2.4.1 Benefits of automation and ICT applications

The **benefits of ICT in libraries** include faster service delivery, improved accuracy, wider access to resources, and enhanced user satisfaction. Automation reduces repetitive manual tasks, allowing staff to focus on higher-level services. ICT also enables remote access to resources, supports collaboration, and ensures that users can retrieve information quickly and reliably.

Fill in the blank: ICT adoption in libraries enhances user _____ by providing faster, more accurate, and accessible services.

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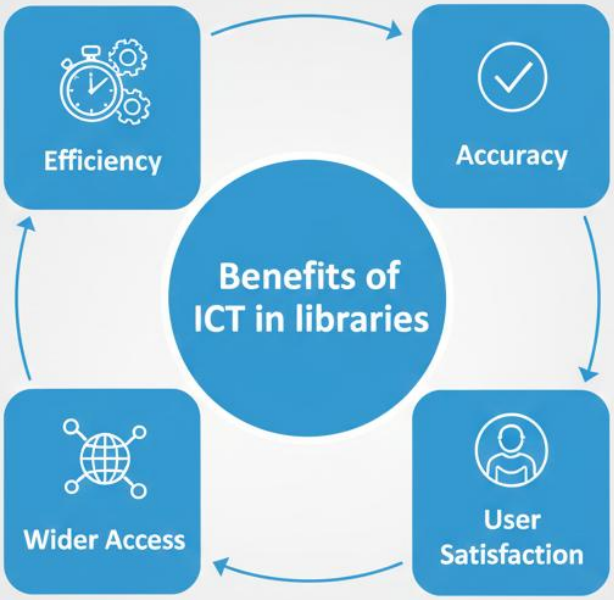

Figure 2.10 Benefits of ICT in libraries

2.4.2 Challenges in implementing ICT in libraries

Despite its benefits, ICT adoption faces several **challenges**. These include high costs of hardware and software, inadequate infrastructure, lack of skilled personnel, and resistance to change. Libraries in developing regions may struggle with unstable electricity supply or limited internet connectivity. Addressing these challenges requires careful planning, investment, and training.

Fill in the blank: One challenge of ICT adoption in libraries is inadequate _____, which may limit effective implementation.

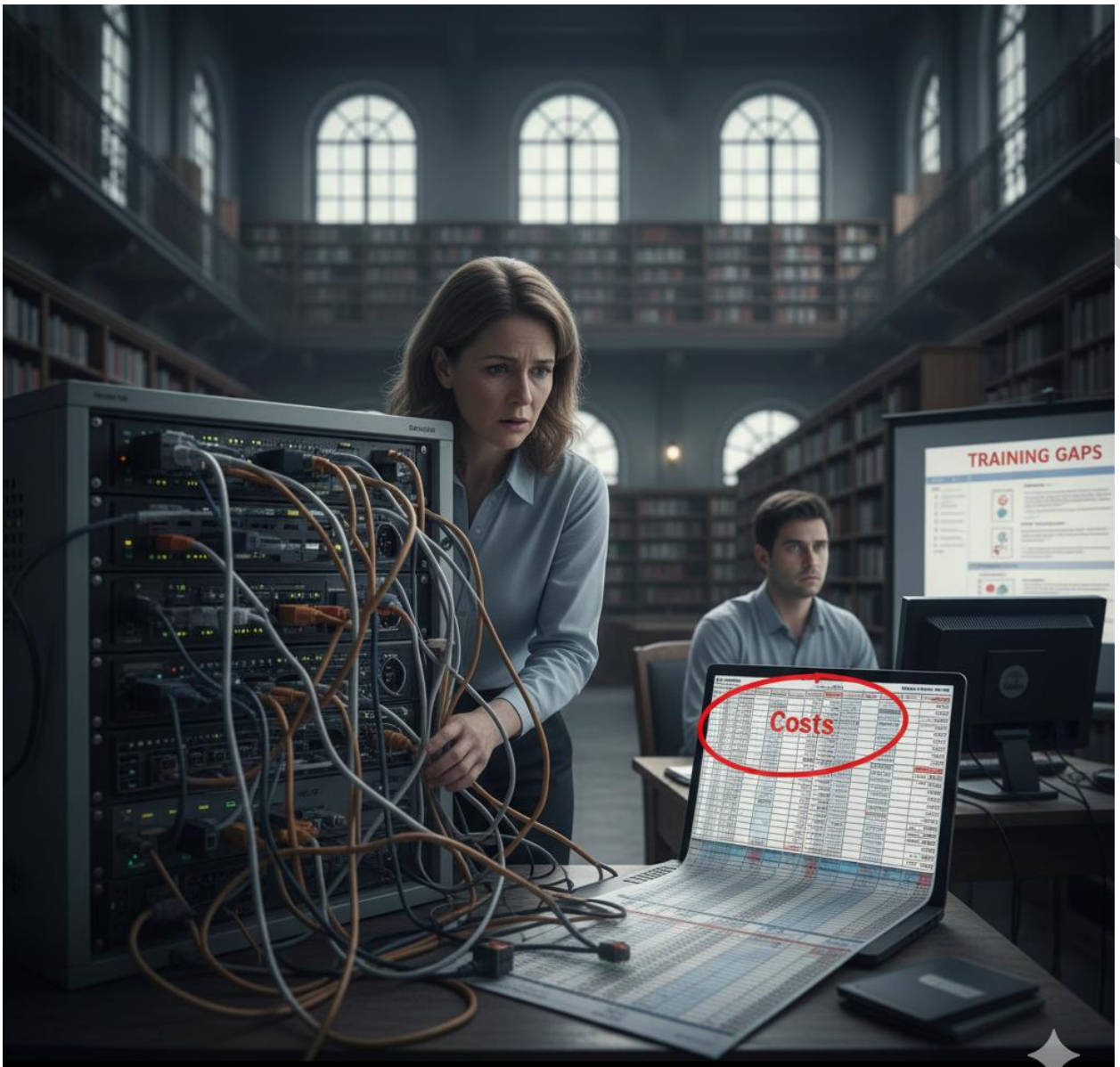

Plate 2.11 Challenges of ICT adoption in libraries

2.4.3 Future prospects for ICT in library services

The **future prospects of ICT in libraries** are promising. Emerging technologies such as cloud computing, artificial intelligence, and mobile applications will further enhance library services. Libraries are likely to adopt more personalised systems, integrate with global databases, and provide seamless access across devices. These developments will ensure that libraries remain relevant and continue to meet the evolving needs of their communities.

Fill in the blank: Future prospects for ICT in libraries include the adoption of cloud computing, _____ intelligence, and mobile applications.

Box 2.12

Future prospects for ICT in library services

Cloud computing for scalable services

Online databases

Artificial intelligence for persoaniset access

Mobile applications for user convenience

Integration with global databases

Pilot questions 2.4

1. Benefits of ICT in libraries include: a. Faster service delivery b. Improved accuracy c. Wider access to resources d. All of the above
2. One challenge of ICT adoption in libraries is: a. High costs of hardware and software b. Inadequate infrastructure c. Lack of skilled personnel d. All of the above
3. Future prospects for ICT in libraries include: a. Cloud computing b. Artificial intelligence c. Mobile applications d. All of the above
4. ICT adoption enhances user satisfaction by: a. Providing faster, more accurate, and accessible services b. Colour coding shelves c. Cancelling subscriptions d. None of the above

5. Libraries in developing regions may struggle with ICT adoption due to: a. Unstable electricity supply and limited internet connectivity b. Colour coding shelves c. Cancelling subscriptions d. None of the above

Series Summary

This Series was designed to show how automation and ICT applications are reshaping library services, making them more efficient, accurate, and user-centred. Beginning with the concept, history, and objectives of library automation, you were introduced to its relevance and scope. We then explored ICT applications in technical services such as cataloguing, acquisitions, and serials management, followed by readers' services including circulation, reference, and information retrieval. Finally, we considered the benefits and challenges of ICT adoption, while also looking ahead to future prospects such as cloud computing and artificial intelligence.

In line with the Series Learning Outcomes, you should now be able to define library automation and explain its objectives and scope (SLO 2.1), describe how ICT is applied to technical services (SLO 2.2), explain its role in readers' services (SLO 2.3), and analyse both the benefits and challenges of ICT adoption in libraries (SLO 2.4). These skills provide a strong foundation for understanding how ICT supports modern library operations and prepares you to engage with more advanced applications in subsequent Series.

Glossary of Terms 2

- **Library automation**: The application of computers and related technologies to perform library operations such as cataloguing, circulation, acquisitions, and serials control.
- **Integrated library system (ILS)**: A software platform that automates core library functions including cataloguing, circulation, and acquisitions.
- **Cataloguing**: The process of creating bibliographic records for library materials to facilitate identification and retrieval.
- **Classification**: The arrangement of library materials into subject categories using a recognised scheme.
- **MARC (Machine-Readable Cataloguing)**: A metadata standard that allows bibliographic information to be represented in a format readable by computers.
- **Acquisition**: The process of selecting and purchasing library materials for inclusion in the collection.
- **Processing**: Preparing acquired materials for use, including labelling, barcoding, and database entry.
- **Serials management**: The handling of journals, magazines, and other periodicals, including subscription tracking and check-in.
- **Circulation services**: Library functions involving lending and returning materials, managing user accounts, and tracking borrowed items.
- **Reference services**: Assistance provided to users in locating information and answering queries, often through digital platforms.
- **Information retrieval**: The process of searching for and obtaining information from databases, catalogues, or repositories.
- **Digital reference desk**: An online platform where users can interact with librarians to receive assistance remotely.
- **Barcode scanner**: A device used to track items and manage circulation efficiently.

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- **Cloud computing**: The use of remote servers hosted on the internet to store, manage, and process data.
- **Artificial intelligence (AI)**: Technology that enables machines to simulate human intelligence, often used in personalised access and search functions.

Objective Questions

1. Library automation refers to: a. The application of computers and related technologies to library operations b. Colour coding shelves c. Cancelling subscriptions d. None of the above *(Linked to SLO 2.1)*
2. Integrated library systems (ILS) first emerged in: a. The 1940s b. The 1960s and 1970s c. The 1990s d. None of the above *(Linked to SLO 2.1)*
3. ICT supports cataloguing and classification through: a. Metadata standards such as MARC b. Integrated library systems c. Online cataloguing tools d. All of the above *(Linked to SLO 2.2)*
4. ICT in circulation services includes: a. Automated circulation systems b. Barcode scanners c. Online renewal platforms d. All of the above *(Linked to SLO 2.3)*
5. Benefits of ICT adoption in libraries include: a. Faster service delivery b. Improved accuracy c. Wider access to resources d. All of the above *(Linked to SLO 2.4)*

Short-Answer Questions

6. Define library automation in your own words. *(Linked to SLO 2.1)*
7. State one ICT application in acquisitions and explain its role. *(Linked to SLO 2.2)*
8. Mention one ICT tool used in reference services. *(Linked to SLO 2.3)*
9. Identify one challenge of ICT adoption in libraries. *(Linked to SLO 2.4)*
10. Give one example of a future prospect for ICT in libraries. *(Linked to SLO 2.4)*

Long-Answer Questions

11. Explain how ICT has transformed technical services in libraries, with examples from cataloguing, acquisitions, and serials management. *(Linked to SLO 2.2)*
12. Analyse the benefits and challenges of ICT adoption in readers' services, highlighting its impact on user satisfaction. *(Linked to SLO 2.3, SLO 2.4)*

Answers to Concept Check Questions 2

Objective Questions

1. a. The application of computers and related technologies to library operations
2. b. The 1960s and 1970s
3. d. All of the above
4. d. All of the above
5. d. All of the above

Short-Answer Questions

6. Library automation is the use of computers and related technologies to perform library functions.
7. Electronic ordering in acquisitions allows libraries to purchase materials quickly and track invoices automatically.
8. Online chat systems are ICT tools used in reference services to assist users remotely.
9. One challenge is inadequate infrastructure, such as poor internet connectivity.

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10. Cloud computing is a future prospect for ICT in libraries.

Long-Answer Questions

11. *Basic response*: ICT has transformed technical services by automating cataloguing with metadata standards, streamlining acquisitions through electronic ordering, and managing serials with subscription tracking systems. *Value-added response*: Outstanding learners may add that ICT ensures consistency in bibliographic records, reduces delays in acquisitions, and provides digital access to journals, thereby improving efficiency and accuracy.

12. *Basic response*: ICT benefits readers' services by reducing queues in circulation, enabling remote renewals, and supporting digital reference desks. Challenges include costs, infrastructure gaps, and training needs. *Value-added response*: Outstanding learners may expand by analysing how ICT enhances user satisfaction through instant access and personalised services, while also noting that overcoming challenges requires investment, skilled staff, and strategic planning.

Answers to Pilot Questions 2

Part 2.1 Introduction to Library Automation

- The application of computers and related technologies to library operations
- The 1960s and 1970s
- Integrated library systems
- Technical services and readers' services
- Internet

Part 2.2 ICT Application to Technical Services

- Integrated library systems and metadata standards
- Selecting and purchasing materials
- Electronic ordering and automated invoicing
- All of the above
- Barcode generation and automated database entry

Part 2.3 ICT Application to Readers' Services

- All of the above
- All of the above
- All of the above
- Reduced queues and minimised errors
- Receive support without being physically present

Part 2.4 Benefits and Challenges of ICT in Library Services

- All of the above
- All of the above
- All of the above
- Providing faster, more accurate, and accessible services
- Unstable electricity supply and limited internet connectivity

General References

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- Wilson, T. D. (2018). *Library automation and digital services: A practical guide*. Routledge.

Illustration Attributions

- *Figure 2.1 Manual versus automated library processes*
- *[Insert figure here]*
- *Diagram comparing manual library processes with automated processes (cataloguing, circulation, acquisitions)*
- *AI prompt suggestion: "Create a diagram comparing manual library processes with automated processes such as cataloguing and circulation."*
- *Suggested OER search: "library automation manual vs automated processes diagram OER"*
- *Plate 2.2 Early tools used in library automation*
- *[Insert plate here]*
- *Image showing punch cards and early computers used in library automation*
- *AI prompt suggestion: "Generate an image showing early library automation tools such as punch cards and early computers."*
- *Suggested OER search: "early library automation punch cards computers OER"*
- *Box 2.3 Objectives and scope of library automation*
- *[Insert box here]*
- *Text-based infographic listing objectives and scope of library automation*
- *AI prompt suggestion: "Generate a text-based infographic listing objectives and scope of library automation in libraries."*
- *Suggested OER search: "objectives and scope of library automation OER"*
- *Figure 2.4 ICT in cataloguing and classification*
- *[Insert figure here]*
- *Diagram showing ICT in cataloguing and classification (metadata standards, online catalogues, subject categories)*
- *AI prompt suggestion: "Create a diagram showing ICT in cataloguing and classification using metadata standards and online catalogues."*
- *Suggested OER search: "ICT cataloguing classification MARC diagram OER"*
- *Plate 2.5 ICT in acquisitions and processing*
- *[Insert plate here]*
- *Image showing ICT in acquisitions and processing (barcode scanners, online vendor catalogues, automated invoicing)*
- *AI prompt suggestion: "Generate an image showing ICT in acquisitions and processing with barcode scanners and online vendor catalogues."*

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- *Suggested OER search: "ICT acquisitions processing libraries OER"*
- *Box 2.6 ICT in serials management*
- *[Insert box here]*
- *Text-based infographic listing ICT applications in serials management*
- *AI prompt suggestion: "Generate a text-based infographic listing ICT applications in serials management such as subscription management and e-journals."*
- *Suggested OER search: "ICT serials management libraries OER"*
- *Figure 2.7 ICT in circulation services*
- *[Insert figure here]*
- *Diagram showing ICT in circulation services (barcode scanning, automated check-out, online renewal)*
- *AI prompt suggestion: "Create a diagram showing ICT in circulation services with barcode scanning, automated check-out, and online renewal."*
- *Suggested OER search: "ICT circulation services libraries diagram OER"*
- *Plate 2.8 ICT in reference services*
- *[Insert plate here]*
- *Image showing ICT in reference services (virtual reference desk, online chat, email support)*
- *AI prompt suggestion: "Generate an image showing ICT in reference services with virtual reference desk, online chat, and email support."*
- *Suggested OER search: "ICT reference services libraries OER"*
- *Box 2.9 ICT in information retrieval and user access*
- *[Insert box here]*
- *Text-based infographic listing ICT applications in information retrieval and user access*
- *AI prompt suggestion: "Generate a text-based infographic listing ICT applications in information retrieval and user access."*
- *Suggested OER search: "ICT information retrieval libraries OER"*
- *Figure 2.10 Benefits of ICT in libraries*
- *[Insert figure here]*
- *Diagram showing benefits of ICT in libraries (efficiency, accuracy, access, satisfaction)*
- *AI prompt suggestion: "Create a diagram showing benefits of ICT in libraries such as efficiency, accuracy, access, and satisfaction."*
- *Suggested OER search: "benefits of ICT in libraries diagram OER"*
- *Plate 2.11 Challenges of ICT adoption in libraries*
- *[Insert plate here]*
- *Image showing challenges of ICT adoption (costs, infrastructure, training gaps)*
- *AI prompt suggestion: "Generate an image showing challenges of ICT adoption in libraries such as costs, infrastructure, and training gaps."*
- *Suggested OER search: "challenges of ICT adoption in libraries OER"*

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- *Box 2.12 Future prospects for ICT in library services*
- *[Insert box here]*
- *Text-based infographic listing future prospects for ICT in library services*
- *AI prompt suggestion: "Generate a text-based infographic listing future prospects for ICT in library services such as cloud computing and AI."*
- *Suggested OER search: "future prospects ICT in libraries OER"*

COURSE CODE: LIS 211
COURSE TITLE: Introduction to ICT in Library and Information Services
COURSE UNIT LOAD: (2 Units C:)

- **Series 1: Basic Concepts in Information and Communication Technology**
- **Series 2: Library Automation and ICT Applications in Services**
- **Series 3: Information Seeking, Databases, and the Internet as Resources**
- **Series 4: Web Page Concept, Design, and Management Applications**
- **Series 5: Digital Libraries, Open Access, and ICT Challenges in Nigerian Contexts**

Series 3: Information Seeking, Databases, and the Internet as Resources

Proposed Outline

- **3.1 ICT Tools for Library Operations**
  - 3.1.1 Library management systems (LMS)
  - 3.1.2 Barcode scanners and RFID technology
  - 3.1.3 Digital catalogues and OPAC (Online Public Access Catalogue)
- **3.2 Digital Resources in Libraries**
  - 3.2.1 E-books and e-journals
  - 3.2.2 Digital repositories and databases
  - 3.2.3 Open educational resources (OER)
- **3.3 ICT Tools for User Services**
  - 3.3.1 Online reference and chat systems
  - 3.3.2 Mobile applications for library access
  - 3.3.3 Cloud-based services and remote access
- **3.4 Benefits and Challenges of ICT Tools and Digital Resources**
  - 3.4.1 Benefits for libraries and users
  - 3.4.2 Challenges in adoption and sustainability
  - 3.4.3 Future directions in ICT tools and digital resources

Introduction

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Libraries today rely heavily on ICT tools and digital resources to deliver efficient, accessible, and user-centred services. This Series introduces you to the technologies that underpin modern library operations, from management systems and barcode scanners to digital catalogues and online platforms. It also explores the wide range of digital resources now available, including e-books, e-journals, repositories, and open educational resources, all of which expand the scope of information access for users.

We will begin by examining ICT tools used in library operations, then move on to digital resources that support learning and research. Next, we will consider ICT tools designed specifically for user services, such as mobile applications and cloud-based platforms. Finally, we will reflect on the benefits and challenges of adopting these tools and resources, while looking ahead to future directions. By the end of this Series, you will be able to connect these applications directly to the Series Learning Outcomes, gaining a clear understanding of how ICT tools and digital resources enhance both library operations and user experiences.

Series Learning Outcomes 3

Upon completing this Series, you should be able to:

- **SLO 3.1** describe ICT tools used in library operations, including library management systems, barcode scanners, and digital catalogues.
- **SLO 3.2** explain the types of digital resources available in libraries, such as e-books, e-journals, repositories, and open educational resources.
- **SLO 3.3** analyse ICT tools that support user services, including online reference platforms, mobile applications, and cloud-based services.
- **SLO 3.4** evaluate the benefits and challenges of ICT tools and digital resources, while identifying future directions for their use in libraries.

3.1 ICT Tools For Library Operations

Libraries rely on ICT tools to manage their operations efficiently and to provide seamless access to resources. These tools automate routine tasks, reduce human error, and improve user satisfaction. In this Part, we will explore three key areas: library management systems, barcode and RFID technologies, and digital catalogues such as OPAC.

3.1.1 Library management systems (LMS)

A **library management system (LMS)** is software designed to automate core library functions such as cataloguing, circulation, acquisitions, and serials control. By integrating these functions into one platform, LMS reduces duplication of effort and ensures consistency across services. Popular examples include Koha, Evergreen, and proprietary systems used in academic and public libraries.

Fill in the blank: A library management system (LMS) is software designed to automate core _____ functions such as cataloguing and circulation.

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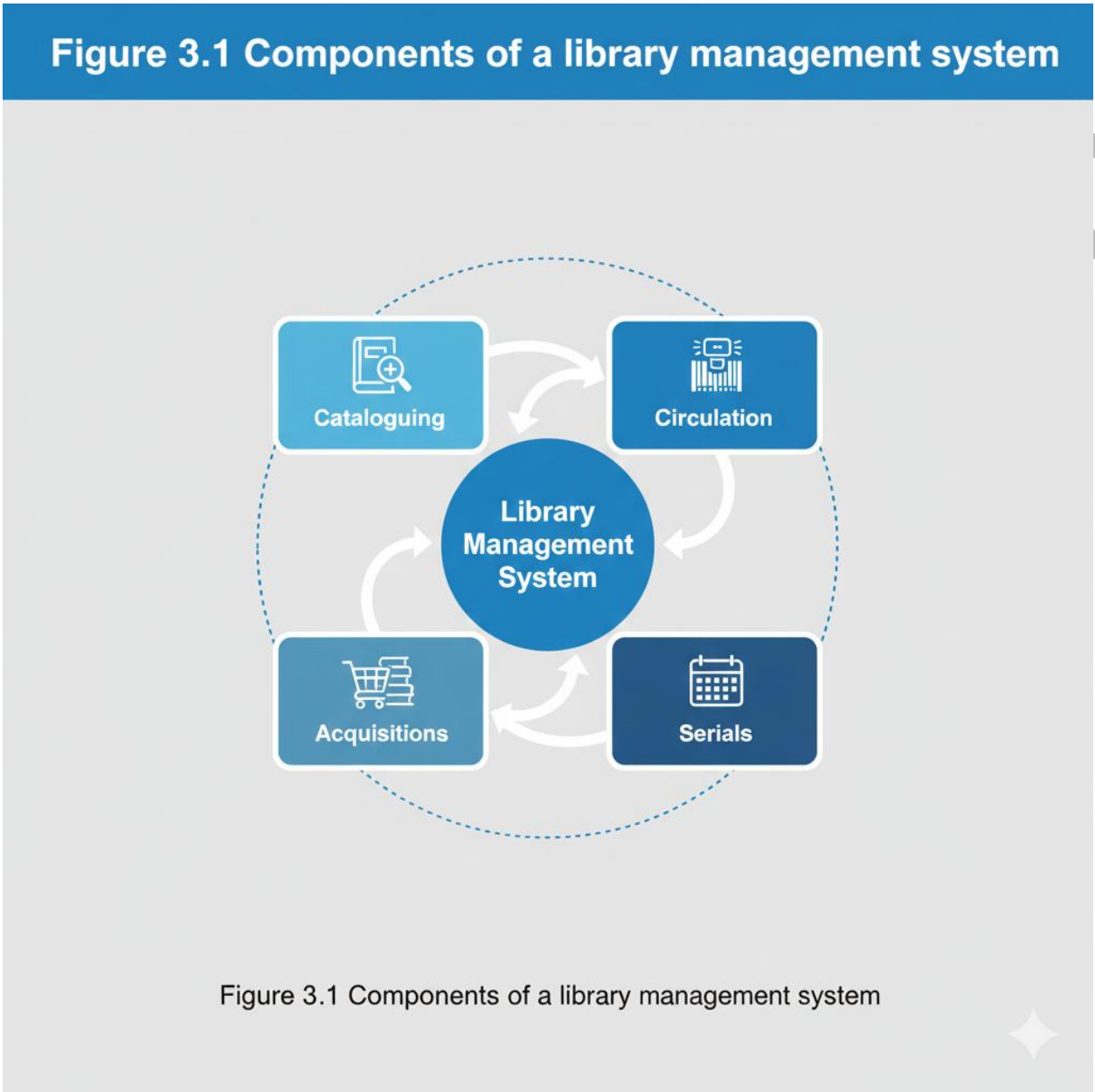

Figure 3.1 Components of a library management system

3.1.2 Barcode scanners and RFID technology

Barcode scanners are devices that read unique codes assigned to library items, enabling quick check-in and check-out. **RFID (Radio Frequency Identification)** technology uses tags and sensors to track items wirelessly, allowing faster circulation and improved security. These tools reduce queues, minimise errors, and make inventory management more accurate.

Fill in the blank: RFID technology uses _____ and sensors to track library items wirelessly.

Plate 3.2 Barcode scanners and RFID technology in libraries

3.1.3 Digital catalogues and OPAC

A **digital catalogue** is an electronic listing of library resources, while **OPAC (Online Public Access Catalogue)** is a user-facing interface that allows patrons to search for materials remotely. OPAC systems provide advanced search options, filters, and links to digital resources. They improve accessibility by enabling users to locate items without needing physical card catalogues.

Fill in the blank: OPAC stands for Online Public Access _____, which allows patrons to search for materials remotely.

Box 3.3 Features of OPAC systems [Insert box here] Text-based infographic listing features of OPAC systems Caption: Box 3.3 Features of OPAC systems AI prompt suggestion: “Generate a text-based infographic listing features of OPAC systems such as advanced search and remote access.” Search string: “OPAC features libraries OER”

Pilot questions 3.1

1. A library management system (LMS) automates: a. Core library functions such as cataloguing and circulation b. Colour coding shelves c. Cancelling subscriptions d. None of the above
2. Barcode scanners are used to: a. Read unique codes assigned to library items b. Cancel subscriptions c. Colour code shelves d. None of the above
3. RFID technology tracks library items using: a. Tags and sensors b. Colour coding shelves c. Cancelling subscriptions d. None of the above
4. OPAC stands for: a. Online Public Access Catalogue b. Offline Public Access Catalogue c. Open Public Access Collection d. None of the above
5. One feature of OPAC systems is: a. Advanced search options b. Colour coding shelves c. Cancelling subscriptions d. None of the above

3.2 Digital Resources In Libraries

Digital resources have become central to modern library services, offering users access to information beyond the physical collection. These resources include electronic books and journals, institutional repositories and databases, and open educational resources (OER). In this Part, we will explore each category and consider how they support learning, research, and information access.

3.2.1 E-books and e-journals

E-books are digital versions of printed books that can be read on computers, tablets, or e-readers. **E-journals** are scholarly journals published online, often with advanced search and citation features. These resources provide convenience, portability, and immediate access, making them essential for academic and research libraries.

Fill in the blank: _____ are scholarly journals published online, often with advanced search and citation features.

[Insert plate here] Image showing e-books on a tablet and e-journals on a computer screen Caption: Plate 3.4 E-books and e-journals in libraries AI prompt suggestion: “Generate an image showing e-books on a tablet and e-journals on a computer screen.” Search string: “e-books e-journals libraries OER”

3.2.2 Digital repositories and databases

A **digital repository** is an online platform where institutions store and preserve scholarly works, theses, dissertations, and research outputs. **Databases** are structured collections of information that allow advanced searching and retrieval of articles, reports, and other resources. Together, they ensure long-term preservation and easy access to academic content.

Fill in the blank: A digital _____ is an online platform where institutions store and preserve scholarly works.

[Insert figure here] Diagram showing the structure of a digital repository and database (storage, indexing, retrieval) Caption: Figure 3.5 Structure of a digital repository and database AI prompt suggestion: “Create a diagram showing the structure of a digital repository and database with

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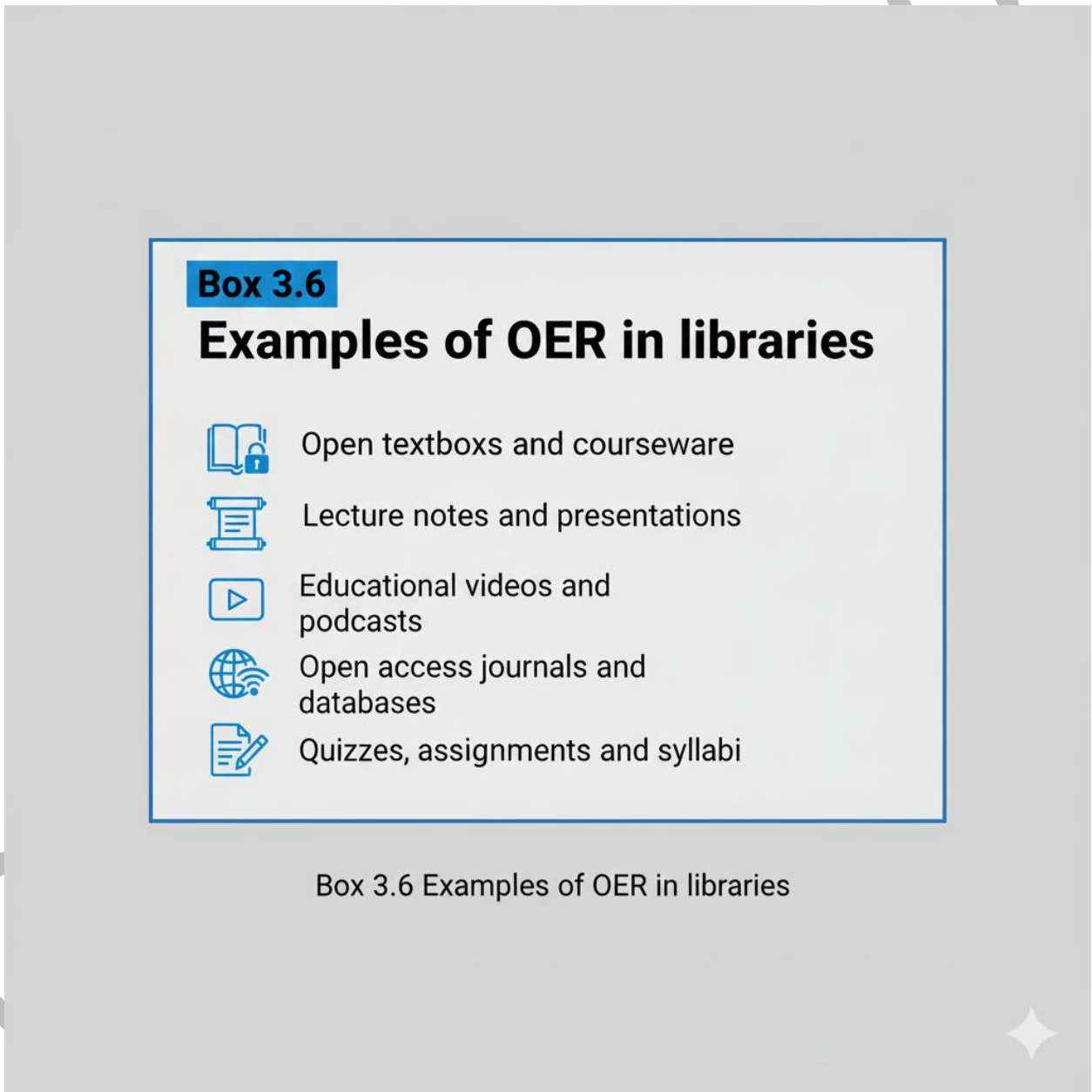
storage, indexing, and retrieval." Search string: "digital repository database libraries diagram OER"

3.2.3 Open educational resources (OER)

Open educational resources (OER) are freely accessible teaching, learning, and research materials available in digital form. They include textbooks, lecture notes, videos, and interactive modules. OER promote equity by reducing costs and expanding access to quality educational content. Libraries often curate OER collections to support students and educators.

Fill in the blank: Open educational resources (OER) are freely accessible _____, learning, and research materials available in digital form.



Box 3.6 Examples of OER in libraries

Pilot questions 3.2

1. E-books are: a. Digital versions of printed books b. Colour coding shelves c. Cancelling subscriptions d. None of the above
2. E-journals are: a. Scholarly journals published online b. Colour coding shelves c. Cancelling subscriptions d. None of the above
3. A digital repository is: a. An online platform for storing scholarly works b. Colour coding shelves c. Cancelling subscriptions d. None of the above
4. Databases allow: a. Advanced searching and retrieval of articles and reports b. Colour coding shelves c. Cancelling subscriptions d. None of the above
5. Open educational resources (OER) include: a. Textbooks, lecture notes, videos, and interactive modules b. Colour coding shelves c. Cancelling subscriptions d. None of the above

3.3 ICT Tools For User Services

User services are the most visible aspect of library operations because they directly involve interaction with patrons. ICT tools have transformed these services, making them more accessible, efficient, and user-centred. In this Part, we will explore online reference and chat systems, mobile applications for library access, and cloud-based services that support remote use.

3.3.1 Online reference and chat systems

Online reference systems provide digital platforms where users can ask questions and receive assistance from librarians. **Chat systems** extend this service by offering real-time support through instant messaging. These tools ensure that users can access help without being physically present in the library, thereby widening the reach of reference services.

Fill in the blank: Online reference systems and chat platforms allow users to receive _____ support from librarians.

3.3.2 Mobile applications for library access

Mobile applications are apps designed to give users access to library services on smartphones and tablets. They allow patrons to search catalogues, renew borrowed items, reserve materials, and access digital resources. Mobile apps increase convenience and ensure that users can interact with the library anytime and anywhere.

Fill in the blank: Mobile applications allow patrons to search catalogues, renew borrowed items, and _____ materials.

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Figure 3.8 Features of a library mobile application

3.3.3 Cloud-based services and remote access

Cloud-based services store library data and resources on remote servers, enabling access from multiple devices and locations. **Remote access** allows users to log in to library systems from outside the physical library, giving them seamless access to catalogues, databases, and e-resources. These tools enhance flexibility and ensure that libraries remain relevant in a digital-first environment.

Fill in the blank: Cloud-based services store library data on _____ servers, enabling access from multiple devices and locations.

Box 3.9 Benefits of cloud-based services in libraries [Insert box here] Text-based infographic listing benefits of cloud-based services Caption: Box 3.9 Benefits of cloud-based services in libraries AI prompt suggestion: “Generate a text-based infographic listing benefits of cloud-

based services in libraries such as flexibility and remote access." Search string: "cloud-based services libraries benefits OER"

Pilot questions 3.3

1. Online reference systems and chat platforms allow users to: a. Receive real-time support from librarians b. Cancel subscriptions c. Colour code shelves d. None of the above
2. Mobile applications for library access allow patrons to: a. Search catalogues b. Renew borrowed items c. Reserve materials d. All of the above
3. Cloud-based services store library data on: a. Remote servers b. Colour coded shelves c. Cancelled subscriptions d. None of the above
4. Remote access allows users to: a. Log in to library systems from outside the physical library b. Cancel subscriptions c. Colour code shelves d. None of the above
5. One benefit of cloud-based services in libraries is: a. Flexibility and remote access b. Colour coding shelves c. Cancelling subscriptions d. None of the above

3.4 Benefits And Challenges Of ICT Tools And Digital Resources

ICT tools and digital resources have transformed libraries, making them more efficient, accessible, and user-focused. However, while these technologies bring many advantages, they also present challenges that libraries must address to remain effective. In this Part, we will explore the benefits, challenges, and future directions of ICT adoption in libraries.

3.4.1 Benefits for libraries and users

The **benefits of ICT tools and digital resources** include faster service delivery, improved accuracy, and wider access to information. Users can search catalogues remotely, access e-books and databases instantly, and interact with librarians through online platforms. For libraries, automation reduces repetitive tasks, supports better resource management, and enhances user satisfaction.

Fill in the blank: ICT tools and digital resources enhance user _____ by providing faster, more accurate, and accessible services.

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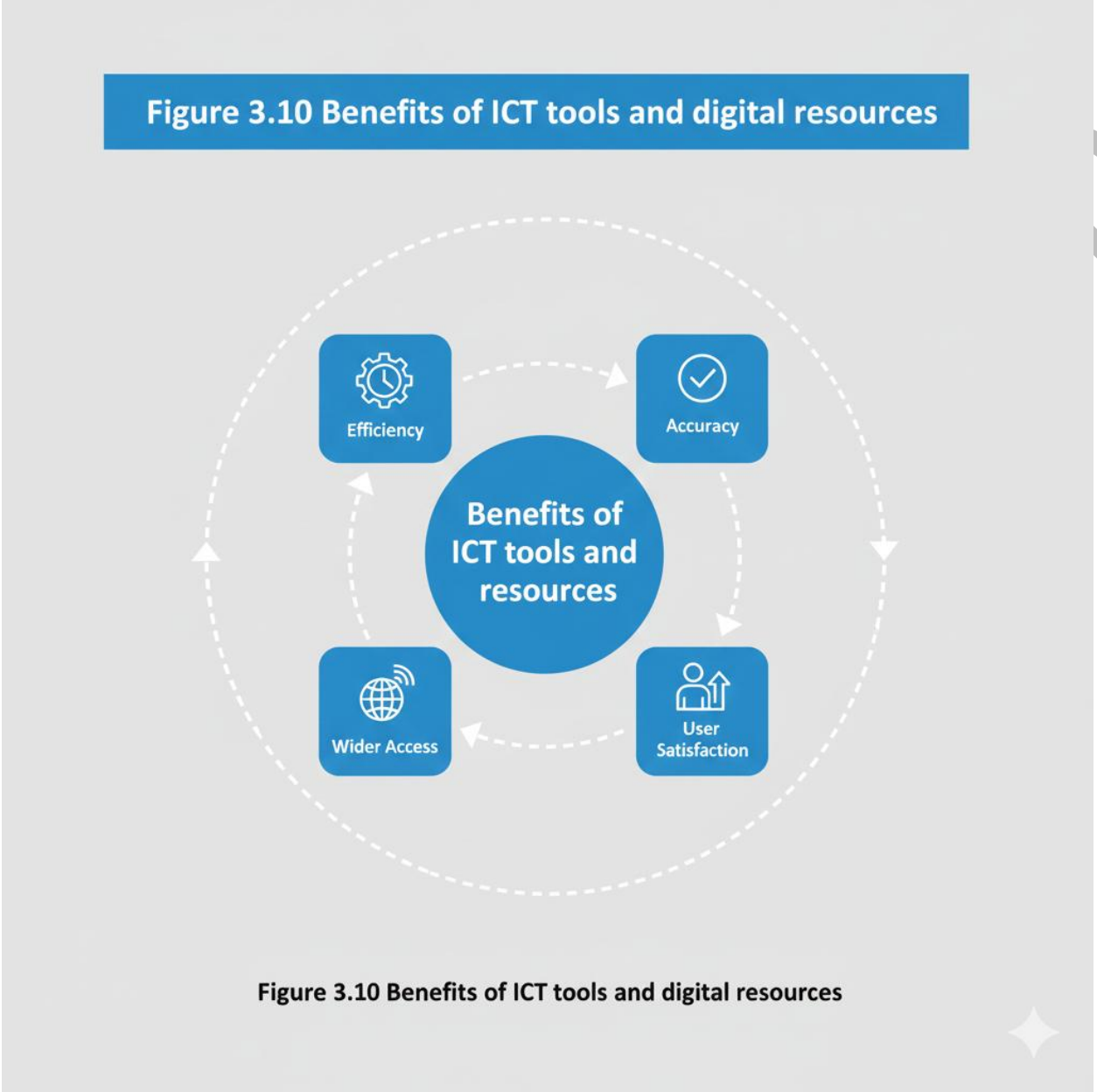


Figure 3.10 Benefits of ICT tools and digital resources

3.4.2 Challenges in adoption and sustainability

Despite the benefits, libraries face several **challenges** in adopting ICT tools and digital resources. These include high costs of hardware and software, inadequate infrastructure, limited internet connectivity, and lack of skilled personnel. Sustainability is another concern, as libraries must continually update systems and train staff to keep pace with technological changes.

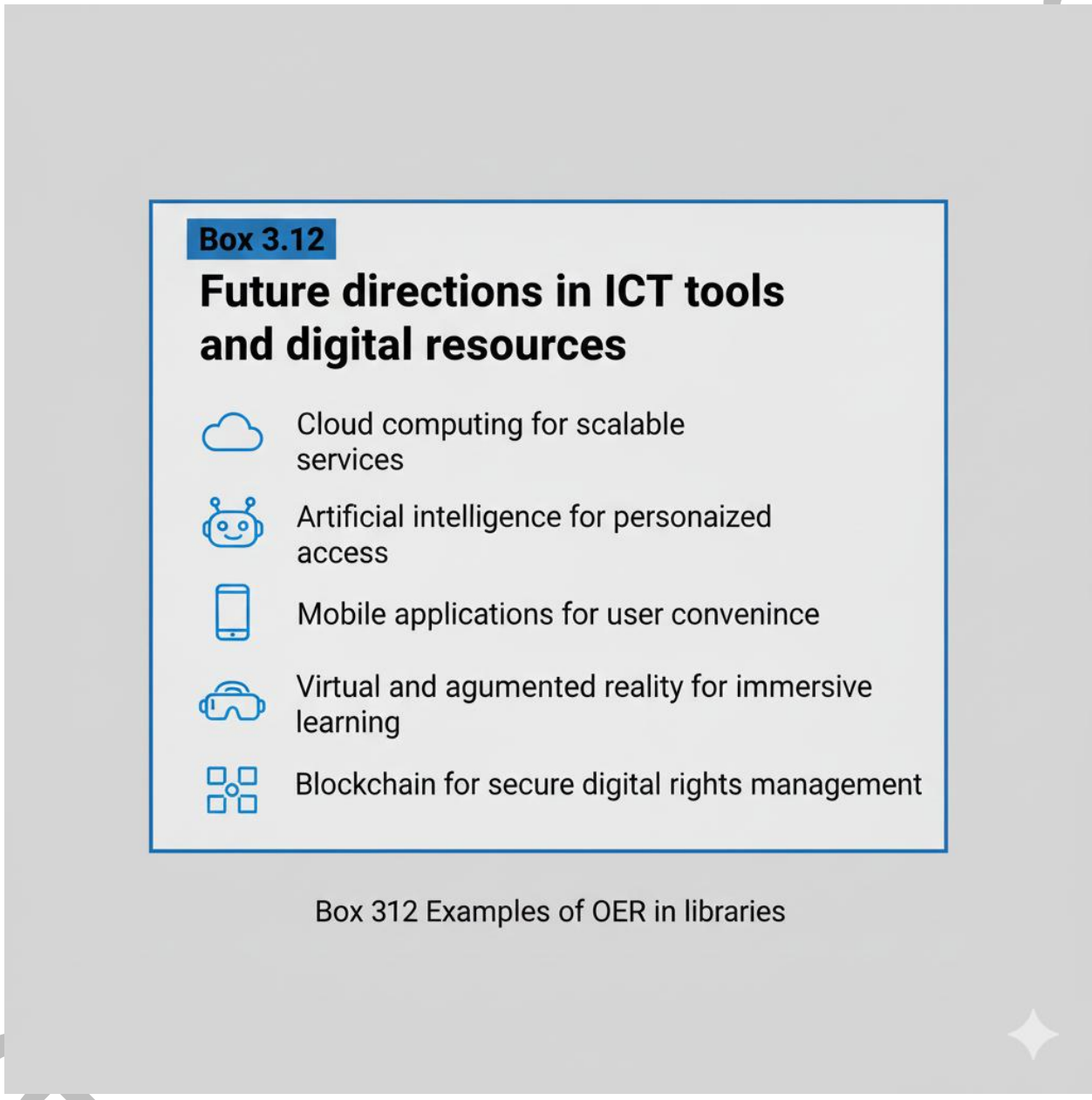
Fill in the blank: One challenge of ICT adoption in libraries is inadequate _____, which may limit effective implementation.

3.4.3 Future directions in ICT tools and digital resources

The **future directions of ICT in libraries** are promising. Emerging technologies such as cloud computing, artificial intelligence, and mobile applications will further enhance library services. Libraries are likely to adopt more personalised systems, integrate with global databases, and

provide seamless access across devices. These developments will ensure that libraries remain relevant and continue to meet the evolving needs of their communities.

Fill in the blank: Future directions for ICT in libraries include the adoption of cloud computing, _____ intelligence, and mobile applications.



Box 312 Examples of OER in libraries

Pilot questions 3.4

1. Benefits of ICT tools and digital resources include: a. Faster service delivery b. Improved accuracy c. Wider access to information d. All of the above
2. One challenge of ICT adoption in libraries is: a. High costs of hardware and software b. Inadequate infrastructure c. Lack of skilled personnel d. All of the above

3. Future directions for ICT in libraries include: a. Cloud computing b. Artificial intelligence c. Mobile applications d. All of the above
4. ICT adoption enhances user satisfaction by: a. Providing faster, more accurate, and accessible services b. Colour coding shelves c. Cancelling subscriptions d. None of the above
5. Libraries must continually update systems and train staff to ensure _____ in ICT adoption.

Series Summary

This Series has shown how ICT tools and digital resources are reshaping library services, making them more efficient, accessible, and user-centred. We began by examining ICT tools for library operations, including management systems, barcode scanners, and RFID technologies. We then explored digital resources such as e-books, e-journals, repositories, and open educational resources, before moving on to ICT tools that support user services like online reference platforms, mobile applications, and cloud-based services. Finally, we considered the benefits and challenges of adopting these technologies, while also looking ahead to future directions such as artificial intelligence and personalised systems.

By working through these Parts, you should now be able to describe ICT tools used in library operations (SLO 3.1), explain the types of digital resources available in libraries (SLO 3.2), analyse ICT tools that support user services (SLO 3.3), and evaluate both the benefits and challenges of ICT adoption while identifying future directions (SLO 3.4). These outcomes provide a strong foundation for understanding how ICT tools and digital resources enhance both library operations and user experiences, preparing you to engage with more advanced applications in subsequent Series.

Glossary of Terms 3

- **Library management system (LMS)**: Software designed to automate core library functions such as cataloguing, circulation, acquisitions, and serials control.
- **Barcode scanner**: A device used to read unique codes assigned to library items, enabling quick check-in and check-out.
- **RFID (Radio Frequency Identification)**: Technology that uses tags and sensors to track library items wirelessly, improving circulation and security.
- **Digital catalogue**: An electronic listing of library resources that replaces traditional card catalogues.
- **OPAC (Online Public Access Catalogue)**: A user-facing interface that allows patrons to search for library materials remotely.
- **E-book**: A digital version of a printed book that can be read on computers, tablets, or e-readers.
- **E-journal**: A scholarly journal published online, often with advanced search and citation features.

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- **Digital repository**: An online platform where institutions store and preserve scholarly works, theses, dissertations, and research outputs.
- **Database**: A structured collection of information that allows advanced searching and retrieval of articles, reports, and other resources.
- **Open educational resources (OER)**: Freely accessible teaching, learning, and research materials available in digital form, such as textbooks, lecture notes, and videos.
- **Online reference system**: A digital platform where users can ask questions and receive assistance from librarians.
- **Chat system**: A tool that provides real-time support through instant messaging between users and librarians.
- **Mobile application**: An app designed to give users access to library services on smartphones and tablets.
- **Cloud-based service**: A system that stores library data and resources on remote servers, enabling access from multiple devices and locations.
- **Remote access**: The ability for users to log in to library systems from outside the physical library, ensuring seamless access to catalogues and resources.

Concept Check Questions 3

Objective Questions

1. A library management system (LMS) automates: a. Core library functions such as cataloguing and circulation b. Colour coding shelves c. Cancelling subscriptions d. None of the above
2. Barcode scanners are used to: a. Read unique codes assigned to library items b. Cancel subscriptions c. Colour code shelves d. None of the above
3. E-journals are: a. Scholarly journals published online b. Colour coding shelves c. Cancelling subscriptions d. None of the above
4. A digital repository is: a. An online platform for storing scholarly works b. Colour coding shelves c. Cancelling subscriptions d. None of the above
5. Cloud-based services store library data on: a. Remote servers b. Colour coded shelves c. Cancelled subscriptions d. None of the above

Short-Answer Questions

6. Define a library management system (LMS) in your own words. *(Linked to SLO 3.1)*
7. State one benefit of using RFID technology in libraries. *(Linked to SLO 3.1)*
8. Mention one type of digital resource available in libraries. *(Linked to SLO 3.2)*
9. Identify one feature of OPAC systems. *(Linked to SLO 3.1)*
10. Give one example of an ICT tool that supports user services. *(Linked to SLO 3.3)*

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Long-Answer Questions

11. Explain how digital resources such as e-books, e-journals, and repositories have transformed access to information in libraries. *(Linked to SLO 3.2)*

12. Analyse the benefits and challenges of ICT tools for user services, highlighting their impact on accessibility and user satisfaction. *(Linked to SLO 3.3, SLO 3.4)*

Answers to Concept Check Questions 3

Objective Questions

1. a. Core library functions such as cataloguing and circulation
2. a. Read unique codes assigned to library items
3. a. Scholarly journals published online
4. a. An online platform for storing scholarly works
5. a. Remote servers

Short-Answer Questions

6. A library management system is software that automates cataloguing, circulation, acquisitions, and serials control.

7. RFID technology allows faster circulation and improved security by tracking items wirelessly.

8. One type of digital resource is an e-book.

9. OPAC systems provide advanced search options and remote access to catalogues.

10. Mobile applications are ICT tools that support user services.

Long-Answer Questions

11. *Basic response*: Digital resources provide instant access to scholarly content, replacing physical limitations of print collections. *Value-added response*: Outstanding learners may add that e-books and e-journals increase portability, repositories preserve institutional knowledge, and databases enable advanced searching, thereby transforming research and learning.

12. *Basic response*: ICT tools for user services, such as online reference systems and mobile apps, improve accessibility and convenience. Challenges include costs, infrastructure gaps, and training needs. *Value-added response*: Outstanding learners may expand by analysing how cloud-based services enhance flexibility, while also noting that sustainability requires continuous updates and skilled staff.

Answers to Pilot Questions 3

Part 3.1 ICT Tools for Library Operations

- Core library functions such as cataloguing and circulation
- Read unique codes assigned to library items

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- Tags and sensors
- Online Public Access Catalogue
- Advanced search options

Part 3.2 Digital Resources in Libraries

- Digital versions of printed books
- Scholarly journals published online
- An online platform for storing scholarly works
- Advanced searching and retrieval of articles and reports
- Textbooks, lecture notes, videos, and interactive modules

Part 3.3 ICT Tools for User Services

- Receive real-time support from librarians
- All of the above
- Remote servers
- Log in to library systems from outside the physical library
- Flexibility and remote access

Part 3.4 Benefits and Challenges of ICT Tools and Digital Resources

- All of the above
- All of the above
- All of the above
- Providing faster, more accurate, and accessible services
- Sustainability

General References

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- Ghosh, S. B. (2019). *Open source library management systems: Current trends and future directions*. Information Development, 35(4), 345–356.
- Taylor, A. G. (2016). *Introduction to cataloguing and classification*. Libraries Unlimited.
- Wilson, T. D. (2018). *Library automation and digital services: A practical guide*. Routledge.
- OER Commons. Retrieved from https://www.oercommons.org

Illustration Attributions

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- *Figure 3.1 Components of a library management system*
- *[Insert figure here]*
- *Diagram showing components of a library management system (cataloguing, circulation, acquisitions, serials)*
- *AI prompt suggestion: "Create a diagram showing components of a library management system including cataloguing, circulation, acquisitions, and serials."*
- *Suggested OER search: "library management system components diagram OER"*
- *Plate 3.2 Barcode scanners and RFID technology in libraries*
- *[Insert plate here]*
- *Image showing barcode scanners and RFID tags used in libraries*
- *AI prompt suggestion: "Generate an image showing barcode scanners and RFID tags used in libraries."*
- *Suggested OER search: "barcode RFID library technology OER"*
- *Box 3.3 Features of OPAC systems*
- *[Insert box here]*
- *Text-based infographic listing features of OPAC systems*
- *AI prompt suggestion: "Generate a text-based infographic listing features of OPAC systems such as advanced search and remote access."*
- *Suggested OER search: "OPAC features libraries OER"*
- *Plate 3.4 E-books and e-journals in libraries*
- *[Insert plate here]*
- *Image showing e-books on a tablet and e-journals on a computer screen*
- *AI prompt suggestion: "Generate an image showing e-books on a tablet and e-journals on a computer screen."*
- *Suggested OER search: "e-books e-journals libraries OER"*
- *Figure 3.5 Structure of a digital repository and database*
- *[Insert figure here]*
- *Diagram showing the structure of a digital repository and database (storage, indexing, retrieval)*
- *AI prompt suggestion: "Create a diagram showing the structure of a digital repository and database with storage, indexing, and retrieval."*
- *Suggested OER search: "digital repository database libraries diagram OER"*
- *Box 3.6 Examples of OER in libraries*
- *[Insert box here]*
- *Text-based infographic listing examples of OER*
- *AI prompt suggestion: "Generate a text-based infographic listing examples of OER such as textbooks, lecture notes, and videos."*
- *Suggested OER search: "open educational resources examples libraries OER"*
- *Plate 3.7 Online reference and chat systems in libraries*
- *[Insert plate here]*
- *Image showing a librarian providing online reference support via chat system*
- *AI prompt suggestion: "Generate an image showing a librarian providing online reference support via chat system."*
- *Suggested OER search: "online reference chat systems libraries OER"*
- *Figure 3.8 Features of a library mobile application*

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- *[Insert figure here]*
- *Diagram showing features of a library mobile application (search, renew, reserve, access e-resources)*
- *AI prompt suggestion: "Create a diagram showing features of a library mobile application such as search, renew, reserve, and access e-resources."*
- *Suggested OER search: "library mobile application features diagram OER"*
- *Box 3.9 Benefits of cloud-based services in libraries*
- *[Insert box here]*
- *Text-based infographic listing benefits of cloud-based services*
- *AI prompt suggestion: "Generate a text-based infographic listing benefits of cloud-based services in libraries such as flexibility and remote access."*
- *Suggested OER search: "cloud-based services libraries benefits OER"*
- *Figure 3.10 Benefits of ICT tools and digital resources*
- *[Insert figure here]*
- *Diagram showing benefits of ICT tools and digital resources (efficiency, accuracy, access, satisfaction)*
- *AI prompt suggestion: "Create a diagram showing benefits of ICT tools and digital resources such as efficiency, accuracy, access, and satisfaction."*
- *Suggested OER search: "benefits ICT tools digital resources libraries diagram OER"*
- *Plate 3.11 Challenges of ICT adoption in libraries*
- *[Insert plate here]*
- *Image showing challenges of ICT adoption (costs, infrastructure, training gaps)*
- *AI prompt suggestion: "Generate an image showing challenges of ICT adoption in libraries such as costs, infrastructure, and training gaps."*
- *Suggested OER search: "challenges ICT adoption libraries OER"*
- *Box 3.12 Future directions in ICT tools and digital resources*
- *[Insert box here]*
- *Text-based infographic listing future directions in ICT tools and digital resources*
- *AI prompt suggestion: "Generate a text-based infographic listing future directions in ICT tools and digital resources such as cloud computing and AI."*
- *Suggested OER search: "future directions ICT tools digital resources libraries OER"*

COURSE CODE: LIS 211
COURSE TITLE: Introduction to ICT in Library and Information Services
COURSE UNIT LOAD: (2 Units C:)

- **Series 1: Basic Concepts in Information and Communication Technology**
- **Series 2: Library Automation and ICT Applications in Services**
- **Series 3: Information Seeking, Databases, and the Internet as Resources**
- **Series 4: Web Page Concept, Design, and Management Applications**
- **Series 5: Digital Libraries, Open Access, and ICT Challenges in Nigerian Contexts**

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Series 4: Web Page Concept, Design, and Management Applications

Proposed Outline

- **4.1 Digital library services**
  - 4.1.1 Online lending and e-circulation
  - 4.1.2 Virtual reference and information services
  - 4.1.3 Digital literacy and user training
- **4.2 Emerging technologies in libraries**
  - 4.2.1 Cloud computing and virtualisation
  - 4.2.2 Artificial intelligence and machine learning applications
  - 4.2.3 Mobile and wearable technologies
- **4.3 Integration of social media and web platforms**
  - 4.3.1 Social media for outreach and engagement
  - 4.3.2 Web portals and personalised dashboards
  - 4.3.3 Collaborative tools and online communities
- **4.4 Benefits, challenges, and future prospects**
  - 4.4.1 Benefits of digital services and emerging technologies
  - 4.4.2 Challenges in adoption and sustainability
  - 4.4.3 Future prospects for digital libraries

Introduction

Libraries are no longer confined to physical spaces and printed collections. With the rise of digital technologies, they now deliver services that extend far beyond their walls, reaching users wherever they are. This Series introduces you to **digital library services** and the **emerging technologies** that are shaping the future of information access.

We begin by exploring digital library services such as online lending, virtual reference, and digital literacy programmes, which ensure that users can interact with libraries seamlessly in a digital environment. Next, we examine emerging technologies including cloud computing, artificial intelligence, and mobile innovations, all of which are transforming how libraries operate and serve their communities. We then consider how libraries integrate social media and web platforms to engage users, build communities, and personalise services. Finally, we reflect on the benefits, challenges, and future prospects of these developments, highlighting both opportunities and areas that require careful planning.

By the end of this Series, you will be able to connect these topics directly to the Series Learning Outcomes, gaining a clear understanding of how digital services and emerging technologies enhance library operations, expand user engagement, and prepare libraries for the future.

Series Learning Outcomes 4

Upon completing this Series, you should be able to:

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- **SLO 4.1** describe digital library services such as online lending, virtual reference, and digital literacy programmes.
- **SLO 4.2** explain emerging technologies in libraries, including cloud computing, artificial intelligence, and mobile innovations.
- **SLO 4.3** analyse how libraries integrate social media and web platforms to enhance outreach, engagement, and collaboration.
- **SLO 4.4** evaluate the benefits, challenges, and future prospects of digital library services and emerging technologies.

4.1 Digital Library Services

Digital library services extend the reach of libraries beyond their physical walls, enabling users to access information and support wherever they are. These services combine ICT tools with innovative practices to ensure that patrons can borrow, learn, and interact seamlessly in a digital environment. In this Part, we will explore online lending and e-circulation, virtual reference and information services, and digital literacy programmes.

4.1.1 Online lending and e-circulation

Online lending refers to the process of borrowing digital resources such as e-books and audiobooks through library platforms. **E-circulation** is the automated management of borrowing and returning items, often supported by digital catalogues and mobile applications. These services provide convenience, reduce queues, and allow users to borrow materials without visiting the library physically.

Fill in the blank: Online lending allows users to borrow _____ resources such as e-books and audiobooks through library platforms.

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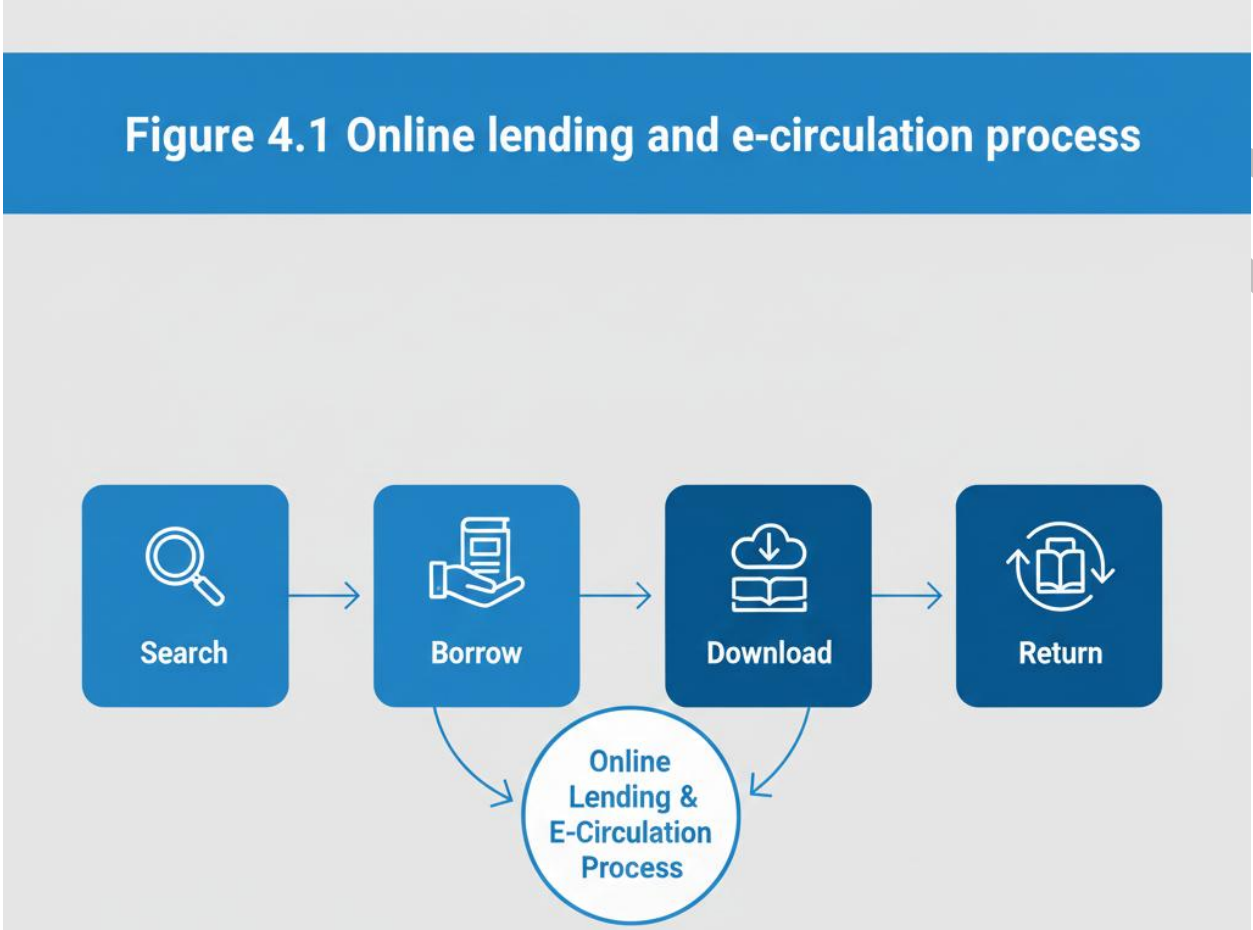

Figure 4.1 ICT in circulation services

4.1.2 Virtual reference and information services

Virtual reference services provide assistance to users through digital platforms such as email, chat, or video conferencing. These services ensure that patrons can receive guidance on research, catalogues, and information retrieval without being physically present. They are particularly useful for distance learners and researchers working remotely.

Fill in the blank: Virtual reference services provide assistance to users through digital platforms such as email, chat, or _____ conferencing.

Plate 4.2 Virtual reference and information services in libraries

4.1.3 Digital literacy and user training

Digital literacy refers to the ability to use digital tools and resources effectively. Libraries provide **user training programmes** to help patrons develop skills such as searching databases, evaluating online information, and using e-resources responsibly. These programmes empower users to navigate the digital environment confidently and make the most of available resources.

Fill in the blank: Digital literacy refers to the ability to use _____ tools and resources effectively.

Box 4.3 Digital literacy skills promoted by libraries

Pilot questions 4.1

1. Online lending allows users to: a. Borrow digital resources such as e-books and audiobooks b. Cancel subscriptions c. Colour code shelves d. None of the above
2. E-circulation refers to: a. Automated management of borrowing and returning items b. Colour coding shelves c. Cancelling subscriptions d. None of the above
3. Virtual reference services provide assistance through: a. Email, chat, or video conferencing b. Colour coding shelves c. Cancelling subscriptions d. None of the above
4. Digital literacy refers to: a. The ability to use digital tools and resources effectively b. Colour coding shelves c. Cancelling subscriptions d. None of the above

5. One digital literacy skill promoted by libraries is: a. Searching databases b. Colour coding shelves c. Cancelling subscriptions d. None of the above

4.2 Emerging Technologies In Libraries

Emerging technologies are reshaping how libraries deliver services, manage resources, and engage with users. These innovations provide new opportunities for efficiency, personalisation, and global connectivity. In this Part, we will explore cloud computing and virtualisation, artificial intelligence and machine learning applications, and mobile and wearable technologies.

4.2.1 Cloud computing and virtualisation

Cloud computing refers to storing and accessing data and applications over the internet rather than on local servers. Libraries use cloud services to host catalogues, databases, and digital collections, ensuring that users can access resources from anywhere. **Virtualisation** allows multiple systems to run on a single physical server, reducing costs and improving scalability.

Fill in the blank: Cloud computing enables libraries to store and access data and applications over the _____ rather than on local servers.

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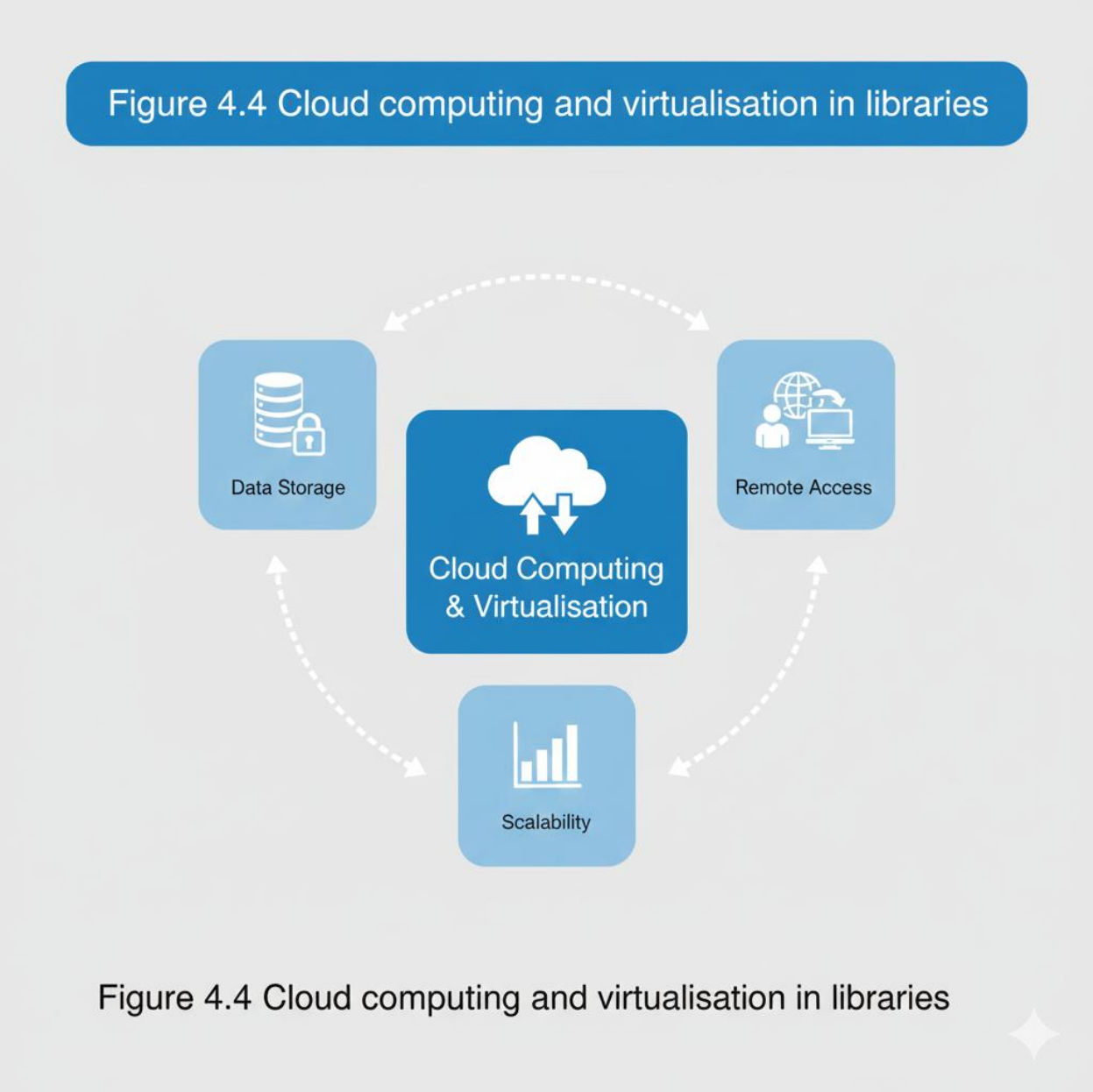


Figure 4.4 Cloud computing and virtualisation in libraries

4.2.2 Artificial intelligence and machine learning applications

Artificial intelligence (AI) refers to computer systems that can perform tasks requiring human-like intelligence, such as natural language processing or image recognition. **Machine learning (ML)** is a subset of AI that enables systems to learn from data and improve over time. Libraries use AI and ML for personalised recommendations, automated cataloguing, and predictive analytics to anticipate user needs.

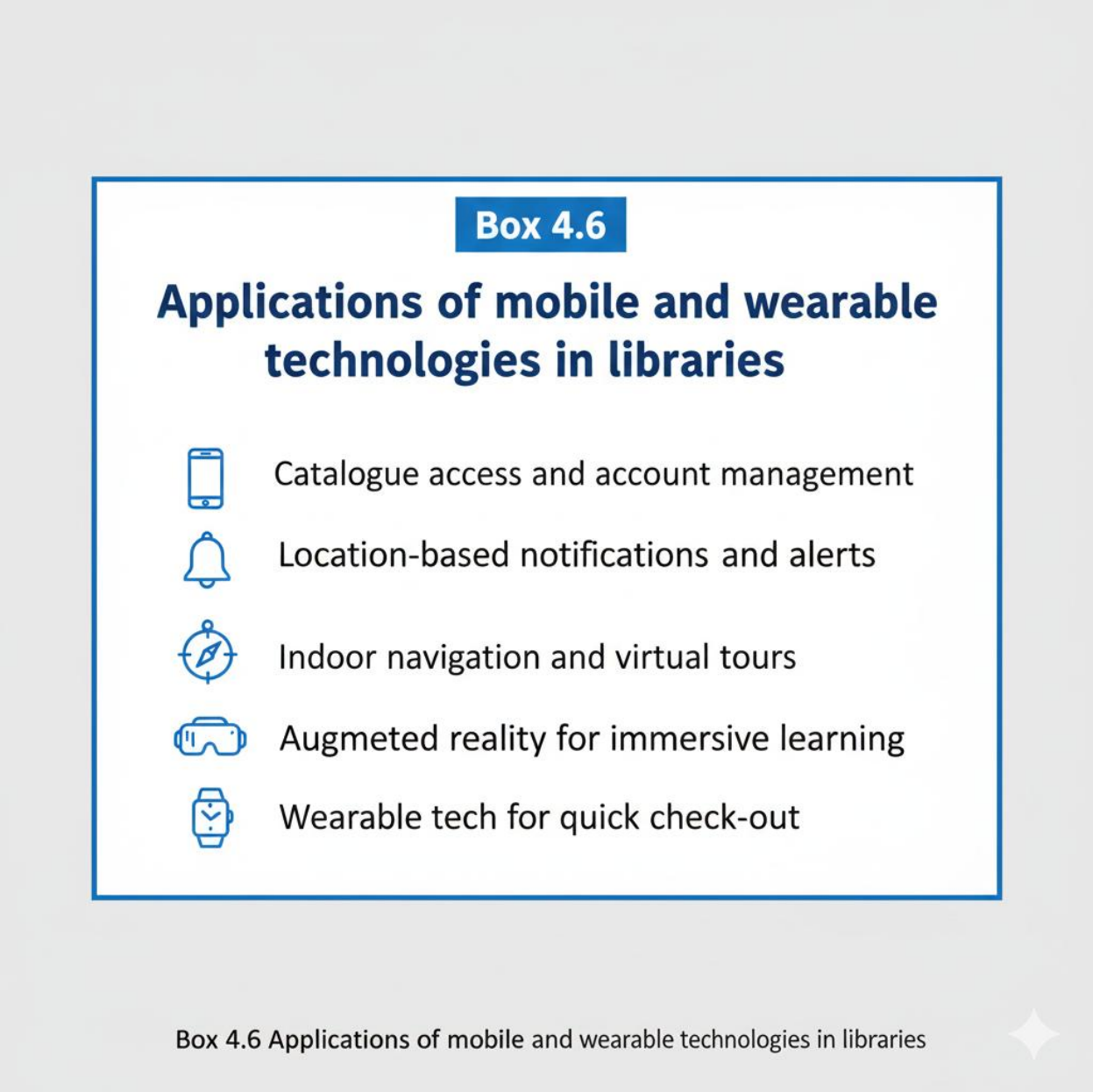
Fill in the blank: Machine learning enables systems to learn from _____ and improve their performance over time.

Plate 4.5 Artificial intelligence and macne machining in libraries

4.2.3 Mobile and wearable technologies

Mobile technologies include smartphones and tablets that allow users to access library services on the go. **Wearable technologies** such as smartwatches and augmented reality (AR) glasses are emerging tools that can provide notifications, navigation within library spaces, and immersive learning experiences. These technologies expand the ways users interact with libraries and information.

Fill in the blank: Wearable technologies such as smartwatches and AR glasses provide _____ learning experiences and real-time notifications.



Box 4.6 Applications of mobile and wearable technologies in libraries

Pilot questions 4.2

1. Cloud computing enables libraries to: a. Store and access data over the internet b. Cancel subscriptions c. Colour code shelves d. None of the above
2. Virtualisation allows libraries to: a. Run multiple systems on a single physical server b. Cancel subscriptions c. Colour code shelves d. None of the above
3. Artificial intelligence refers to: a. Computer systems performing tasks requiring human-like intelligence b. Colour coding shelves c. Cancelling subscriptions d. None of the above
4. Machine learning enables systems to: a. Learn from data and improve performance b. Cancel subscriptions c. Colour code shelves d. None of the above

5. Wearable technologies such as AR glasses provide: a. Immersive learning experiences and real-time notifications b. Colour coding shelves c. Cancelling subscriptions d. None of the above

4.3 Integration Of Social Media And Web Platforms

Libraries increasingly use social media and web platforms to connect with their communities, promote resources, and provide interactive services. These tools help libraries remain visible in the digital space, engage users in meaningful ways, and foster collaboration. In this Part, we will explore social media for outreach and engagement, web portals and personalised dashboards, and collaborative tools and online communities.

4.3.1 Social media for outreach and engagement

Social media platforms such as Facebook, Twitter, Instagram, and LinkedIn allow libraries to share updates, promote events, and highlight resources. They also provide opportunities for two-way communication, enabling libraries to respond to user queries and build stronger relationships with their communities.

Fill in the blank: Social media platforms allow libraries to share updates, promote events, and highlight _____.

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Plate 4.7 Social media for outheuah and engagement in libraries

4.3.2 Web portals and personalised dashboards

Web portals are centralised online platforms that provide access to library services, catalogues, and resources. **Personalised dashboards** allow users to customise their experience, view borrowing history, receive recommendations, and track learning progress. These tools make library services more user-centred and efficient.

Fill in the blank: Personalised dashboards allow users to customise their experience and view their _____ history.

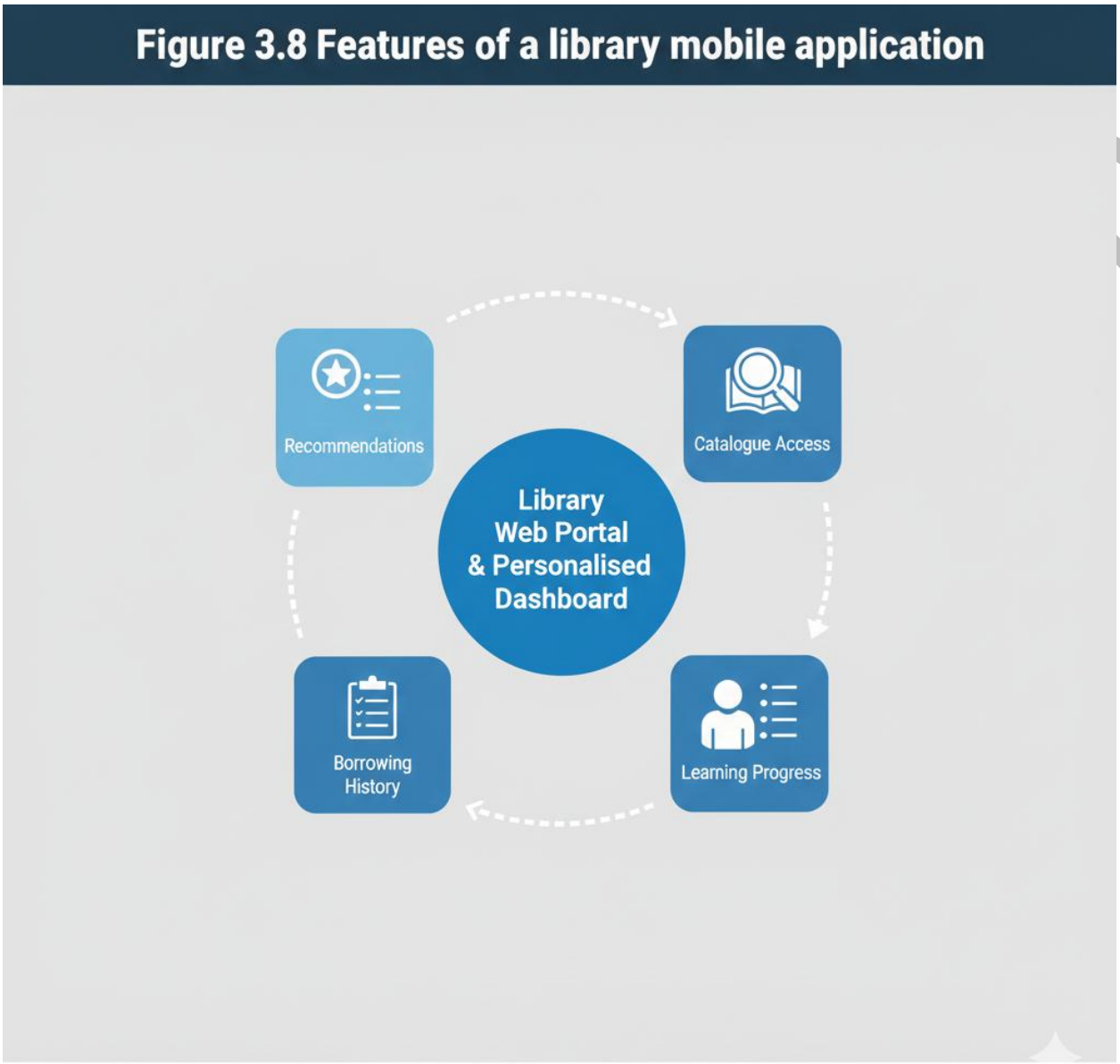
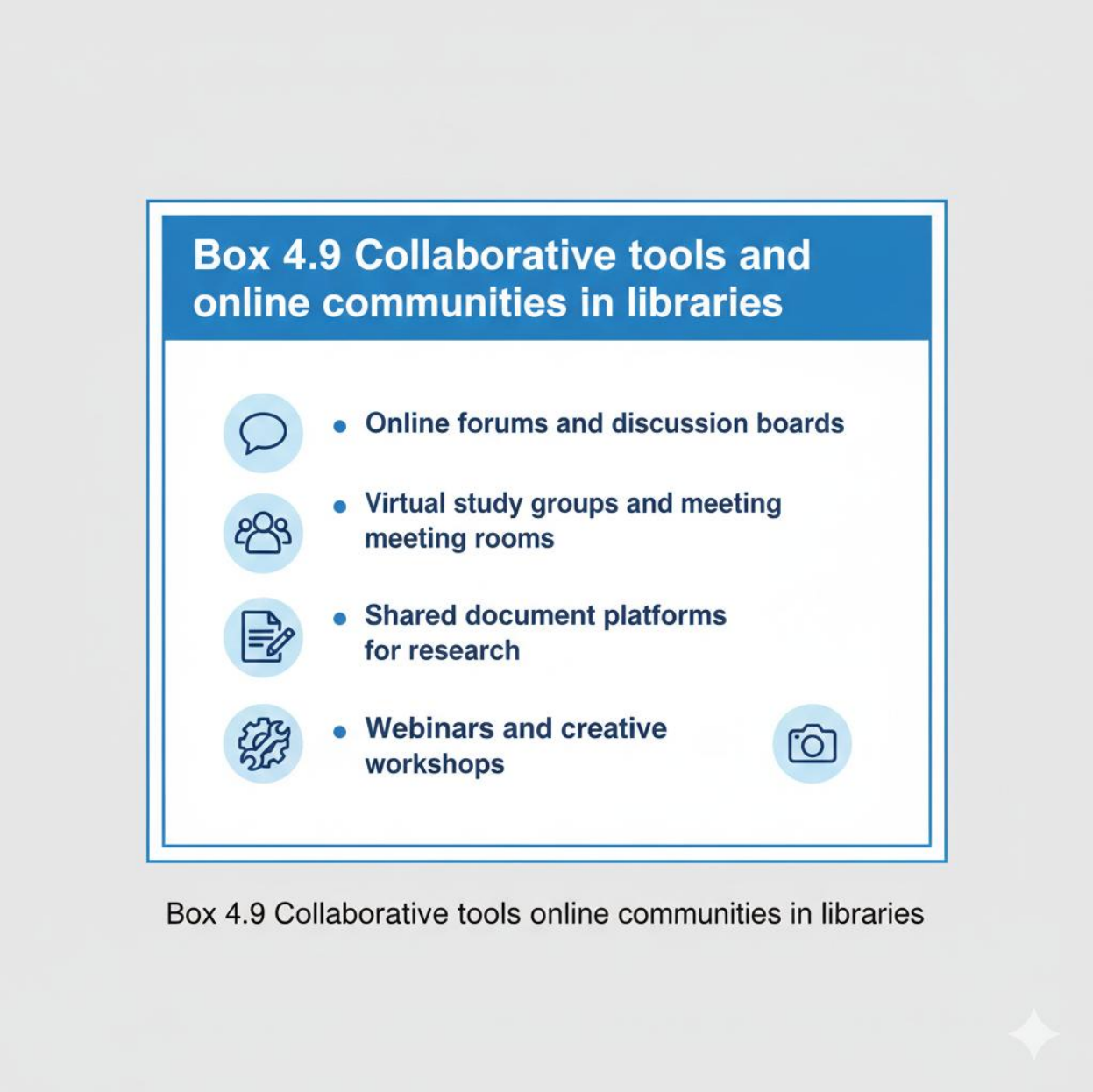


Figure 3.8 Features of a library mobile application

4.3.3 Collaborative tools and online communities

Collaborative tools such as Google Docs, Microsoft Teams, and Slack enable users to work together on projects, share resources, and communicate effectively. Libraries also support **online communities** where users can discuss topics, exchange ideas, and participate in virtual study groups. These platforms foster collaboration and knowledge sharing beyond the physical library.

Fill in the blank: Collaborative tools such as Google Docs and Microsoft Teams enable users to work together on _____.



Box 4.9 Collaborative tools online communities in libraries

ot questions 4.3

1. Social media platforms allow libraries to: a. Share updates, promote events, and highlight resources b. Cancel subscriptions c. Colour code shelves d. None of the above
2. Web portals provide: a. Centralised access to library services and resources b. Colour coding shelves c. Cancelling subscriptions d. None of the above
3. Personalised dashboards allow users to: a. Customise their experience and view borrowing history b. Cancel subscriptions c. Colour code shelves d. None of the above
4. Collaborative tools such as Google Docs enable users to: a. Work together on projects b. Cancel subscriptions c. Colour code shelves d. None of the above

5. Online communities supported by libraries allow users to: a. Discuss topics and participate in virtual study groups b. Cancel subscriptions c. Colour code shelves d. None of the above

4.4 Benefits, Challenges, And Future Prospects

Digital library services and emerging technologies bring significant opportunities for libraries, but they also present challenges that must be carefully managed. Understanding both sides helps libraries plan strategically and remain relevant in a rapidly evolving information environment.

4.4.1 Benefits of digital services and emerging technologies

The **benefits** of adopting digital services and emerging technologies include improved accessibility, faster service delivery, and enhanced user engagement. Users can access resources remotely, receive personalised recommendations, and collaborate through online platforms. Libraries benefit from streamlined operations, reduced physical storage needs, and the ability to reach wider audiences.

Fill in the blank: Digital services improve _____ by allowing users to access resources remotely and receive personalised recommendations.

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Figure 4.10 Benefits of digital services and emerging technologies

Figure 4.10 Benefits of digital services and emerging technologies

4.4.2 Challenges in adoption and sustainability

Libraries face several **challenges** when adopting digital services and emerging technologies. These include high implementation costs, limited infrastructure, inadequate internet connectivity, and the need for continuous staff training. Sustainability is also a concern, as technologies evolve quickly and require regular updates to remain effective.

Fill in the blank: One challenge of adopting digital services in libraries is the need for continuous _____ to keep pace with technological changes.

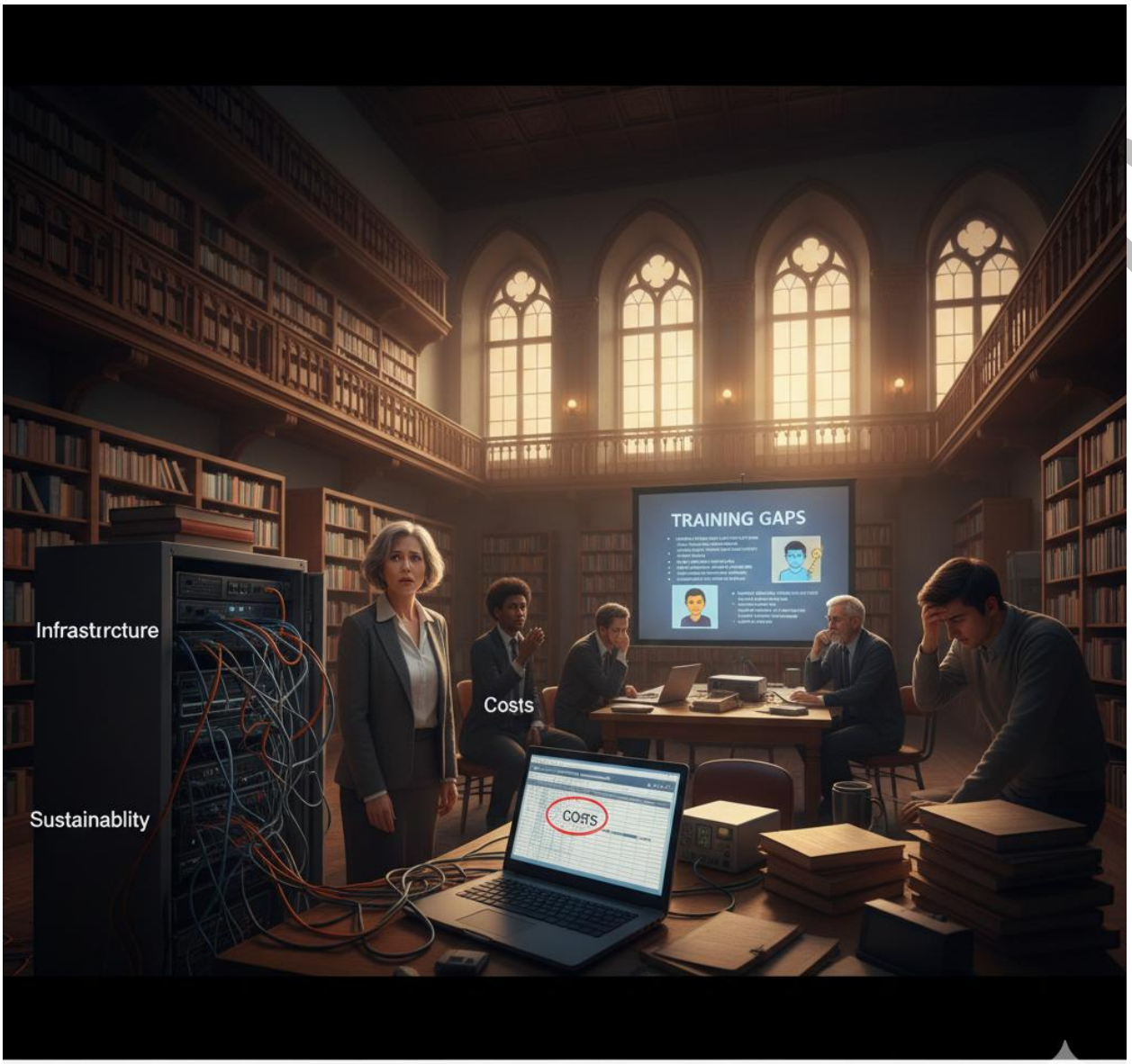
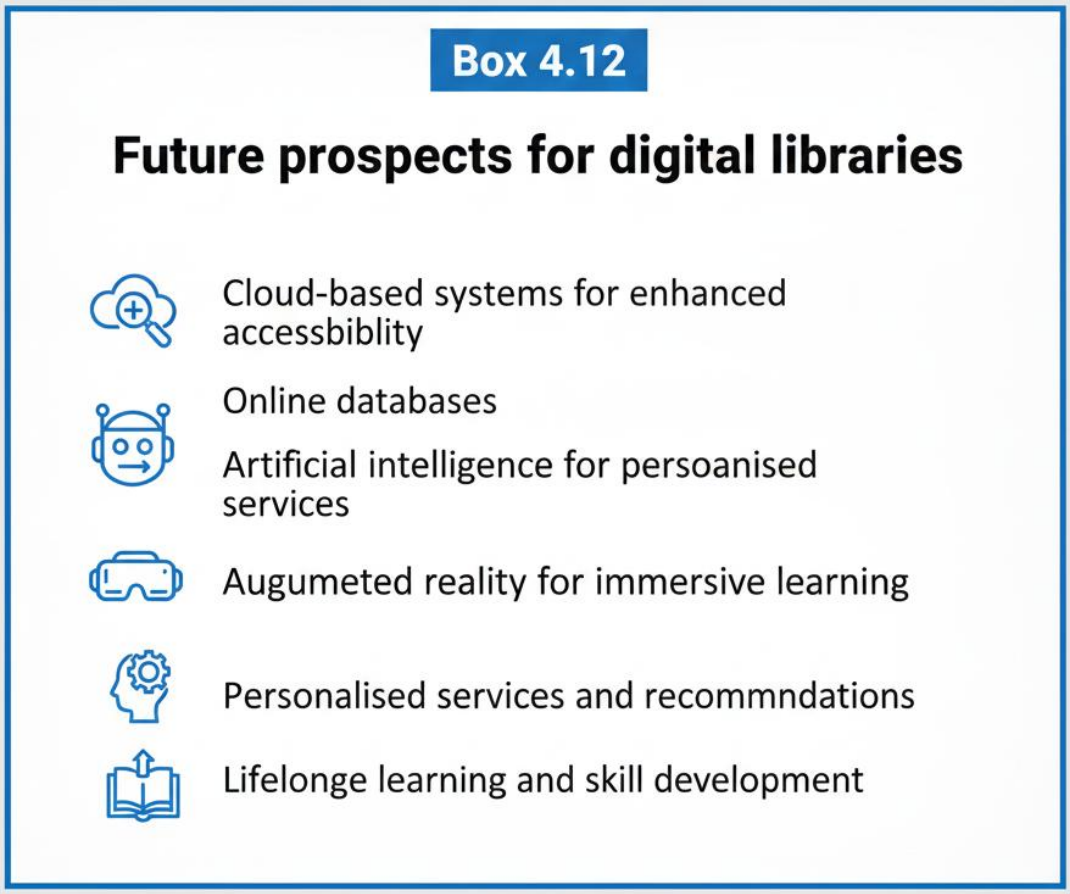


Plate 4.11 Challenges of adopting digital services in libraries

4.4.3 Future prospects for digital libraries

The **future prospects** of digital libraries are promising. Emerging trends such as artificial intelligence, cloud-based systems, and immersive technologies like augmented reality will continue to transform library services. Libraries are expected to offer more personalised experiences, integrate global resources, and support lifelong learning through innovative platforms.

Fill in the blank: Future prospects for digital libraries include the adoption of immersive technologies such as _____ reality.



Box 4.12 Applications of mobile and wearable technologies in libraries

Pilot questions 4.4

1. Benefits of digital services and emerging technologies include: a. Improved accessibility b. Faster service delivery c. Enhanced user engagement d. All of the above
2. One challenge of adopting digital services in libraries is: a. High implementation costs b. Limited infrastructure c. Need for continuous staff training d. All of the above
3. Future prospects for digital libraries include: a. Artificial intelligence b. Cloud-based systems c. Augmented reality d. All of the above
4. Digital services reduce physical _____ needs by providing access to resources in electronic form.

5. Sustainability in ICT adoption requires regular _____ to remain effective as technologies evolve.

Series Summary 4

This Series has explored how libraries deliver **digital services** and adopt **emerging technologies** to remain relevant in a rapidly changing information environment. We began with digital library services such as online lending and e-circulation, virtual reference, and digital literacy programmes, which extend access and empower users. We then examined emerging technologies including cloud computing, artificial intelligence, and mobile and wearable innovations, highlighting their transformative impact on library operations. Next, we considered the integration of social media and web platforms, showing how libraries use these tools for outreach, personalised services, and collaboration. Finally, we reflected on the benefits, challenges, and future prospects of digital services, noting both opportunities and sustainability concerns.

By working through these Parts, you should now be able to **describe** digital library services (SLO 4.1), **explain** emerging technologies in libraries (SLO 4.2), **analyse** how libraries integrate social media and web platforms (SLO 4.3), and **evaluate** the benefits, challenges, and future prospects of digital services and emerging technologies (SLO 4.4). These outcomes provide a comprehensive understanding of how libraries are evolving in the digital age, preparing you to engage with advanced applications and innovations in subsequent Series.

Glossary of Terms 4

- **Online lending**: The process of borrowing digital resources such as e-books and audiobooks through library platforms.
- **E-circulation**: Automated management of borrowing and returning items, often supported by digital catalogues and mobile applications.
- **Virtual reference services**: Assistance provided to users through digital platforms such as email, chat, or video conferencing.
- **Digital literacy**: The ability to use digital tools and resources effectively, including searching databases and evaluating online information.
- **Cloud computing**: Storing and accessing data and applications over the internet rather than on local servers.
- **Virtualisation**: Technology that allows multiple systems to run on a single physical server, reducing costs and improving scalability.
- **Artificial intelligence (AI)**: Computer systems capable of performing tasks requiring human-like intelligence, such as natural language processing.
- **Machine learning (ML)**: A subset of AI that enables systems to learn from data and improve their performance over time.
- **Mobile technologies**: Devices such as smartphones and tablets that allow users to access library services on the go.

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- **Wearable technologies**: Devices such as smartwatches and augmented reality glasses that provide notifications, navigation, and immersive learning experiences.
- **Social media platforms**: Online tools such as Facebook, Twitter, and Instagram used by libraries for outreach, engagement, and communication.
- **Web portal**: A centralised online platform that provides access to library services, catalogues, and resources.
- **Personalised dashboard**: A user interface that allows patrons to customise their experience, view borrowing history, and receive recommendations.
- **Collaborative tools**: Digital platforms such as Google Docs or Microsoft Teams that enable users to work together on projects and share resources.
- **Online communities**: Virtual spaces supported by libraries where users can discuss topics, exchange ideas, and participate in study groups.
- **Sustainability**: The ability of libraries to maintain and update digital services and technologies over time.
- **Augmented reality (AR)**: Technology that overlays digital information onto the physical environment, creating immersive learning experiences.

Concept Check Questions 4

Objective Questions

1. Online lending allows users to: a. Borrow digital resources such as e-books and audiobooks b. Cancel subscriptions c. Colour code shelves d. None of the above
2. Virtual reference services provide assistance through: a. Email, chat, or video conferencing b. Colour coding shelves c. Cancelling subscriptions d. None of the above
3. Cloud computing enables libraries to: a. Store and access data over the internet b. Cancel subscriptions c. Colour code shelves d. None of the above
4. Machine learning enables systems to: a. Learn from data and improve performance b. Cancel subscriptions c. Colour code shelves d. None of the above
5. Social media platforms allow libraries to: a. Share updates, promote events, and highlight resources b. Cancel subscriptions c. Colour code shelves d. None of the above

Short-Answer Questions

6. Define e-circulation in your own words. *(Linked to SLO 4.1)*
7. State one benefit of cloud computing for libraries. *(Linked to SLO 4.2)*
8. Mention one feature of personalised dashboards in library web portals. *(Linked to SLO 4.3)*
9. Identify one challenge of adopting digital services in libraries. *(Linked to SLO 4.4)*

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10. Give one example of a wearable technology that can be used in libraries. *(Linked to SLO 4.2)*

Long-Answer Questions

11. Explain how digital library services such as online lending, virtual reference, and digital literacy programmes extend access and empower users. *(Linked to SLO 4.1)*

12. Analyse the role of emerging technologies such as AI, cloud computing, and wearable devices in transforming library operations and user engagement. *(Linked to SLO 4.2, SLO 4.3)*

13. Evaluate the benefits and challenges of integrating social media and web platforms into library services, highlighting their impact on outreach and collaboration. *(Linked to SLO 4.3, SLO 4.4)*

Answers to Concept Check Questions 4

Objective Questions

1. a. Borrow digital resources such as e-books and audiobooks
2. a. Email, chat, or video conferencing
3. a. Store and access data over the internet
4. a. Learn from data and improve performance
5. a. Share updates, promote events, and highlight resources

Short-Answer Questions

6. E-circulation is the automated management of borrowing and returning items in libraries.

7. Cloud computing allows libraries to provide remote access to catalogues and databases.

8. Personalised dashboards let users view borrowing history and receive tailored recommendations.

9. One challenge is the need for continuous staff training to keep pace with technological changes.

10. Smartwatches are an example of wearable technology used in libraries.

Long-Answer Questions

11. *Basic response*: Digital services extend access by allowing users to borrow resources online, receive remote assistance, and build digital skills. *Value-added response*: Outstanding learners may add that these services empower distance learners, reduce physical barriers, and promote lifelong learning.

12. *Basic response*: Emerging technologies improve efficiency and engagement through automation, remote access, and personalised services. *Value-added response*: Outstanding learners may expand by analysing how AI supports recommendations, cloud computing ensures scalability, and wearable devices enhance immersive learning.

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13. *Basic response*: Social media and web platforms help libraries reach wider audiences and support collaboration. *Value-added response*: Outstanding learners may add that while these tools enhance engagement, challenges include managing privacy, sustaining infrastructure, and ensuring inclusivity.

Answers to Pilot Questions 4

Part 4.1 Digital Library Services

- Borrow digital resources such as e-books and audiobooks
- Automated management of borrowing and returning items
- Email, chat, or video conferencing
- The ability to use digital tools and resources effectively
- Searching databases

Part 4.2 Emerging Technologies in Libraries

- Store and access data over the internet
- Run multiple systems on a single physical server
- Computer systems performing tasks requiring human-like intelligence
- Learn from data and improve performance
- Immersive learning experiences and real-time notifications

Part 4.3 Integration of Social Media and Web Platforms

- Share updates, promote events, and highlight resources
- Centralised access to library services and resources
- Customise their experience and view borrowing history
- Work together on projects
- Discuss topics and participate in virtual study groups

Part 4.4 Benefits, Challenges, and Future Prospects

- All of the above (accessibility, faster service delivery, enhanced user engagement)
- All of the above (costs, infrastructure, staff training)
- All of the above (AI, cloud-based systems, augmented reality)
- Storage needs
- Updates

General References

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- Borgman, C. L. (2000). *From Gutenberg to the global information infrastructure: Access to information in the networked world*. MIT Press.
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- Singh, J., & Kaur, T. (2019). *Emerging technologies for libraries: Trends and applications*. IGI Global.
- Tenopir, C. (2018). *Social media use in academic libraries*. Online Information Review, 42(3), 398–411.
- OER Commons. Retrieved from https://www.oercommons.org

Illustration Attributions

- *Figure 4.1 Online lending and e-circulation process*
- *Diagram showing the process of online lending and e-circulation (search, borrow, download, return)*
- *AI prompt suggestion: "Create a diagram showing the process of online lending and e-circulation including search, borrow, download, and return."*
- *Suggested OER search: "online lending e-circulation libraries diagram OER"*
- *Plate 4.2 Virtual reference and information services in libraries*
- *Image showing a librarian assisting a user through a virtual reference chat system*
- *AI prompt suggestion: "Generate an image showing a librarian assisting a user through a virtual reference chat system."*
- *Suggested OER search: "virtual reference information services libraries OER"*
- *Box 4.3 Digital literacy skills promoted by libraries*
- *Text-based infographic listing digital literacy skills (searching databases, evaluating online information, using e-resources responsibly)*
- *AI prompt suggestion: "Generate a text-based infographic listing digital literacy skills promoted by libraries."*
- *Suggested OER search: "digital literacy skills libraries OER"*
- *Figure 4.4 Cloud computing and virtualisation in libraries*
- *Diagram showing cloud computing and virtualisation (data storage, remote access, scalability)*
- *AI prompt suggestion: "Create a diagram showing cloud computing and virtualisation in libraries."*
- *Suggested OER search: "cloud computing virtualisation libraries diagram OER"*
- *Plate 4.5 Artificial intelligence and machine learning in libraries*

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- *Image showing AI and ML applications (recommendation systems, automated cataloguing, predictive analytics)*
- *AI prompt suggestion: "Generate an image showing AI and machine learning applications in libraries."*
- *Suggested OER search: "AI machine learning libraries applications OER"*
- *Box 4.6 Applications of mobile and wearable technologies in libraries*
- *Text-based infographic listing applications (catalogue access, notifications, navigation, immersive learning)*
- *AI prompt suggestion: "Generate a text-based infographic listing applications of mobile and wearable technologies in libraries."*
- *Suggested OER search: "mobile wearable technologies libraries OER"*
- *Plate 4.7 Social media for outreach and engagement in libraries*
- *Image showing a library using social media platforms to engage with users*
- *AI prompt suggestion: "Generate an image showing a library using social media platforms to engage with users."*
- *Suggested OER search: "libraries social media outreach engagement OER"*
- *Figure 4.8 Features of a library web portal and personalised dashboard*
- *Diagram showing features (catalogue access, recommendations, borrowing history, learning progress)*
- *AI prompt suggestion: "Create a diagram showing features of a library web portal and personalised dashboard."*
- *Suggested OER search: "library web portal personalised dashboard diagram OER"*
- *Box 4.9 Collaborative tools and online communities in libraries*
- *Text-based infographic listing collaborative tools and online communities supported by libraries*
- *AI prompt suggestion: "Generate a text-based infographic listing collaborative tools and online communities supported by libraries."*
- *Suggested OER search: "collaborative tools online communities libraries OER"*
- *Figure 4.10 Benefits of digital services and emerging technologies*
- *Diagram showing benefits (accessibility, efficiency, engagement, collaboration)*
- *AI prompt suggestion: "Create a diagram showing benefits of digital services and emerging technologies."*

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- *Suggested OER search: "benefits digital services emerging technologies libraries diagram OER"*
- *Plate 4.11 Challenges of adopting digital services in libraries*
- *Image showing challenges (costs, infrastructure, training, sustainability)*
- *AI prompt suggestion: "Generate an image showing challenges of adopting digital services in libraries."*
- *Suggested OER search: "challenges digital services libraries OER"*
- *Box 4.12 Future prospects for digital libraries*
- *Text-based infographic listing future prospects (AI, cloud-based systems, augmented reality, personalised services, lifelong learning)*
- *AI prompt suggestion: "Generate a text-based infographic listing future prospects for digital libraries."*
- *Suggested OER search: "future prospects digital libraries OER"*

COURSE CODE: LIS 211
COURSE TITLE: Introduction to ICT in Library and Information Services
COURSE UNIT LOAD: (2 Units C:)

- **Series 1: Basic Concepts in Information and Communication Technology**
- **Series 2: Library Automation and ICT Applications in Services**
- **Series 3: Information Seeking, Databases, and the Internet as Resources**
- **Series 4: Web Page Concept, Design, and Management Applications**
- **Series 5: Digital Libraries, Open Access, and ICT Challenges in Nigerian Contexts**

Series 5: Digital Libraries, Open Access, and ICT Challenges in Nigerian Contexts

Proposed Outline

- **5.1 Information retrieval systems**
  - 5.1.1 Definition and components of information retrieval systems
  - 5.1.2 Types of information retrieval systems (manual, automated, hybrid)
  - 5.1.3 Evaluation of retrieval systems (precision, recall, relevance)
- **5.2 Search strategies in libraries**
  - 5.2.1 Basic search techniques (keywords, Boolean operators)
  - 5.2.2 Advanced search techniques (truncation, proximity searching, field-specific searching)

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    - 5.2.3 User-centred search strategies and behaviour
- **5.3 Tools and platforms for information retrieval**
    - 5.3.1 Library catalogues and OPACs
    - 5.3.2 Databases and indexing services
    - 5.3.3 Discovery tools and federated search
- **5.4 Benefits, challenges, and future directions**
    - 5.4.1 Benefits of effective retrieval systems and strategies
    - 5.4.2 Challenges in search and retrieval (information overload, digital divide)
    - 5.4.3 Future directions in retrieval systems (AI-driven search, semantic web, personalised retrieval)

Introduction

Information retrieval is at the heart of modern library and information services. As collections grow in size and complexity, libraries must rely on retrieval systems and effective search strategies to ensure that users can find the information they need quickly and accurately. This Series introduces you to the **principles, tools, and techniques of information retrieval**, equipping you with the skills to navigate both traditional and digital environments.

We begin by examining **information retrieval systems**, their components, types, and evaluation methods such as precision, recall, and relevance. Next, we explore **search strategies in libraries**, ranging from basic keyword searches and Boolean operators to advanced techniques like truncation, proximity searching, and field-specific queries. We then consider the **tools and platforms** that support retrieval, including catalogues, databases, indexing services, and discovery tools. Finally, we reflect on the **benefits, challenges, and future directions** of retrieval systems, highlighting issues such as information overload, the digital divide, and emerging innovations like AI-driven search and the semantic web.

By the end of this Series, you will be able to **describe** information retrieval systems, **apply** search strategies, **analyse** retrieval tools and platforms, and **evaluate** the benefits, challenges, and future directions of information retrieval. These outcomes will strengthen your ability to access and manage information effectively, a critical skill for both academic and professional contexts.

Series Learning Outcomes 5

Upon completing this Series, you should be able to:

- **SLO 5.1** describe information retrieval systems, their components, types, and evaluation methods.
- **SLO 5.2** apply basic and advanced search strategies in libraries, including Boolean operators and truncation.
- **SLO 5.3** analyse tools and platforms for information retrieval such as catalogues, databases, and discovery services.
- **SLO 5.4** evaluate the benefits, challenges, and future directions of information retrieval systems and search strategies.

5.1 Information Retrieval Systems

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Information retrieval systems (IRS) are the backbone of modern libraries and information centres. They enable users to locate, access, and evaluate information efficiently from vast collections. In this Part, we will explore their definition and components, types, and evaluation methods.

5.1.1 Definition and components of information retrieval systems

An **information retrieval system** is a set of tools and processes designed to store, organise, and retrieve information based on user queries. Its key **components** include:

- **Database/Collection**: The repository of documents or records.
- **Indexing mechanism**: Structures that allow fast searching (e.g., inverted index).
- **Search interface**: The user-facing tool for entering queries.
- **Retrieval engine**: The algorithm that matches queries with relevant documents.

Fill in the blank: An information retrieval system is designed to store, organise, and _____ information based on user queries.

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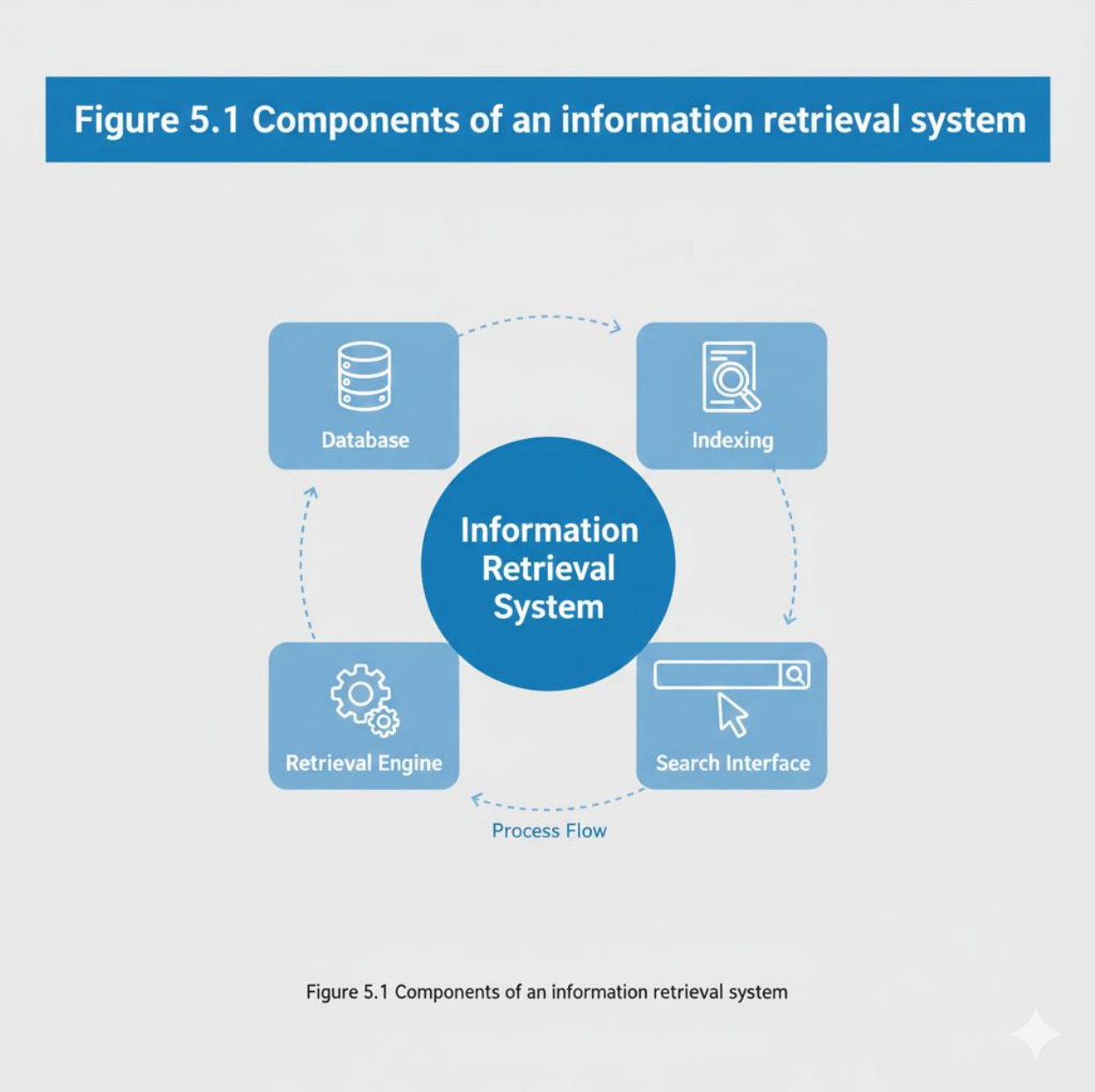


Figure 5.1 Components of an information retrieval system

5.1.2 Types of information retrieval systems

There are several **types** of information retrieval systems:

- **Manual systems**: Traditional card catalogues and printed indexes.
- **Automated systems**: Computerised catalogues, OPACs, and digital databases.
- **Hybrid systems**: Combine manual and automated features, often used during transitions.

Fill in the blank: Automated information retrieval systems include computerised catalogues, _____, and digital databases.

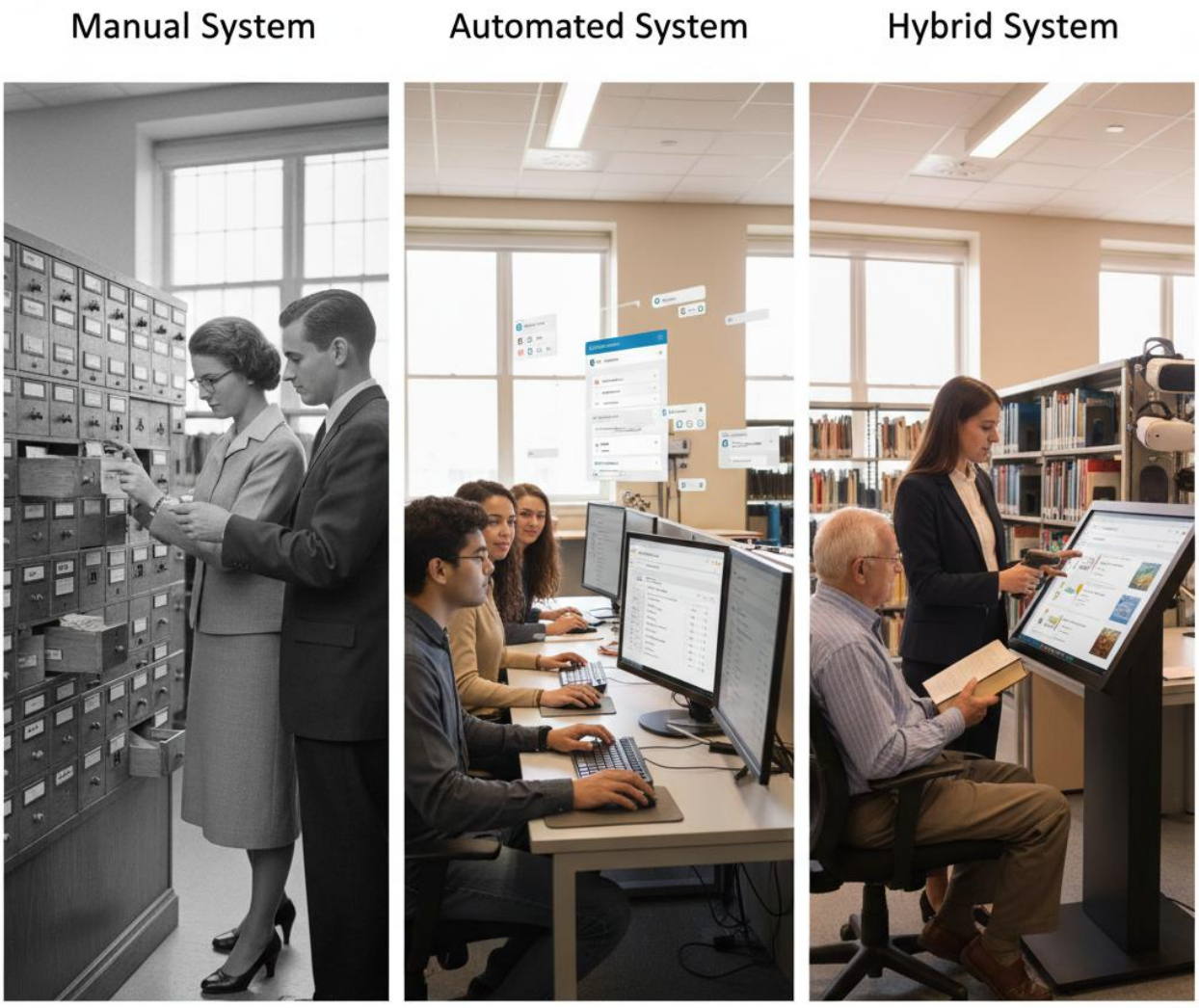


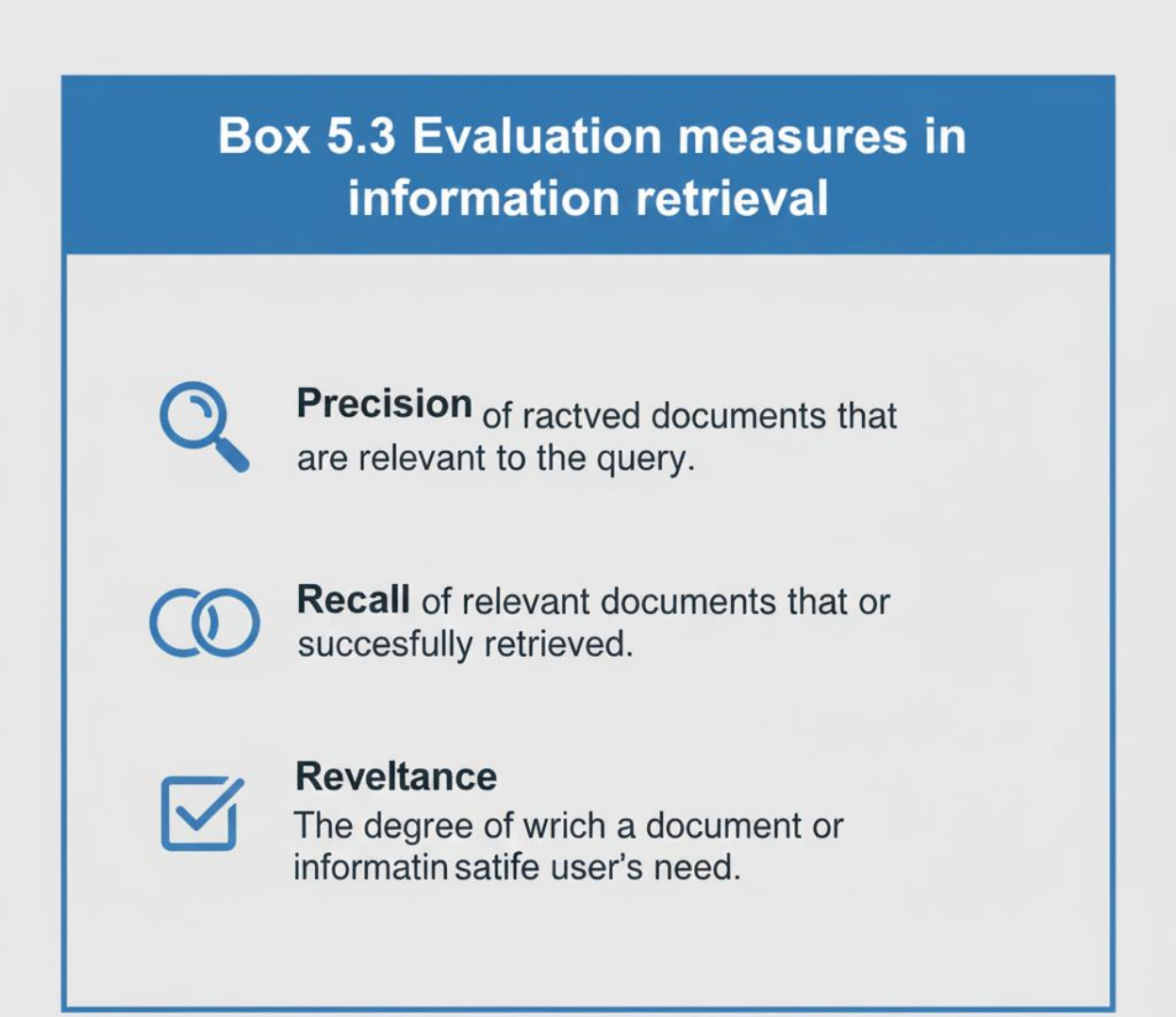
Plate 5.2 Types of information retrieval systems

5.1.3 Evaluation of retrieval systems (precision, recall, relevance)

Evaluation of information retrieval systems is critical to ensure effectiveness. Key measures include:

- **Precision**: The proportion of retrieved documents that are relevant.
- **Recall**: The proportion of relevant documents that are successfully retrieved.
- **Relevance**: The degree to which retrieved documents meet the user's information need.

Fill in the blank: Precision measures the proportion of retrieved documents that are _____.



Box 5.3 Evaluation measures in information retrieval

Pilot questions 5.1

1. An information retrieval system is designed to: a. Store, organise, and retrieve information b. Cancel subscriptions c. Colour code shelves d. None of the above
2. Components of an information retrieval system include: a. Database, indexing, search interface, retrieval engine b. Colour coding shelves c. Cancelling subscriptions d. None of the above
3. Automated information retrieval systems include: a. Computerised catalogues, OPACs, and digital databases b. Colour coding shelves c. Cancelling subscriptions d. None of the above
4. Precision measures: a. The proportion of retrieved documents that are relevant b. Colour coding shelves c. Cancelling subscriptions d. None of the above

5. Recall measures: a. The proportion of relevant documents successfully retrieved b. Colour coding shelves c. Cancelling subscriptions d. None of the above

5.2 Search Strategies in Libraries

Search strategies are the methods and techniques used by users to locate information effectively within retrieval systems. A well-structured search strategy ensures that users find relevant information quickly and avoid information overload. In this Part, we will explore basic search techniques, advanced search techniques, and user-centred search strategies.

5.2.1 Basic search techniques (keywords, Boolean operators)

Basic search techniques include:

- **Keywords**: Selecting important words or phrases related to the topic.
- **Boolean operators**: Using AND, OR, and NOT to combine or exclude terms.
    - Example: *climate AND change* retrieves documents containing both terms.
    - Example: *education OR training* retrieves documents containing either term.
    - Example: *pollution NOT noise* excludes documents containing "noise."

Fill in the blank: Boolean operators such as AND, OR, and NOT are used to _____ or exclude search terms.

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5.2.2 Advanced search techniques (truncation, proximity searching, field-specific searching)

Advanced search techniques allow users to refine searches for greater precision:

- **Truncation**: Using symbols (e.g., *) to find variations of a word. Example: *educat* retrieves education, educator, educating.
- **Proximity searching**: Finding words that appear close together in a text. Example: *library NEAR technology*.
- **Field-specific searching**: Restricting searches to specific fields such as author, title, or subject.

Fill in the blank: Truncation uses symbols such as * to find _____ of a word.

Plate 5.5 Advanced search techniques in libraries

5.2.3 User-centred search strategies and behaviour

User-centred search strategies focus on how users interact with retrieval systems. Factors include:

- **Search behaviour**: The patterns users follow when seeking information.
- **Information need**: The specific requirement driving the search.
- **User preferences**: Choices such as preferred databases, search interfaces, or filters.

Libraries design systems to accommodate diverse user behaviours, ensuring accessibility and relevance.

Fill in the blank: User-centred search strategies focus on how _____ interact with retrieval systems.

Box 5.6 User-centrred search strategies in libraries

Pilot questions 5.2

1. Boolean operators such as AND, OR, and NOT are used to: a. Combine or exclude search terms b. Cancel subscriptions c. Colour code shelves d. None of the above
2. Truncation allows users to: a. Find variations of a word using symbols b. Cancel subscriptions c. Colour code shelves d. None of the above
3. Proximity searching helps users: a. Find words that appear close together in a text b. Cancel subscriptions c. Colour code shelves d. None of the above
4. Field-specific searching restricts searches to: a. Specific fields such as author, title, or subject b. Colour coding shelves c. Cancelling subscriptions d. None of the above

5. User-centred search strategies focus on: a. How users interact with retrieval systems b. Colour coding shelves c. Cancelling subscriptions d. None of the above

5.3 Tools and Platforms for Information Retrieval

Libraries rely on a variety of tools and platforms to support effective information retrieval. These systems provide structured access to collections, enable advanced searching, and integrate multiple resources into unified interfaces. In this Part, we will explore library catalogues and OPACs, databases and indexing services, and discovery tools with federated search.

5.3.1 Library catalogues and OPACs

Library catalogues are organised lists of a library's holdings, traditionally in card format but now digitised. **Online Public Access Catalogues (OPACs)** are web-based catalogues that allow users to search holdings by author, title, subject, or keyword. OPACs often include features such as availability status, location, and links to digital copies.

Fill in the blank: OPACs allow users to search library holdings by author, title, subject, or _____.

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Figure 5.7 Features of OPACs in libraries

Figure 5.7 Features of OPACs in libraries

5.3.2 Databases and indexing services

Databases are structured collections of information that can be searched electronically. Examples include JSTOR, PubMed, and ProQuest. **Indexing services** provide bibliographic records and abstracts, helping users locate relevant articles across journals and publications. Together, these tools expand access to scholarly and specialised information beyond the library's physical holdings.

Fill in the blank: Indexing services provide bibliographic records and _____ to help users locate relevant articles.

Plate 5.8 Databases and indexing services in libraries

5.3.3 Discovery tools and federated search

Discovery tools provide a single search interface that integrates multiple databases, catalogues, and repositories. **Federated search** allows users to search across several resources simultaneously, retrieving results from diverse platforms in one list. These tools simplify the search process and reduce the need to query multiple systems individually.

Fill in the blank: Federated search allows users to search across several _____ simultaneously.

Pilot questions 5.3

1. OPACs allow users to search holdings by: a. Author, title, subject, or keyword b. Colour coding shelves c. Cancelling subscriptions d. None of the above
2. Databases are: a. Structured collections of information searchable electronically b. Colour coding shelves c. Cancelling subscriptions d. None of the above
3. Indexing services provide: a. Bibliographic records and abstracts b. Colour coding shelves c. Cancelling subscriptions d. None of the above
4. Discovery tools provide: a. A single search interface integrating multiple databases and catalogues b. Colour coding shelves c. Cancelling subscriptions d. None of the above

5. Federated search allows users to: a. Search across several resources simultaneously b. Cancel subscriptions c. Colour code shelves d. None of the above

5.4 Benefits, Challenges, And Future Directions

Information retrieval systems and search strategies provide powerful tools for accessing knowledge, but they also come with challenges. Understanding both the advantages and limitations helps libraries and users plan effectively and anticipate future innovations.

5.4.1 Benefits of effective retrieval systems and strategies

Benefits include:

- **Efficiency**: Users can locate relevant information quickly.
- **Accuracy**: Precision and recall ensure high-quality results.
- **Accessibility**: Retrieval systems provide access to diverse collections, including digital resources.
- **User empowerment**: Effective search strategies help users become independent information seekers.

Fill in the blank: Effective retrieval systems improve _____ by enabling users to locate relevant information quickly.

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Figure 5.10 Benefits of effective retrieval systems

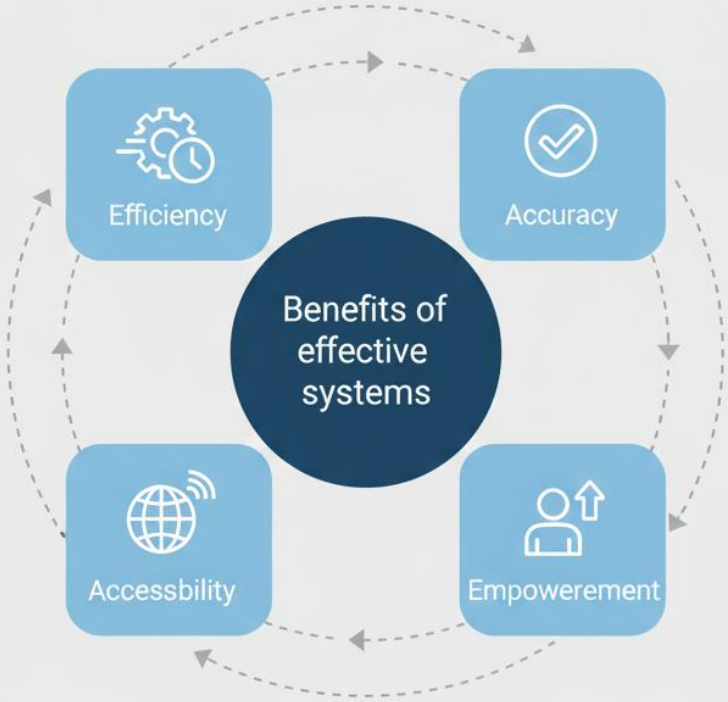


Figure 5.10 Benefits of effective retrieval systems

5.4.2 Challenges in search and retrieval (information overload, digital divide)

Challenges include:

- **Information overload**: Too many results can overwhelm users.
- **Digital divide**: Unequal access to technology limits participation.
- **Complexity**: Advanced search techniques may be difficult for novice users.
- **Quality control**: Ensuring relevance and reliability of retrieved information.

Fill in the blank: One challenge of information retrieval is _____ overload, where too many results overwhelm users.

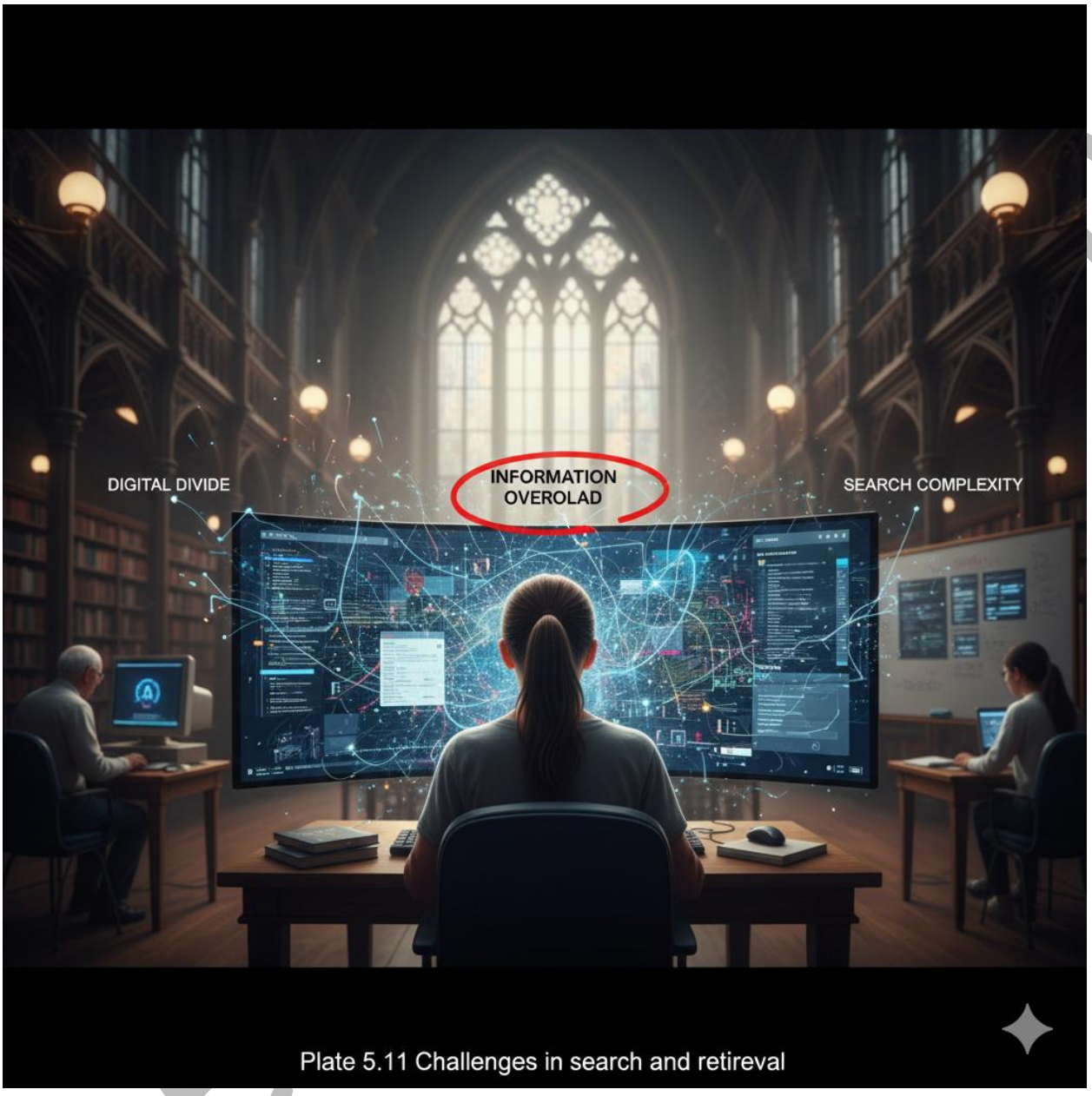


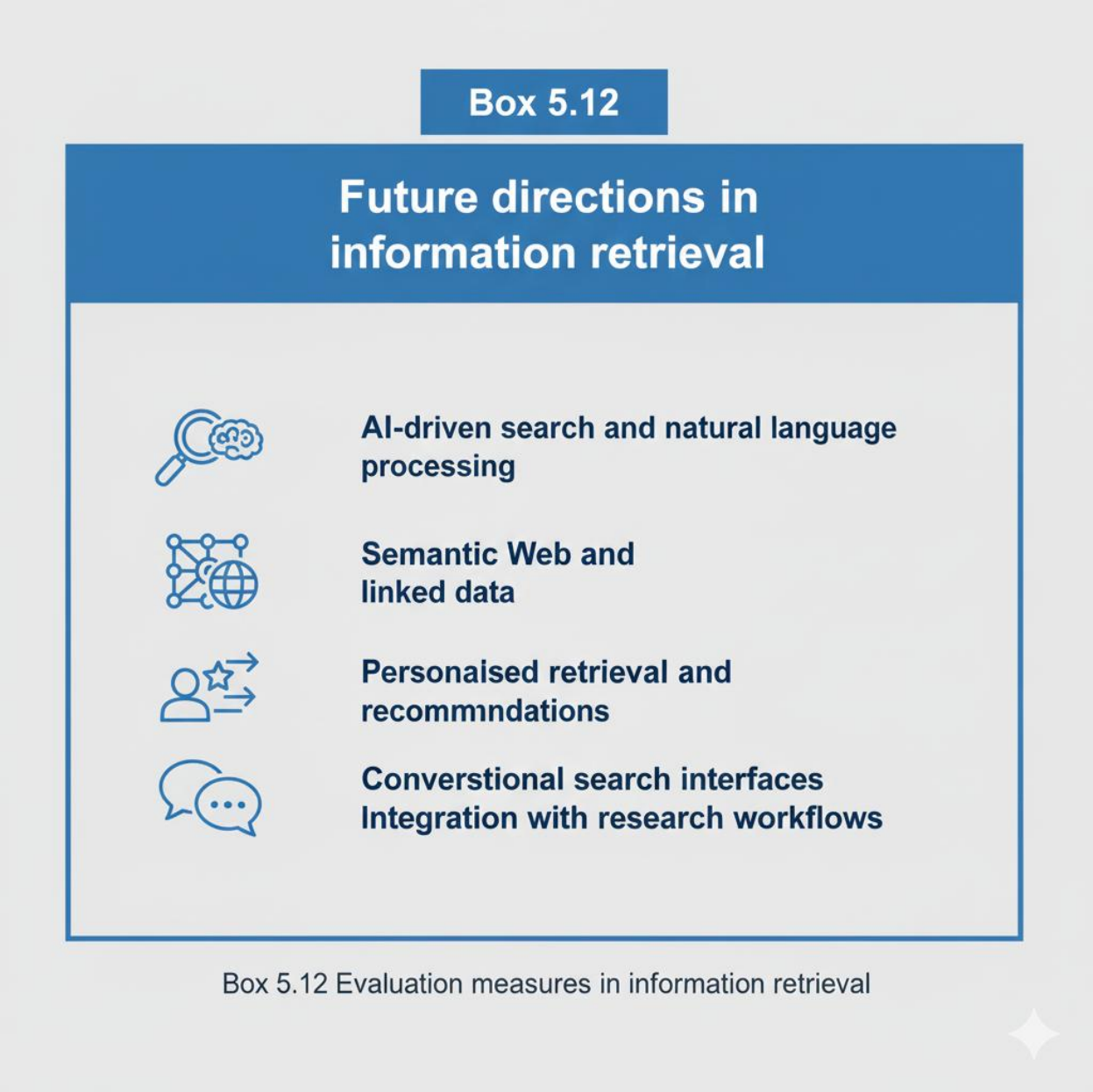
Plate 5.11 Challenges in search and retireval

5.4.3 Future directions in retrieval systems (AI-driven search, semantic web, personalised retrieval)

Future directions include:

- **AI-driven search**: Using artificial intelligence to deliver personalised and predictive results.
- **Semantic web**: Enhancing retrieval by understanding meaning and context of queries.
- **Personalised retrieval**: Tailoring search results to individual user preferences and behaviours.
- **Integration**: Unified platforms combining catalogues, databases, and discovery tools.

Fill in the blank: Future retrieval systems will increasingly use _____ intelligence to deliver personalised and predictive results.



Box 5.12 Evaluation measures in information retrieval

Pilot questions 5.4

1. Benefits of effective retrieval systems include: a. Efficiency b. Accuracy c. Accessibility d. All of the above
2. One challenge of information retrieval is: a. Information overload b. Digital divide c. Complexity for novice users d. All of the above
3. Future retrieval systems will increasingly use: a. Artificial intelligence b. Semantic web c. Personalised retrieval d. All of the above
4. Effective retrieval systems empower users to become independent _____ seekers.

5. Ensuring relevance and reliability of retrieved information is part of _____ control.

Series Summary 5

This Series has explored the foundations of **information retrieval systems and search strategies**, showing how libraries organise, retrieve, and deliver information effectively. We began by defining information retrieval systems, examining their components, types, and evaluation measures such as precision, recall, and relevance. We then studied search strategies in libraries, starting with basic techniques like keywords and Boolean operators, moving to advanced methods such as truncation, proximity searching, and field-specific queries, and finally considering user-centred approaches. Next, we analysed the tools and platforms that support retrieval, including OPACs, databases, indexing services, and discovery tools with federated search. Finally, we reflected on the benefits, challenges, and future directions of retrieval systems, highlighting issues such as information overload, the digital divide, and innovations like AI-driven search and the semantic web.

By working through these Parts, you should now be able to **describe** information retrieval systems (SLO 5.1), **apply** search strategies in libraries (SLO 5.2), **analyse** retrieval tools and platforms (SLO 5.3), and **evaluate** the benefits, challenges, and future directions of retrieval systems and search strategies (SLO 5.4). These outcomes equip you with practical skills for navigating complex information environments and prepare you for advanced study in information organisation and access.

Glossary of Terms 5

- **Information retrieval system (IRS)**: A set of tools and processes designed to store, organise, and retrieve information based on user queries.
- **Database/Collection**: The repository of documents or records within an IRS.
- **Indexing mechanism**: Structures that allow fast searching, such as inverted indexes.
- **Search interface**: The user-facing tool for entering queries into an IRS.
- **Retrieval engine**: The algorithm that matches queries with relevant documents.
- **Manual retrieval systems**: Traditional card catalogues and printed indexes.
- **Automated retrieval systems**: Computerised catalogues, OPACs, and digital databases.
- **Hybrid retrieval systems**: Systems combining manual and automated features.
- **Precision**: The proportion of retrieved documents that are relevant.
- **Recall**: The proportion of relevant documents successfully retrieved.
- **Relevance**: The degree to which retrieved documents meet the user's information need.
- **Keyword search**: Using important words or phrases related to a topic to locate information.
- **Boolean operators**: Logical connectors (AND, OR, NOT) used to combine or exclude search terms.

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- **Truncation**: Using symbols (e.g., *) to find variations of a word.
- **Proximity searching**: Finding words that appear close together in a text.
- **Field-specific searching**: Restricting searches to specific fields such as author, title, or subject.
- **User-centred search strategies**: Approaches that focus on how users interact with retrieval systems, considering behaviour, needs, and preferences.
- **OPAC (Online Public Access Catalogue)**: A web-based catalogue that allows users to search library holdings by author, title, subject, or keyword.
- **Indexing services**: Tools that provide bibliographic records and abstracts to help users locate relevant articles.
- **Discovery tools**: Platforms that provide a single search interface integrating multiple databases and catalogues.
- **Federated search**: A search method that retrieves results from several resources simultaneously.
- **Information overload**: A challenge where too many results overwhelm users.
- **Digital divide**: Unequal access to technology that limits participation in information retrieval.
- **AI-driven search**: Retrieval systems enhanced by artificial intelligence to deliver personalised and predictive results.
- **Semantic web**: A web framework that enables machines to understand meaning and context in queries.
- **Personalised retrieval**: Tailoring search results to individual user preferences and behaviours.

Concept Check Questions 5

Objective Questions

1. An information retrieval system is designed to: a. Store, organise, and retrieve information b. Cancel subscriptions c. Colour code shelves d. None of the above
2. Components of an information retrieval system include: a. Database, indexing, search interface, retrieval engine b. Colour coding shelves c. Cancelling subscriptions d. None of the above
3. Boolean operators such as AND, OR, and NOT are used to: a. Combine or exclude search terms b. Cancel subscriptions c. Colour code shelves d. None of the above
4. Truncation allows users to: a. Find variations of a word using symbols b. Cancel subscriptions c. Colour code shelves d. None of the above

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5. Federated search allows users to: a. Search across several resources simultaneously b. Cancel subscriptions c. Colour code shelves d. None of the above

Short-Answer Questions

6. Define precision in information retrieval. *(Linked to SLO 5.1)*

7. State one example of a Boolean operator and explain its function. *(Linked to SLO 5.2)*

8. Mention one feature of OPACs that supports user access. *(Linked to SLO 5.3)*

9. Identify one challenge of information retrieval in the digital age. *(Linked to SLO 5.4)*

10. Give one example of a discovery tool used in libraries. *(Linked to SLO 5.3)*

Long-Answer Questions

11. Explain the components of an information retrieval system and how they work together to support access. *(Linked to SLO 5.1)*

12. Analyse the role of basic and advanced search strategies in improving the effectiveness of information retrieval. *(Linked to SLO 5.2)*

13. Evaluate the benefits and challenges of using OPACs, databases, and discovery tools in libraries. *(Linked to SLO 5.3, SLO 5.4)*

Answers to Concept Check Questions 5

Objective Questions

1. a. Store, organise, and retrieve information
2. a. Database, indexing, search interface, retrieval engine
3. a. Combine or exclude search terms
4. a. Find variations of a word using symbols
5. a. Search across several resources simultaneously

Short-Answer Questions

6. Precision is the proportion of retrieved documents that are relevant.

7. Example: AND – retrieves documents containing both specified terms.

8. OPACs provide search fields such as author, title, subject, or keyword.

9. One challenge is information overload, where too many results overwhelm users.

10. Examples include EBSCO Discovery Service or Summon.

Long-Answer Questions

11. *Basic response*: Components include the database, indexing mechanism, search interface, and retrieval engine. Together, they store, organise, and retrieve information. *Value-added*

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response: Outstanding learners may add that indexing structures improve speed, retrieval engines ensure relevance, and interfaces enhance usability.

12. *Basic response*: Basic strategies like keywords and Boolean operators help refine searches, while advanced techniques like truncation and proximity searching improve precision. *Value-added response*: Outstanding learners may expand by analysing how these strategies reduce information overload and support diverse user needs.

13. *Basic response*: OPACs, databases, and discovery tools provide structured access to collections and simplify searching. *Value-added response*: Outstanding learners may add that while these tools improve efficiency and accessibility, challenges include digital divide, complexity for novice users, and ensuring quality control.

Answers to Pilot Questions 5

Part 5.1 Information Retrieval Systems

- Store, organise, and retrieve information
- Database, indexing, search interface, retrieval engine
- Computerised catalogues, OPACs, and digital databases
- The proportion of retrieved documents that are relevant
- The proportion of relevant documents successfully retrieved

Part 5.2 Search Strategies in Libraries

- Combine or exclude search terms
- Find variations of a word using symbols
- Find words that appear close together in a text
- Specific fields such as author, title, or subject
- How users interact with retrieval systems

Part 5.3 Tools and Platforms for Information Retrieval

- Author, title, subject, or keyword
- Structured collections of information searchable electronically
- Bibliographic records and abstracts
- A single search interface integrating multiple databases and catalogues
- Search across several resources simultaneously

Part 5.4 Benefits, Challenges, and Future Directions

- All of the above (efficiency, accuracy, accessibility, empowerment)
- All of the above (information overload, digital divide, complexity)

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- All of the above (AI, semantic web, personalised retrieval)
- Information seekers
- Quality control

General References

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- Manning, C. D., Raghavan, P., & Schütze, H. (2008). *Introduction to information retrieval*. Cambridge University Press.
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Illustration Attributions

- *Figure 5.1 Components of an information retrieval system*
- *Diagram showing components (database, indexing, search interface, retrieval engine)*
- *AI prompt suggestion: "Create a diagram showing components of an information retrieval system including database, indexing, search interface, and retrieval engine."*
- *Suggested OER search: "information retrieval system components diagram OER"*
- *Plate 5.2 Types of information retrieval systems*
- *Image showing manual, automated, and hybrid retrieval systems*
- *AI prompt suggestion: "Generate an image showing manual, automated, and hybrid information retrieval systems in libraries."*
- *Suggested OER search: "types of information retrieval systems libraries OER"*
- *Box 5.3 Evaluation measures in information retrieval*
- *Text-based infographic listing precision, recall, and relevance*
- *AI prompt suggestion: "Generate a text-based infographic listing evaluation measures in information retrieval: precision, recall, and relevance."*
- *Suggested OER search: "evaluation measures information retrieval precision recall relevance OER"*
- *Figure 5.4 Boolean operators in search strategies*

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- *Diagram showing Boolean search logic (AND, OR, NOT) with overlapping circles*
- *AI prompt suggestion: "Create a diagram showing Boolean search logic with AND, OR, and NOT operators using overlapping circles."*
- *Suggested OER search: "Boolean operators search strategies libraries diagram OER"*
- *Plate 5.5 Advanced search techniques in libraries*
- *Image showing truncation, proximity searching, and field-specific searching in a database interface*
- *AI prompt suggestion: "Generate an image showing advanced search techniques in a database interface including truncation and proximity searching."*
- *Suggested OER search: "advanced search techniques libraries OER"*
- *Box 5.6 User-centred search strategies in libraries*
- *Text-based infographic listing aspects of user-centred search strategies (search behaviour, information need, user preferences)*
- *AI prompt suggestion: "Generate a text-based infographic listing aspects of user-centred search strategies such as search behaviour and information need."*
- *Suggested OER search: "user-centred search strategies libraries OER"*
- *Figure 5.7 Features of OPACs in libraries*
- *Diagram showing OPAC features (search fields, availability, location, digital links)*
- *AI prompt suggestion: "Create a diagram showing features of OPACs including search fields, availability, and digital links."*
- *Suggested OER search: "OPAC features libraries diagram OER"*
- *Plate 5.8 Databases and indexing services in libraries*
- *Image showing a researcher using a database interface with indexing services*
- *AI prompt suggestion: "Generate an image showing a researcher using a database interface with indexing services."*
- *Suggested OER search: "databases indexing services libraries OER"*
- *Box 5.9 Discovery tools and federated search in libraries*
- *Text-based infographic listing features of discovery tools and federated search (single interface, integrated results, simplified searching)*
- *AI prompt suggestion: "Generate a text-based infographic listing features of discovery tools and federated search in libraries."*

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- *Suggested OER search: "discovery tools federated search libraries OER"*

- *Figure 5.10 Benefits of effective retrieval systems*

- *Diagram showing benefits (efficiency, accuracy, accessibility, empowerment)*

- *AI prompt suggestion: "Create a diagram showing benefits of retrieval systems such as efficiency, accuracy, accessibility, and empowerment."*

- *Suggested OER search: "benefits information retrieval systems libraries diagram OER"*

- *Plate 5.11 Challenges in search and retrieval*

- *Image showing challenges (information overload, digital divide, complexity)*

- *AI prompt suggestion: "Generate an image showing challenges of search and retrieval such as information overload and digital divide."*

- *Suggested OER search: "challenges information retrieval libraries OER"*

- *Box 5.12 Future directions in information retrieval*

- *Text-based infographic listing future directions (AI-driven search, semantic web, personalised retrieval, integration)*

- *AI prompt suggestion: "Generate a text-based infographic listing future directions in information retrieval such as AI-driven search and semantic web."*

- *Suggested OER search: "future directions information retrieval libraries OER"*

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