# Supporting learning, knowledge sharing, and team-based work with Open Access and Open Source technology and tools

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**Abstract:**

*Libraries and information agencies have multiple needs related to knowledge management and many of the activities in a library are underpinned by tools, techniques, and skills that have a basis in knowledge management. Unfortunately, the on-going support costs of commercial software to support knowledge management and sharing initiatives puts systems and tools out of the financial reach of many small and medium sized libraries and information agencies. Open access and open source technology and tools can help address the financial issues associated with these needs in libraries and information agencies. This paper is a review of some open source tools that can be used by libraries and other information organizations for knowledge management initiatives to support learning, knowledge sharing, and team-based work.*

**Keywords:** knowledge management, open source software, knowledge sharing, organizational communications.

## 1 INTRODUCTION

Libraries and information agencies have multiple needs related to knowledge management. For example, supporting learning, knowledge sharing, and team-based work are all activities that are underpinned by tools, techniques, and skills that have a basis in knowledge management. An issue for many libraries are the high costs associated with acquiring the tools and systems that can create effective learning and knowledge sharing environments. Even in the corporate library environment, many companies do not have the funding or

infrastructure in place to support the purchase of commercial software systems that may cost millions of dollars. Even when an organization can find one-time funding for the purchase of a knowledge management system or tool, the on-going support costs of commercial software puts systems and tools out of the financial reach of many small and medium sized libraries and information agencies.

Open access and open source technology and tools can help address the financial issues associated with these needs in libraries and information agencies. While open source tools and systems do not typically have an initial acquisition cost, it is important to understand that there are other costs that need to be considered. Some of these considerations include implementation services, server hosting, as well as possible customizations and modifications of the software to meet the needs of the local environment. With commercial software, these costs are often fixed and solely under the control of the vendor. With open source software, these services can be acquired in a number of different ways. For example, a library may contract with an independent consultant or they may decide to develop the necessary expertise in-house. Regardless of the path chosen, these costs tend to be significantly less than those associated with commercial software.

A unique aspect of many open source tools and systems in the knowledge management arena is that commercial software development companies often produce "community source" and "commercial source" versions of their software. In these cases, the community source version of the software is available completely within the open source model but the development is guided and mainly provided through the software company. Even so, this type of software may be downloaded and installed without cost and free support is provided by and within the user community. The reason these companies do this is because they view the community source versions of their software as a "loss leader." This means that they offer the version based on the assumption that many people who adopt the community version will eventually update to the commercial versions of the software which provides more sophisticated functionality or better support for larger user communities.

This paper is a review of some tools that can be used by libraries and other information organizations for knowledge management initiatives to support learning, knowledge sharing, and team-based work. While there are a number of different ways one could categorize and present them, we will present tools and systems in the following categories:

- Knowledge management (KM) systems
- Business Intelligence (BI) systems
- Document management (DM) tools
- Decision table and rules engines
- Knowledge representation and information discovery tools
- Personal knowledge management tools
- Tools for specialized applications

The selection of tools for this paper has been based on a number of factors. It would be incorrect to assume that these are the only suitable tools for knowledge management efforts in libraries and information agencies. While all of these tools are open source and have been used in a wide variety of environments, both commercial and non-profit, inclusion in this paper does not imply suitability in all environments. Some tools also have commercialized versions that support more complex functionality not provided in their corresponding community source version but those aspects of functionality are not addressed in this paper.

## 2 KNOWLEDGE MANAGEMENT SYSTEMS

In the arena of full-blown knowledge management systems, there two open source projects Cyn.in and OpenKM. Both software packages are designed to provide complete solutions for knowledge management at the organizational level. By working within a unified application, libraries and information organizations can collect and build collaborative knowledge networks using advanced, integrated communication tools, productivity, and social tools.

Cyn.in[1] provides a number of different types of functionality that include collaborative, social, productivity, organization, and management applications. For example, built into the base Cyn.in package are a number of collaborative applications such as wikis, event calendars, blogs, discussion boards, bookmark directories, in addition to audio, video, and still image galleries based on a file repository. The software supports group collaboration through the creating of "spaces." Within these spaces, custom workflows can be created to guide the movement of work products through individuals or groups working on an initiative. Subspaces allow people to dynamically alter the structure based on changing needs of the teams. Within a space, views and dashboards can be created to keep the team up to date on key performance indicators or conditions that affect their work. Additionally, contextual conversations enable of a "corporate memory" that can be accessed, searched for and reused anytime.

OpenKM[2] is similar in many ways to Cyn.in in that is a software package that is focused on overall knowledge management within an organization. However, where it differs from Cyn.in is that it is designed from the perspective of knowledge management primarily being a function of managing various types of documents within an organization.

Perhaps not surprisingly, the user interface of OpenKM is more primitive than that of Cyn.in. Being based on the document model, most user interaction within the system is based on a document sharing and passing model. However, for organizations that are primarily focused on documents, this can be a significant strength of OpenKM over Cyn.in. This is primarily due to the much more sophisticated build out of functionality around document management, such as the integration of Abby OCR scanning into the software, integration with Google Docs, and additional integrations including workflow creation based on the JBPM model (Java Business Process Management) and Jasper compatible reports.

## 3 BUSINESS INTELLIGENCE SYSTEMS

SpagoBI[3] and JasperSoft[4] are both business intelligence systems rather than knowledge management systems. Business intelligence is a subset of techniques and tools within the larger knowledge management arena. Business intelligence (BI) systems typically process large amounts of data, often transactional, in order to uncover relationships that may not be explicitly observable from data alone. BI systems do this by providing services that improve the quality of data, integrate and harmonize data, and analyze content. Often, the results of BI are used to create systems that provide management with an easily observable status report (such as dashboards) or feed into larger analytics projects.

Whereas SpagoBI is purely an open source software project, JasperSoft has both community source and commercial versions. JasperSoft community version is a basic BI tool and does not include many of the interesting features available in the commercial version such as cloud-based hosting.

SpagoBI provides a platform for analysis of large volumes of heterogeneous structured and unstructured data. That is, it focuses on problems related to "big data." It supports real-time analysis of streaming data in order to identify, interpret, give meaning to and manage data selection events. The information can be used to produce various types of documents, such as charts, reports, and thematic maps and dashboards. Additionally, SpagoBI allows any user to develop their business intelligence analysis independently and easily, not only with enterprise data but also with private data, stored on a central server or locally.

## 4  DOCUMENT MANAGEMENT TOOLS

Document management is a critical component of many knowledge management initiatives. In some early stage knowledge management projects, document management may be primary or only focus. Organizations that may already have software in place to address other aspects of knowledge management may choose to implement a stand-alone document management solution.

In either case, OpenDocMan[5], the most widely used open source document management system, is frequently used in these situations. Based on standards (such as the ISO 17025 document management standard), OpenDocMan includes a number of features one would expect to find in a full-fledged document management system such as:
- Allowing for the integration of current business rules into the system
- Support for a wide variety of text file types
- Metadata at the document level
- Automated document review process
- Document check-in and check-out
- Revision history
- Ability to set automatic file expiration
- Extensible document properties to meet unique local needs
- E-mail notification options prior, during, and after steps in a workflow

## 5  KNOWLEDGE REPRESENTATION AND INFORMATION DISCOVERY TOOLS

Knowledge management systems often are built from data or input created in other systems that perform specialized functions. Knowledge representation and information discovery tools represent two different types of tools that can be useful in developing a rich metadata an content environment for KM initiatives.

TemaTres[6] is a completely open source tool for the creation of vocabularies, thesauri, taxonomies, ontologies, or other formal representations of knowledge. Some of the noteworthy features of TeamTres include its ability to create multilingual thesauri; vocabulary harmonization such as equivalent, no equivalent, and partial terms with other vocabularies; establishing relationships between terms (BT/NT, USE/UF, RT), unlimited number of levels of hierarchy; and scope, historical, and bibliographical notes if applicable.

For an organization that is developing or managing a controlled vocabulary, a significant advantage to using a tool such as TemaTres is the ability to export the controlled vocabulary scheme in a standard format that can be processed by other software applications. TemaTres supports a wide variety of metadata schemas including:
- Skos-Core (Simple Knowledge Organization System)
- BS 8723 (Structured Vocabularies for Information Retrieval)

- Dublin Core (ISO 15836-2003)
- MADS (Metadata Authority Description Schema)
- TopicMaps (ISO/IEC 13250:2003)
- IMS VDEX Scheme (Vocabulary Definition and Exchange)

Media Crawler[7] is a Java desktop application that facilitates the management of multimedia objects and related metadata. It does this by crawling a file system, extracting basic metadata from the objects and mapping that metadata into a database. Files can be grouped into collections and the object and collection metadata can be exported in standard XML-based format. The built-in schemas used by the software allow for the extraction and collection of metadata information for document, audio, video and image file.

While there are many different open source project related to search engines, OpenSearchServer[8] is a complete package that provides search, indexing, and crawling services. In addition to suppoting full-text search, OpenSearchServer supports many functions traditionally found in library discovery systems such as phonetic searching, advanced boolean searching with a query language, faceted clustered results, plus modern features such as geolocation, spell-checking, search suggestion/autocomplete, and relevance customization using algebraic functions.

OpenSearchServer supports automatic language recognition in seventeen languages. In addition, it can map schemas between languages, perform lemmatization and strip diacritics to normalized searches, recognize synonyms and expression synonyms, and export indexed terms lists with frequencies for analysis in other software.

## 6  PERSONAL TOOLS

PiggyDB[9] is a tool for knowledge management at the personal level. Using a bottom-up approach, the software uses heuristics to uncover new concepts and ideas. Typically, people begin using the software as a diary or notebook. As the number of notes or items grows, the software begins making connections between items to help create a structured knowledge base. A user can manually intervene and connect knowledge fragments in a network structure. Individual knowledge elements can also be categorized using tags.

Freeplane[10] is another open source tool for personal knowledge management. While sharing many characteristics in common with PiggyDB, Freeplane differs significantly in that it uses a mind mapping model for gathering and organizing information. From the mind map that is created, the software creates knowledge connections between the nodes, allowing for both subtopics (represented as child nodes) and independent topics, represented as free nodes. Topics can be based on textual information, hyperlinks, pictures or other media types. Arrows are used to indicate directed relationships whereas non-directional lines created relationships. Unique to Freeplane, individual topic nodes can be password protected or related to a specific time or content filter.

## 7  SPECIALIZED TOOLS

Knowledge management applications within libraries and information agencies span a number of areas. Two specialized areas that are becoming increasing important are related to information technology management and project management.

Kwok Information Server[11] is a specialized open source solution that provides a centralized mechanism for managing licenses, service contracts, vendor contracts, and physical inventory, such as computers and other equipment found in the library. Knowledge base support is included to enable issues tracking, thereby providing support for helpdesk operations as well as reference services.

Plandora[12] is primarily designed for teams that need to manage projects, whether they be traditional software development or other types of projects. Support for the complete project lifecycle, from gathering requirements to project completion, one of the advantages of using a tool like Plandora is the ability to capture the history of a project to support organizational learning about project "do's and don'ts." The system can help manage a number of common project concerns: resource bottlenecks, competing project commitments, deadline management, as well as the formal documentation of tasks, requirements, and scope.

## 8   SOCIAL MEDIA TOOLS

There are many social media tools that can be used for knowledge management initiatives. These are free and easily available for experimentation. Deep technical skills are not needed in-house in order to begin experiment with KM initiatives building upon these tools.

Commonly used social network applications such as LinkedIn, Google+, and Facebook all have features that allow you to create closed groups that can be used for virtual team collaboration and knowledge sharing, regardless of staff location.  Twitter can also be used as a knowledge sharing tools by creating streams of links and comments via hashtags. However, these posts are public, so they should not be used for internal or proprietary information that is not intended to be shared with the world.

Other types of knowledge initiatives are possible, such as building newsletters with dynamically updated content, using free software such as Paper.Li[13]. The newsletter, *KM Today* by Rebecca Jones[14], is managed using the Paper.Li software. The process of creating the newsletter is greatly eased as paper.li automatically processes more than 250 million social media posts per day. As an author, you select what you think is relevant and publish it to your newsletter.

Yammer and Jive are both microblogging software applications that are used within organizations for knowledge sharing and collaboration. Several libraries have adopted Yammer for internal communications including the Toronto Public Library, the City of Yarra[15]in Victoria, Australia, and the British Library[16].

## 9   SOFTWARE AND REFERENCE URLS

[1] Cyn.in (http://www.cynapse.com/cynin)
[2] OpenKM (http://www.openkm.com/en/)
[3] SpagoBI (http://www.spagoworld.org/xwiki/bin/view/SpagoBI/)
[4] JasperSoft (http://www.jaspersoft.com/)
[5] OpenDocMan (http://www.opendocman.com/)
[6] TemaTres (http://www.vocabularyserver.com/)
[7] MediaCrawler (http://mediacrawl.sourceforge.net)

[8] OpenSearchServer (http://www.open-search-server.com/)

[9] PiggyDB (http://sourceforge.net/projects/piggydb/?source=directory)

[10] Freeplane (http://freeplane.sourceforge.net/)

[11] Kwok Information Server (http://www.kwoksys.com/)

[12] Plandora (http://www.plandora.org/)

[13] Paper.li (http://paper.li/)

[14] KM Today newsletter (http://paper.li/rebeccajonesgal/1308329187)

[15] City of Yarra and Yammer (http://yarraweb2.wordpress.com/activities/thing-6-minutes-and-flipboard/)

[16] British Library and Yammer http://www.inoutfield.com/2009/04/01/the-british-library-is-all-a-twitter-about-yammer/)