LINKED DATA AND SEMANTIC TECHNOLOGIES: RE-IMAGINING LIBRARY COLLECTIONS, SERVICES AND DISCOVERY

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Crossref DOI - https://doi.org/10.5281/zenodo.23363976

Abstract :

Libraries have traditionally organised information through cataloguing standards, classification schemes, subject headings, and bibliographic databases. These systems have provided a strong foundation for managing library collections, but the growth of digital resources has created new challenges. Information is now distributed across library catalogues, institutional repositories, digital libraries, research databases, electronic journals, and open-access platforms. When these resources remain in separate systems, users may find it difficult to discover the relationships between them.

Linked Data and Semantic Technologies offer an opportunity to move library collections and services beyond these information silos. Instead of treating bibliographic records as isolated descriptions, Linked Data makes it possible to represent resources, people, subjects, organisations, and other entities as connected data. The Resource Description Framework (RDF) provides a model for representing resources and the relationships between them and for linking them across different datasets.

This paper examines the role of Linked Data and Semantic Technologies in re-imagining library collections, services, and discovery. It discusses the relevance of RDF, URIs, ontologies, controlled vocabularies, authority data, knowledge graphs, BIBFRAME, and the IFLA Library Reference Model (LRM). BIBFRAME is specifically designed as a Linked Data-based approach to bibliographic description and provides a possible transition from MARC-based bibliographic environments. The paper also examines the benefits and challenges of implementing these technologies in libraries and discusses a practical approach for moving from isolated metadata records towards interconnected knowledge. It concludes that Linked Data can help libraries make their collections more visible, interoperable, and meaningful within the wider information environment.

Keywords : Linked Data; Semantic Technologies; BIBFRAME; Library Discovery

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Introduction :

The primary purpose of a library has always been to connect users with information. Traditionally, this task has been performed through catalogues, classification systems, subject

headings, and bibliographic records. These tools continue to be important for maintaining consistency and control over library collections. They provide a structured framework through which users can identify and locate information resources.

However, the information environment has changed significantly. Academic libraries now manage a mixture of print and electronic books, journals, databases, institutional repositories, digital collections, research outputs, and open-access resources. These resources are often created and managed using different standards and systems. As a result, information is distributed across multiple platforms rather than being available through a single environment.

This situation creates a fragmented information environment. A library catalogue may describe a book, an institutional repository may contain the author's research paper, and an external database may provide related journal literature. Although these resources may be closely related, their metadata may remain disconnected. Users may therefore need to search different systems separately to discover information that is actually connected.

Linked Data provides a different way of thinking about this problem. Instead of viewing a bibliographic record as a closed unit, Linked Data allows individual entities and relationships to become part of a larger network of information. A person can be connected with their works, a work can be connected with subjects, and subjects can be connected with related concepts and other resources. This creates opportunities for users to discover information through relationships rather than through isolated records.

The Library of Congress describes BIBFRAME as a foundation for bibliographic description on the Web and in the wider networked environment, using Linked Data techniques. This approach represents an important movement from traditional record-based bibliographic description towards a more connected data environment.

Thus, the movement from **"silos to synthesis"** can be understood as a movement from isolated records towards connected data and meaningful relationships. Linked Data and Semantic Technologies can help libraries make their collections more visible, interconnected, and useful within the wider digital information environment.

Linked Data and Library Collections :

Linked Data provides a way to connect information resources through clearly defined relationships. In the traditional library environment, a bibliographic record usually contains information about a particular resource. In a Linked Data environment, information can be represented through individual entities and the relationships between those entities.

For example, information about a book can be linked to its author, title, publisher, subject, edition, and related works. The author's name can also be connected with other works by the same author. Similarly, a subject can be connected with related topics and concepts. Such relationships can provide users with additional pathways for discovering relevant information.

The use of identifiers such as URIs helps distinguish individual entities and makes it possible to represent them consistently across different systems. RDF provides a framework for representing relationships between resources. Together, these technologies can support the development of interconnected library data and improve interoperability between different information systems.

Semantic Technologies and Knowledge Organisation :

Semantic Technologies provide methods for representing the meaning of information and the relationships between different concepts and entities. In libraries, these technologies can support the transformation of traditional knowledge organisation systems into more connected and machine-readable structures.

Controlled vocabularies, authority files, taxonomies, and ontologies can provide meaningful relationships between people, subjects, organisations, and concepts. Instead of simply assigning a subject term to a resource, semantic approaches can help represent how one concept is related to another. This can improve information discovery and allow users to explore related resources more easily.

Knowledge graphs are another important development in this area. They can represent different entities and their relationships within a connected structure. For libraries, knowledge graphs provide an opportunity to connect bibliographic data with information from institutional repositories, research systems, and other trusted datasets.

BIBFRAME and IFLA LRM :

BIBFRAME represents an important development in the movement towards Linked Data-based bibliographic description. It provides a framework for representing bibliographic information in a networked environment and offers a possible transition from traditional MARC-based records towards interconnected data.

The IFLA Library Reference Model (LRM) provides an important conceptual foundation for understanding bibliographic information through entities and relationships. Rather than focusing only on individual records, the model supports a broader understanding of bibliographic information and the relationships among different entities.

Together, developments such as BIBFRAME and IFLA LRM indicate a gradual movement towards more connected approaches to library metadata. They can support libraries in adapting traditional bibliographic practices to contemporary digital information environments.

Interdisciplinary Collection Development :

Interdisciplinary collection development refers to the planned selection and management of resources from different academic disciplines to support a common research area, theme, or academic programme. It does not replace subject-based collection development; rather, it complements specialised collections by identifying connections

between disciplines.

For example, a collection on Artificial Intelligence in Education may include resources from computer science, education, psychology, statistics, and ethics. Similarly, a collection on Climate Change may include resources from environmental science, geography, agriculture, economics, and public policy. In both cases, users require information from different subject areas to understand the broader research problem.

Thus, the focus shifts from **"subject-wise resources" to "knowledge relationships."** Such an approach can help libraries respond to emerging research areas where information cannot be adequately supported by a single discipline.

Need for Interdisciplinary Collections :

The need for interdisciplinary collections has increased because research problems are becoming more complex, and many new academic programmes combine different disciplines. Faculty members and students are increasingly involved in interdisciplinary projects, while digital resources provide access to information from a wide range of subject areas.

Emerging fields such as Artificial Intelligence, climate change, sustainability, digital humanities, and public health often require knowledge from several disciplines. Traditional subject-based collections can provide strong resources within individual areas, while an interdisciplinary approach can help users identify connections between those areas. Such collections can therefore contribute to effective research and knowledge discovery.

Role of Librarians :

Librarians play an important role in identifying interdisciplinary information needs and supporting the development of integrated collections. Regular interaction with faculty members and researchers helps librarians understand emerging research areas, new courses, and collection gaps.

Librarians can analyse curriculum requirements, study research trends, consult faculty members, and identify relevant resources from different disciplines. Electronic resources and open-access materials can also be evaluated to strengthen interdisciplinary collections. Resource sharing and collaborative acquisition can further improve access to specialised information.

This changes the role of the librarian from a traditional subject-based selector to a **knowledge connector**. Librarians not only select resources but also help users identify relationships between information resources and different areas of knowledge.

Role of Digital and Open-Access Resources :

Electronic resources have made interdisciplinary collection development more flexible. E-books, e-journals, databases, institutional repositories, and open-access resources

provide access to information from multiple disciplines and support research beyond traditional subject boundaries.

Open-access resources are particularly useful when library budgets are limited. They can complement subscribed resources and help libraries respond to emerging research areas without depending entirely on traditional acquisition models. Digital resources also provide opportunities for libraries to connect users with information available beyond their physical collections.

Faculty Collaboration and Resource Sharing :

Faculty collaboration is essential for identifying emerging interdisciplinary requirements. Librarians can work with faculty members to understand new courses, research projects, and areas of academic interest. Such communication helps librarians understand information needs that may not be visible through traditional collection data.

Resource-sharing networks and library consortia can further strengthen interdisciplinary collections. Through cooperation and shared access, institutions can provide users with specialised resources that may not be available within their own collections. This approach can reduce unnecessary duplication and make better use of available library resources.

Conclusion:

Linked Data and Semantic Technologies provide an important opportunity for libraries to rethink the way collections, services, and discovery systems are developed. Traditional catalogues and bibliographic records remain valuable, but the growing complexity of the digital information environment requires stronger connections between resources, people, subjects, and organisations.

The movement “from silos to synthesis” represents a shift from isolated metadata records towards interconnected knowledge. Technologies and approaches such as RDF, URIs, ontologies, knowledge graphs, BIBFRAME, and IFLA LRM can contribute to this transformation by supporting relationships and interoperability.

At the same time, interdisciplinary collection development can help libraries respond to the changing nature of academic research. Faculty collaboration, digital and open-access resources, resource sharing, and systematic collection assessment can strengthen the development of integrated collections.

The future academic library should therefore not be viewed merely as a place where resources are organised separately by subject. It should increasingly be understood as a connected knowledge environment, where collections, metadata, services, and users are linked through meaningful relationships. Such an approach can improve information discovery, increase the visibility of library collections, and help libraries remain relevant in the rapidly changing digital information environment.

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