



INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) APPLICATIONS IN INFORMATION ORGANISATION AND ACCESS IN NIGERIAN LIBRARIES: A NETWORK THEORY PERSPECTIVE

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Abstract

Information and Communication Technology (ICT) has transformed the organisation and access to information in modern knowledge environments. This article examines the role of ICT in Information Organisation and Access in Nigeria through the lens of Network Theory. Using a conceptual and descriptive approach, the study draws on existing literature and theoretical frameworks rather than empirical data. It explores how ICT-enabled networks, including digital libraries, metadata systems, cloud platforms, and interoperable infrastructures, enhance information discoverability, accessibility, and knowledge sharing. The study finds that information systems derive greater value as user participation, technological integration, and data connectivity increase. It further highlights the importance of networked LIS/ICT infrastructures, inclusive metadata practices, and effective policy frameworks in ensuring equitable access to information in digital environments.

Keywords: Information and Communication Technology; Information Organisation; Information Access; Network Theory; Digital Libraries; Knowledge Networks

Introduction

The rapid growth of digital information has transformed the way information is created, organised, stored, and accessed. Information and Communication Technology (ICT) plays a major role in managing this complexity by providing tools and systems that support efficient information organisation and broad access to knowledge resources. ICT includes computers, telecommunications networks, software applications, databases, cloud platforms, and digital repositories that facilitate the processing and dissemination of information (Romero-Ochoa et al., 2025; Liu et al., 2025; Hakami, Alginahi & Sabri, 2025).

In libraries, archives, healthcare institutions, business and commerce, government agencies, the communication industry and the

entertainment industry in Nigeria, ICT has shifted information organisation from traditional paper-based systems to dynamic networked environments (Seema and Jandsalar, 2022). In academic libraries, digital catalogues and Integrated Library Systems (ILS) are gradually replacing manual cataloguing methods, improving efficiency, accuracy, and remote access to resources (Ejiroghene, 2020). Metadata standards such as MARC, Dublin Core, and RDA support consistent bibliographic description, while linked data technologies such as RDF (Resource Description Framework), OWL (Web Ontology Language), SPARQL, URIs (Uniform Resource Identifiers), BIBFRAME, Schema.org, and Wikidata enable



interoperability and resource sharing across institutions (Urdu et al., 2024).

Consequently, the use of linked data and semantic web technologies has improved the discovery and accessibility of information by connecting records across global digital networks. Organisations such as OCLC, IFLA, and NISO have encouraged the use of web-based metadata standards that make information systems more interoperable and machine-readable. As a result, access to information is no longer restricted to physical libraries, as users can now access information resources through interconnected digital platforms worldwide (Ejiroghene 2020). To understand this transformation, Network Theory provides a useful analytical framework by conceptualising information systems as networks of interconnected nodes and edges. Nodes include users, documents, systems, metadata, digital libraries, AI technologies, and institutions, while edges represent the relationships and interactions among them. Through ICT, these networks become more valuable as participation, connectivity, and information exchange increase (Lewis, 2024).

Methodology

This study adopts a conceptual and descriptive analysis approach that relies on existing literature and theoretical frameworks rather than generating new empirical data. Network Theory is used to explain relationships among users, systems, documents, and concepts within ICT-enabled information environments. It also analyses how ICT tools, metadata standards, digital libraries, and interoperable systems enhance information organisation and access. Conceptual models and descriptive explanations are employed to interpret network effects, interoperability, and user participation. This methodology is appropriate because it provides a clear understanding of how connectivity and standardisation improve

discoverability, retrieval, and equitable access to information.

Conceptual Review

ICT in Information Management

Information and Communication Technology (ICT) refers to technologies such as computers, software, networks, and digital databases used to acquire, process, store, and disseminate information (Dwivedi & Pachauri, 2025). ICT supports digital storage, retrieval, metadata management, and networked communication, making it essential for information management in modern digital environments (Dwivedi & Pachauri, 2023). Digital technologies allow information to be converted into electronic formats that can be accessed, duplicated, and distributed efficiently through cloud systems, servers, and storage devices. Metadata also plays a critical role by providing descriptive details such as titles, authors, subjects, and identifiers, making digital resources discoverable and interoperable. Effective metadata management supports long-term preservation and retrieval of information resources (Yang, Fu, Amin et al., 2025).

Information Organisation and Information Access

Information organisation and information access are strongly linked because users' ability to find and use information effectively depends on how well information resources are structured, described, and managed. Information organisation includes processes such as classification, cataloguing, indexing, and metadata creation, all of which arrange information resources logically and systematically. Through classification schemes, materials with similar characteristics are grouped, while metadata supplies descriptive information that enhances retrieval and navigation. As a core component of library and information science, effective organisation



enables users to identify, locate, retrieve, and utilise relevant information more efficiently. Properly organised information systems also enhance accessibility, support informed decision-making, and help minimise information overload (Lemounes, 2024). Furthermore, in digital information environments, knowledge organisation systems facilitate information discovery, interoperability, and data reuse across repositories and various research domains (Liu, Huvila, Kaiser et al., 2023; Bawden & Robinson, 2022). On the other hand, information access refers to the ability of users to search for, obtain, and utilise relevant information resources efficiently. Without proper organisation, access becomes difficult, time-consuming, and sometimes impossible. ICT supports access through search engines, online databases, digital repositories, and library portals that enable structured searching and browsing (Jenkins, 2011). However, access depends not only on technology but also on factors such as digital literacy, internet availability, and user permissions. Digital divides and limited infrastructure continue to restrict equitable access in many developing contexts (Aliyu, Musa, Rabi, Kawure, Ringim & Ahmed, 2025).

Literature Review

Recent studies identify ICT as a major enabler of efficient information organisation and equitable access. ICT supports advanced classification systems, metadata creation, indexing, and retrieval, thereby improving discoverability across heterogeneous information systems (Kohn et al., 2024). Integrated Library Systems (ILS), digital repositories, and cloud-based platforms allow libraries to automate cataloguing, circulation, and collection management while improving operational efficiency (Igwechi, 2023; Okoroma, 2023; Owate, 2024).

Metadata standards promote consistency, interoperability, and seamless exchange of information across digital platforms. In addition, linked data technologies enhance the visibility and accessibility of information resources by connecting local records to broader global knowledge graphs, thereby improving discoverability and integration across systems (Hayat, Warraich, Akhtar, Batool & Hashmi, 2025). ICT further minimises barriers to information access by enabling remote access to digital collections, repositories, and online databases, allowing users to retrieve information regardless of geographical location (Aliyu et al., 2025).

Furthermore, Artificial Intelligence (AI) has significantly advanced information organisation and retrieval processes. AI applications such as machine learning and natural language processing automate metadata generation, enhance indexing precision, and improve search and retrieval efficiency (Oyighan, Ukubeyinje, David-West & Oladokun, 2024). AI-driven technologies also facilitate personalised information retrieval and adaptive recommendation services tailored to users' information needs and behaviours (Islam, Ahmad, Aqil et al., 2025). Collectively, ICT and AI have transformed traditional static repositories into dynamic and interconnected information networks. This development reflects the principles of Network Theory, which emphasises how interconnected digital systems, users, and information nodes interact to support efficient communication, resource sharing, knowledge dissemination, and collaborative access within contemporary information environments.

Theoretical Framework: Network Theory

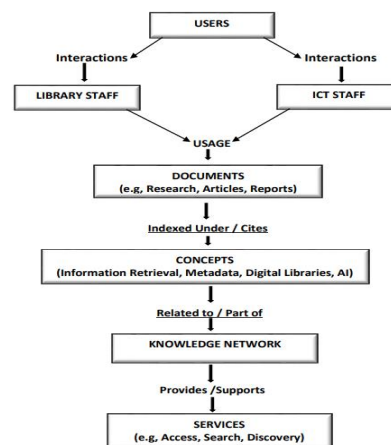
Network Theory examines how entities are interconnected and how these relationships shape behaviour within complex systems. The theory originated from Leonhard Euler's graph



theory and was later developed through sociological studies of social networks (Euler, 1736; Moreno, 1934; Granovetter, 1973). The theory is built around two major concepts: nodes and edges. Nodes represent entities within a network, while edges represent the relationships or interactions between those entities. In Library and Information Science (LIS) and ICT systems, nodes include users, databases, documents, metadata, digital libraries, AI systems, and institutions (Barabási & Albert, 1999). Edges represent information flows such as user-system interactions, citations, semantic relationships, and communication pathways (Easley & Kleinberg, 2010).

While nodes serve as critical connection points for storing, transmitting, and retrieving information, edges determine how efficiently information moves across the network and how relationships among resources are established. Strong and well-connected networks improve discoverability, retrieval efficiency, and knowledge sharing (Watts & Strogatz, 1998; Borgatti & Halgin, 2011). Network Theory, therefore, provides a useful framework for understanding how ICT supports information organisation and access through interconnected digital systems.

Flow chart 1: Relationship network of nodes and edges for information organisation and access



Users → Library Staff: Interactions (Searching, Accessing)

Users → System: Interactions (Searching, Accessing)

Users → Document: Usage (Reading, Downloading, Referencing)

Document → Document: Citations, References

Document/Concept → Concept: Semantic or Subject-Based Links

Flow Chat 1: Redesigned and extended Conceptual Framework for Information and Communication Technology (ICT), Information Organisation and Access (interplay of nodes and edges)

Note. The model is informed by prior work on digital libraries, information retrieval, and knowledge organisation (Bi, 2025; Ioannidis, 2005; Gourley, D 2001):

Discussion

Information Organisation and Access Networks in LIS

Networked information systems in LIS demonstrate how information is structured, connected, and delivered through ICT infrastructures. Users, systems, documents,



and concepts function as nodes within the network, while interactions such as searching, referencing, and semantic linking form the edges (Bi, 2025; Liu, 2025). Modern digital libraries integrate databases, metadata standards, and interoperable systems to improve retrieval and resource discovery (Dragon, Mayo, Stocks & Tatterson, 2025). Semantic networks and ontologies enhance subject representation and retrieval intelligence, allowing users to navigate complex knowledge structures more effectively (Bascur, Verberne, van Eck et al., 2023).

ICT and Networked Library Catalogues

ICT has transformed library cataloguing from isolated MARC records into interconnected metadata networks. Linked data technologies connect bibliographic records across systems and the wider web, enabling users to discover related resources beyond a single catalogue. Organisations such as OCLC enrich bibliographic records with linked data identifiers, creating bridges between traditional cataloguing systems and global knowledge networks. This integration enhances interoperability, semantic relationships, and contextual understanding of resources (Akullo & Nsibirwa, 2024; Monyela, 2023). From a Network Theory perspective, the adoption of shared metadata standards increases connectivity between information nodes, improving retrieval efficiency and the overall value of the information network.

LIS/ICT Network effect: As more institutions adopt shared metadata standards, the collective information network becomes richer and more navigable.

Knowledge Organisation Systems and Interoperability

ICT supports interoperable Knowledge Organisation Systems (KOS) such as ontologies, thesauri, and classification schemes. These systems provide consistent structures for organising and exchanging information across platforms. Interoperability improves semantic mapping, resource discovery, and data reuse across distributed systems. Through shared standards and semantic web technologies, ICT enables cohesive and interconnected knowledge environments (Rathi et al., 2024; Busch & Zeng, 2025).

LIS/ICT Network effect: Greater interoperability increases information visibility and reuse across systems.

ICT and Networked Information Access

Digital libraries and open-access platforms demonstrate how ICT enables decentralised and global access to information. Cloud computing allows users to access digital collections remotely, while open-access initiatives reduce financial and technical barriers to scholarly communication (Israel, 2025; Sivanandham, John, & Sivankalai, 2025). User participation also strengthens information systems. Activities such as tagging, commenting, and content creation enrich metadata and improve retrieval algorithms. Increased user interaction enhances system intelligence, accessibility, and collaborative knowledge production (Walsh et al., 2025; Yang, Fu, Amin et al., 2025).

LIS/ICT Network effect: Increased user access leads to higher citation, reuse, and collaborative knowledge production, and more user interaction improves system intelligence and accessibility.



Challenges in Networked Information Organisation and Access

Despite its benefits, ICT-driven information systems face several challenges. Many academic libraries experience difficulties adopting linked data technologies due to inadequate infrastructure, insufficient funding, and limited technical expertise (Okoroma, 2023). Digital divides continue to restrict access for users with poor internet connectivity or low digital literacy. In addition, algorithmic bias, proprietary systems, and concerns about data privacy can undermine equitable access to information (Walsh et al., 2025). These challenges highlight the need for institutional support, inclusive metadata practices, ethical governance, and sustainable preservation strategies.

Implications for Libraries and Information Institutions

Libraries and information institutions should prioritise connectivity, collaboration, and inclusivity in their adoption of ICT. Strategic investment in interoperable systems, digital infrastructure, and staff training is necessary to maximise the benefits of networked information environments. Policies that support open standards, shared platforms, and active user participation can strengthen information ecosystems and improve equitable access to knowledge resources.

Conclusion

ICT has transformed information organisation and access by enabling scalable, collaborative, and highly interconnected information networks. Through digital libraries, interoperable metadata systems, cloud platforms, and AI-driven technologies, ICT enhances discoverability, retrieval, and knowledge sharing. From a Network Theory perspective, the value of information systems increases as participation and connectivity expand. ICT not only facilitates access to

information but also shapes how knowledge is created, connected, and utilised within digital environments. To sustain these benefits, libraries and information institutions must continue investing in interoperable infrastructures, inclusive practices, and policies that support equitable access to information.

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