

**CDOE PCP Session - Day 3 Digital  
Technologies & Tools - Units III & IV**

# **DAY 3: DIGITAL TECHNOLOGIES & TOOLS**

**Units III & IV • CDOE PCP Session 2s •**

**ReCON & UNICODE •  
DIGITAL LIBRARIES**

**PRESERVATION •  
LIBRARY 2.0**

-  • **ReCON and Unicode**
-  • **Digital libraries and preservation**
-  • **Library 2.0 and Semantic Web**
-  • **Scholarly online services**
-  • **Barcodes and QR Codes**
-  • **Screen readers and accessibility**

**Learning Focus - Slide 1 - Massive Font 48px - CDOE DAY 3**

## Learning Focus

# Learning Focus

-  **ReCON and Unicode**
-  **Digital libraries and preservation**
-  **Library 2.0 and Semantic Web**
-  **Scholarly online services**
-  **Barcodes and QR Codes**
-  **Screen readers and accessibility**

## ReCON Concept

# ReCON Concept



**ReCON = Retrospective Conversion**



**Converts legacy catalogue records into machine-readable records**



**Sources: Catalogue cards, accession registers, printed catalogues, local databases**



**Output: Searchable bibliographic and holdings data in ILMS or discovery interface**



**Key Highlight Box: ReCON converts the RECORD, not necessarily the physical document**

## ReCON Workflow

# ReCON Workflow

- 1** **Select and inventory legacy records**
- 2** **Capture: Scan, key in, or import data**
- 3** **Map: Place names, titles, subjects into defined metadata fields**
- 4** **Standardise: Apply cataloguing rules, authority control, MARC 21 format**
- 5** **Validate: Remove duplicates, verify links, load into ILMS**

## ReCON Library Value

# ReCON Library Value



- Makes older collections searchable through OPAC



- Supports circulation and inventory operations



- Improves record sharing and union catalogue participation



- Enables authority control and duplicate detection



- Reveals rare underused or local collections to remote users

**Requirement:** Careful quality control at every step

## Unicode Concept

# Unicode Concept



Unicode = Universal character-encoding standard



Assigns every character unique code point



Example: **À = U+0041**, Devanagari अ = **U+0905**



Supports multilingual information exchange across systems



Current version Unicode 18.0.0 released 16 Sept 2026

## Unicode How It Works

# Unicode How It Works

| Term                                                                                                     | Meaning                                         |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------------|
|  <b>Character</b>       | Meaningful textual symbol - what you see        |
|  <b>Code point</b>      | Unique numerical identity e.g. U+0041           |
|  <b>Encoding forms</b> | UTF-8 • UTF-16 • UTF-32 - how stored            |
|  <b>Font</b>          | Determines visible glyph display                |
|  <b>Key principle</b> | Same code point same meaning across all systems |

## Unicode in Libraries

# Unicode in Libraries



- Records titles names subjects in original scripts



- Supports Gurmukhi Devanagari Bengali Tamil Telugu and other Indian scripts



- Enables multilingual catalogues interfaces repositories



- Improves exchange of records



- Also requires Fonts input methods script-aware searching correct configuration



- Limitation Does not automatically translate or transliterate text

## Digital Library Concept

# Digital Library Concept



- **Digital library = Organised collection of digital objects**



- **Includes metadata, technology, policies, services**



- **Content may be born-digital or digitised**



- **Supports discovery, access, rights management, preservation**



- **More than website with downloadable files - must be systematically managed**

## Digital Library Components

# Digital Library Components

### Component



**Digital objects**



**Metadata**



**Repository/storage**



**Discovery interface**



**Access control**



**Rights & preservation**

### Function

The content text images audio video datasets

Descriptive structural administrative information

Managed secure scalable storage system

Search and browse capabilities

User authentication authorisation

Copyright compliance long-term integrity

## Digital Library Benefits

# Digital Library Benefits



**1. Remote access to information 24/7 any location**



**2. Faster searching and discovery full-text fielded faceted**



**3. Reduced handling of fragile originals  
digital surrogates protect materials**



**4. Wider visibility of institutional research and heritage**



**5. Support for teaching research reuse collaboration**



**6. Access depends on Copyright licensing connectivity  
institutional policies**

**Digital  
Preservation**

# Digital Preservation



**Maintain authentic and usable digital objects over time**



**Use checksums to detect file changes or corruption**



**Keep redundant and secure copies in multiple locations**



**Monitor obsolete file formats and plan migration**



**Migrate files when necessary to current formats**



**Maintain preservation metadata and audit trails for accountability**

## Digital Library Examples - Indian & International

# Digital Library Examples

## INDIAN



**NDLI – National Digital Library of India**  
Learning and discovery service



**Shodhganga – Indian electronic theses**  
and dissertations



**ShodhGangotri – Research-in-progress**  
synopses



**IndCat – Union catalogue services**



**Institutional repositories – Preserve**  
local scholarship.

## INTERNATIONAL



**Project Gutenberg – Public-domain e-books**



**Internet Archive – Books • websites •**  
audio • video • software



**Europeana – European cultural-heritage**  
discovery



**HathiTrust – Digitised scholarly collections**



**DPLA – Digital Public Library of America.**

## Library 2.0 Concept

# Library 2.0 Concept



**Participatory approach to library services**  
**Encourages two-way communication**  
**not one-way announcements**



**Users contribute reviews tags feedback**



**Services respond continuously to user needs**  
**Combines people participation technology**

## Library 2.0 Applications

# Library 2.0 Applications



**Blogs and social platforms for library communication**



**User reviews and ratings for resources**



**Tags and folksonomies user-generated keywords**



**Alerts and personalised recommendations**



**Virtual reference chat email video**



**Crowdsourced transcription or metadata correction**

## Library 2.0 Responsibilities

# Library 2.0 Responsibilities



- Moderate user-generated content



- Protect privacy and confidentiality



- Verify contributed information for accuracy



- Provide accessible participation channels for all users



- Maintain services over time sustainability



- Do not replace professional metadata with uncontrolled tags

## Web 3.0 and Semantic Web

# Web 3.0 and Semantic Web



**WEB 3.0 HAS NO SINGLE ACCEPTED MEANING**



**IN LIS COMMONLY REFERS TO SEMANTIC WEB OR WEB OF LINKED DATA**



**IN TECH COMMUNITIES MAY REFER TO DECENTRALISED APPLICATIONS BLOCKCHAIN**



**CORE IDEA DATA EXPRESSED IN MACHINE-PROCESSABLE RELATIONSHIPS**



**LINKED DATA CONNECTS RESOURCES THROUGH PERSISTENT IDENTIFIERS**



**KNOWLEDGE GRAPHS REPRESENT CONNECTED ENTITIES AND RELATIONSHIPS**

## Linked Data in Libraries

# Linked Data in Libraries

-  Connects Works, authors, subjects, institutions
-  Uses Identifiers, URIs and defined relationships - RDF triples
-  Supports Richer discovery and contextual navigation
-  Makes library data reusable on the web
-  BIBFRAME Supports web-oriented bibliographic description, MARC transition
-  Key point: Linked Data complements rather than instantly replaces existing systems

**End of  
First Part**



**BREAK**

**End of First Part**

**Next: Scholarly Online Services • Barcodes • QR Codes • Screen Readers**

**DAY 3 • DIGITAL TECHNOLOGIES**

## Scholarly Online Services

# Scholarly Online Services

| Service                                                                                                    | Purpose                          | Type                                 |
|------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------|
|  <b>ORCID</b>             | Persistent researcher identity   | Identifier system not social network |
|  <b>ResearchGate</b>      | Academic networking and sharing  | Commercial ASN                       |
|  Institutional repository | Deposits and preserves research  | Managed preservation service         |
|  Scopus or PubMed        | Subject or citation discovery    | Bibliographic database               |
|  Google Scholar Profile | Publication and citation profile | Citation profile                     |

**Key point: These services have different purposes and are not interchangeable.**

## Responsible Scholarly Profiles

# Responsible Scholarly Profiles



- Maintain accurate names and affiliations



- Link outputs to an ORCID iD persistent identifier



- Correct duplicate or wrongly assigned records



- Upload only permitted versions check publisher policies



- Prefer trusted repositories for long-term access



- Do not treat platform counts downloads views as direct measures of research quality

## Academic Social Networks

# Academic Social Networks Uses and Cautions

## Uses



**Dissemination - Share links or permitted versions**



**Networking - Identify peers collaborators**



**Discovery - Follow authors topics**



**Metrics - Track attention**



**Rights and privacy - Verify consent platform terms**

## Cautions



**Verify publisher policies & licences**



**Platform metrics not equal curated citation indicators**



**Check coverage limitations**



**Platform counts not interchangeable with citations**



**Before uploading content**

**Library Support for Researcher Identity**

# **Library Support for Researcher Identity**



**Help create and maintain accurate  
ORCID and platform profiles**



**Advise on repository deposit accepted  
manuscripts licences embargoes**



**Explain differences  
Citations vs usage vs attention indicators  
vs platform metrics**



**Support metadata quality author  
disambiguation affiliation consistency**



**Teach privacy copyright predatory-platform  
awareness responsible metrics**

## Barcodes in Libraries

# Barcodes in Libraries



- Machine-readable linear symbols bars and spaces



- Usually encode item or borrower identifier not full record



- Scanner reads identifier ILMS retrieves associated record



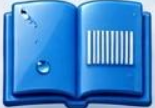
- Used for Issue return renewal inventory



- Key limitation Barcode itself does not perform theft detection  
separate security systems needed

## Barcode Circulation Workflow

# Barcode Circulation Workflow

- 1**  **Scan borrower card**
- 2**  **Scan item barcode**
- 3**  **↓ ILMS checks borrower and item status**
- 4**  **↓ Loan transaction is recorded**
- 5**  **↓ Due date and item status are updated**
- 6**  **↓ Accurate database linkage remains essential**

## Barcodes Collection Management

# Barcodes Collection Management



**Inventory:** Compare scanned identifiers with holdings database



**Shelf checking:** Identify missing, misshelved or unexpected items



**Weeding:** Combine item data with policy, condition, use – evidence before withdrawal



**Statistics:** Aggregate transactions carefully – protect borrower confidentiality



**Note:** Ordinary barcodes do not provide theft detection – separate security technologies needed

## Barcodes Benefits and Constraints



# Barcodes Benefits and Constraints

### Benefits

- **Faster less error-prone than typing**
- **Relatively inexpensive widely supported**
- **Simple reliable technology**

### Constraints

- **Requires line-of-sight**
- **Normally scanned one item at a time**
- **Damaged poorly printed duplicated labels**  
Reliable service depends on accurate database links, equipment, staff, procedures

## QR Codes Concept

# QR Codes Concept



**QR = Quick Response Code**  
**two-dimensional matrix symbology**



**Capacity Depends on version encoding mode**  
**error-correction level**



**Theoretical maximum Version 40-L**  
**4296 alphanumeric characters or 2953 bytes**



**Practical library use**  
**Short stable URL for simpler more**  
**reliable scanning**



**Trade-off Error correction recovers**  
**damaged codewords but reduces data capacity**

# QR Codes in Libraries



**Two-dimensional matrix codes**



**Commonly contain URL or short data string**



**Connect physical locations with digital information**



**Used for Catalogue records guides exhibits forms**



**Readable URL should also be provided as alternative**



**Destination must be secure stable accessible**

## QR Codes Access Applications

# QR Codes Access Applications



**1. Link from shelves posters handouts to catalogue/discovery records**



**2. Connect print materials to authorised e-books finding aids digital exhibits**



**3. Provide mobile access to opening hours maps guides service forms**



**4. Share Wi-Fi credentials only where institutional security policy permits**



**5. Best practice**

**Use persitent HTTPS links • provide readable URL as alternative**

## QR Codes Information Applications

# QR Codes Information Applications



**Exhibits:** Link to captions, audio description, transcripts & related collections



**Events:** Codes open current details or registration pages



**Tutorials:** Connect equipment or service points to concise guidance



**Feedback:** Lead to accessible forms with clear privacy notice

## QR Codes Benefits and Risks

# QR Codes Benefits and Risks



## BENEFITS



- Connect physical locations / objects with current digital information



- Reduce manual URL entry especially mobile



## RISKS



- Static codes inexpensive, hosted/dynamic services may charge fees



- Scan analytics only through destination / managed redirect + privacy implications



- Check destination ownership, link persistence, contrast, quiet zone, print size, tampering

## Barcode versus QR Code

# Barcode versus QR Code

| Aspect                                                                                                   | Barcode                    | QR Code                                     |
|----------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------------|
|  <b>Primary Purpose</b> | Identifies an item or user | Provides access to digital information      |
|  <b>Scanner Needed</b>  | Dedicated scanner          | Mobile device camera                        |
|  <b>Supports</b>       | Internal operations        | Discovery, guidance, outreach               |
|  <b>Data Capacity</b> | Short identifier           | URL, text, hundreds to thousands characters |

## Screen Readers Concept

# Screen Readers Concept



### Screen reader

Assistive software presenting interface and document information as speech or braille



Interprets text controls states structure exposed through accessibility APIs



### Users

Blind, low vision, print-access needs, many reasons



### Key limitation

Cannot repair inaccessible content lacking structure labels or text alternatives



### Navigation

Keyboard and gesture commands support reading navigation interaction

## Screen Readers and Accessibility

# Screen Readers and Accessibility

-  Convert digital content into speech or braille
-  Examples: JAWS, NVDA, VoiceOver, TalkBack, Orca
-  Depend on Headings, labels, reading order, alternative text
-  Accessible webpages expose a meaningful accessibility tree
-  Image-only content creates barriers
-  Accessible design benefits all users

## Screen Readers How They Work

# Screen Readers How They Work



- Read the accessibility tree exposed by operating system browser or application



- Announce roles names values states of controls document structure



- Navigation by Heading landmark link form field table other elements



- Output Speech synthesis or refreshable braille display

- OCR may help with image-only text accessible source content is better

## Accessible Library Services

# Accessible Library Services



**Label search boxes buttons form controls**



**Enable complete keyboard operation**



**Use meaningful headings and link text**



**Provide alternative text for informative images**



**Tag PDFs and define correct reading order**



**Test services with screen readers and actual users**



**Use WCAG 2.2 as principal web-accessibility benchmark**

# Accessible Library Content and Systems

## System

## Accessibility Requirements



**OPAC / Discovery**



Labelled controls, keyboard access,  
logical focus order



**E-books**



Accessible formats, navigation, reading order,  
alternatives for non-text



**PDFs**



Tagged structure, correct reading order,  
language labels, text alternatives



**Web services**



Evaluate against WCAG, test with users  
and assistive technologies



**Procurement**



Contracts include measurable accessibility  
requirements, remediation plans

## Screen Reader Examples

# Screen Reader Examples

### Software



**JAWS**



**NVDA**



**VoiceOver**



**TalkBack**



**Orca**

### Platform

Windows

Windows

Apple macOS iOS

Android

Linux

### Cost

Commercial licence varies

Free open-source

Built-in

Built-in

Free open-source

## Accessibility Standards and Law

# Accessibility Standards and Law



### Standard/Law

**WCAG 2.2**

**WCAG 3.0**

**RPWD Act 2016**

**Section 508**

**ADA**

### Jurisdiction

W3C Recommendation current

Working Draft 2026 not yet  
Recommendation

India

USA federal

USA

### Scope

Web content accessibility

Future standard

Disability rights and duties

Information and communication technology

Americans with Disabilities Act

**Key point: Applicable obligations depend on jurisdiction**  
– accessibility requires policy, testing, user involvement.

## Final Integration

# Final Integration: Technology Serving the Library

### Technology



**ReCON**



**Unicode**



**Digital libraries**



**Library 2.0**



**Linked Data**



**Scholarly services**



**Barcodes**



**QR Codes**



**Accessibility**

### Library Function

**Converts legacy records**

**Supports multilingual text**

**Organise and preserve digital resources**

**Encourages participation**

**Connects entities and relationships**

**Support identity discovery dissemination**

**Support operations**

**Connect physical and digital services**

**Ensures inclusive use**

## **Technology Application - Quick Assessment**

Select one technology discussed today:

# **Quick Application Question**

- 1** Identify the library problem it addresses
- 2** State one expected benefit
- 3** State one implementation requirement
- 4** State one accessibility privacy or security risk
- 5** Explain how success would be evaluated

**Course Recap  
All Units**

# Course Recap All Units

## Unit

## Key Concepts



### Unit I

**IT Fundamentals • Hardware • Software • OS • Networks**



### Unit II

**Web • HTML • WWW • Search Engines • Protocols  
HTTP • TCP/IP • DNS**



### Unit III

**Automation • ILMS • ReCON • UNICODE**



### Unit IV

**Digital • Digital Libraries • Preservation • Library 2.0  
Web 3.0 • ASN • Barcodes • QR • Screen Readers**

## Core Definitions

# Core Definitions

| Term                                                                                                          | Definition                                                                   |
|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
|  <b>ReCON</b>                | <b>Converting legacy manual records to machine-readable format</b>           |
|  <b>Unicode</b>              | <b>Universal character encoding for all languages</b>                        |
|  <b>Digital Library</b>      | <b>Organised collection of digital objects with metadata and services</b>    |
|  <b>Digital Preservation</b> | <b>Maintaining authentic usable digital objects over time</b>                |
|  <b>Library 2.0</b>         | <b>Participatory library services with user contribution</b>                 |
|  <b>Linked Data</b>        | <b>Connecting resources through persistent identifiers and relationships</b> |
|  <b>ORCID</b>              | <b>Persistent researcher identifier not a social network</b>                 |
|  <b>Screen Reader</b>      | <b>Software converting digital text to speech or braille</b>                 |

## Key Comparisons

# Key Comparisons

### Comparison



**Barcode vs QR Code**



**ORCID vs ResearchGate**



**Repository vs ASN**



**Platform metrics vs Citations**



**Web 2.0 vs Web 3.0**

### Key Difference

**1D short identifier vs 2D greater capacity URL storage**

**Persistent identifier vs commercial social network**

**Managed preservation vs networking platform**

**Attention indicators vs curated scholarly impact**

**User participation vs machine-processable data**

## Applying Concepts in Libraries

# Applying Concepts in Libraries



**For each technology:**

Connect definition → function → workflow → benefit → risk → library example



**Examples:** Koha ILMS • DSpace repositories • Shodhganga theses •  
NDLI discovery



**Evaluate together:**

Accessibility • privacy • security • copyright • interoperability • preservation



**Avoid technology-first decisions:**

Begin with user needs → evidence → resources → service outcomes



**Recheck dynamic facts:**

Versions • prices • platform features • legal requirements change

## Future Directions

# Future Directions

| Trend                                                                                                                    | Library Application            | Consideration                                         |
|--------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------|
|  <b>AI Discovery</b>                    | Description support            | Source grounding, evaluation & oversight              |
|  <b>IoT / Sensors</b>                   | Buildings & collections        | Security, privacy & obligations                       |
|  <b>Linked Data / Knowledge Graphs</b> | Entity connections, data reuse | Standards & quality                                   |
|  <b>Immersive Media</b>               | Learning, exhibitions          | Accessible alternatives required                      |
|  <b>Analytics</b>                     | Service improvement            | Proportionate data, transparent purposes & safeguards |

# **Discussion: Responsible Technology Adoption**

- 1 Which user or service problem is the technology intended to solve?**
- 2 What evidence would show the service improves access efficiency or learning?**
- 3 What accessibility privacy security copyright preservation risks must be controlled?**
- 4 Who will maintain the service data documentation staff capability over time?**
- 5 When should the library pilot scale redesign or discontinue the service?**