


International Journal of Applied Knowledge Management

Volume 1 Issue 2

A light gray world map is centered in the background of the page, showing the outlines of continents and major islands.

Content Management System as an Effective Knowledge Management Enabler

Morvin Savio Martis

Manipal Institute of Technology,
Manipal, India

ISSN 1746-8167

Abstract:

The value of knowledge as a strategic asset is not only recognized by the knowledge-intensive sectors (software), but by the more traditional sectors (manufacturing) of the economy as well. As the organization grows, the volume of content handled grows enormously and a stage is reached when it becomes impossible to handle all the content manually unless the industries exploit the power of information processing technology.

Many organizations including government agencies and educational institutions, have been adopting Content Management Systems (CMSs) to help them organize digital content and create content-based products for their customers and employees. CMS is a powerful software solution that benefits users by making it easier to manage learning content and digital assets in an enterprise learning environment. This paper traces the need and benefit of implementing CMS along with adequate details on the objectives, requirements and outputs generated by the system for the use of management.

Keywords:

Content Management System, Knowledge Management, Digital Asset Management, Metadata, Workflow, E-Learning, Expertise Profiling, and Content Conversion.

Introduction

The term “content management” originated in the mid 1990s, and it has several different meanings in today’s marketplace (Rosenblatt, 2003). CMS is a system which can store and manage content for the purposes of editing and authoring. Publishing is a separate process, which the CMS may or may not support (Garshol, 2004). In the general IT community, however, a CMS is primarily thought of as a system facilitating the publishing of content that also supports the necessary authoring and editing (Bronder, 2002).

A typical content management system (CMS) includes people, processes, and technology. Content can include databases, documents, presentations, or e-mail; virtually any artefact of transactions, inside or outside the organization. Content could also include audio/video files, and animated graphics. Increasingly, content management may also need to address external content (subscriptions to data and analysis, and publications) and content from the extended enterprise (suppliers, customers, consultants, and external sales) since users would want to access internal as well as external content from the same system and with the same queries (Barrett, 2000).

By empowering every individual to be a content creator and maintainer, a large application system can have up-to-date content in every area, since the individual who is closest to that content has the ability to update and modify that content, without incurring additional human costs. In addition, a centralized content management can improve an organization's capability for knowledge sharing and communication. By making content readily available to the right people in the right format (e.g. HTML, PDF, email), content management systems can improve people's efficiency in finding knowledge while simultaneously reducing barriers to communicating relevant information (Richard, 2003).

Objectives of an Efficient Content Management System

APQC (2001) defines following key objectives of CMS:

- Identify the need for a CMS.
- Audit existing content to determine what needs to be managed.
- Understand user requirements.
- Identify sources of internal and external content.
- Develop processes to author, validate, and refresh content.
- Identify users that would benefit from the content.
- Develop applications for the content.
- Analyse costs associated with content management.

The objectives listed above may be taken just as the guidelines and modified accordingly to suit local needs.

Key Features of a Content Management System

The features of the CMS should be made known to all the concerned in the organization. This is because the success of CMS is based on the input from the employees operating at all levels. The following are the key features of a typical CMS:

- CMSs should provide some form of user interface through which authors and editors may access and modify their content (Garshol, 2004).
- CMSs should organize content in a structure within which they can be categorized and found.
- CMSs should support some way of dealing with the problem that users may cause conflict by modifying the same content at the same time.
- CMSs should incorporate basic search features.
- CMSs should have multi-lingual support for managing and translating content (Richard, 2003).
- CMSs should assign different access rights to different groups of users (Carol, 2004).
- CMSs should have some level of support for storing each version of a content object throughout its history together with descriptions of the changes made to each version.
- CMSs should be integrated with a publishing system.
- Redundancy of content should be prevented.
- A single access control system allowing administrators to specify which users can perform what types of actions.

Meeting corporate objectives with scant resources is one of the cardinal objectives of modern management. So the employees need to be trained to do more with fewer resources such as time, machines, material and money. Workers' quicker access to answers is even more critical with the ever-increasing emphasis on speed. But content management technology alone does not help this problem, because its focus is typically on getting more information to people and not necessarily the right information. Content management technology has very little to do with determining the quality or the effectiveness of the information presented. Content is much more than data or information (Davis & Olson, 1987; Laudon & Laudon, 2003); it is knowledge that has been codified so that it can be more easily distributed and reused for a specific business purpose by a targeted audience.

So, from a knowledge management (KM) perspective, the real question for content managers is not “What content do we have?” but “What content do we need?” As an aggregator, the CMS technology should be able to piece together content from disparate systems and applications into meaningful artefacts based on unique requests. The CMS system should be able to manage the content from these systems, assemble it based on the needs of the content recipient, and publish the information in whatever format is required. However, most of the organizations have a wealth of information in a variety of repositories ranging from databases to file servers to individual laptops, which are owned and managed by a variety of functions for a variety of purposes. Just plugging in a technology solution is unrealistic. These needs can only be addressed through a systems approach, meaning an integrated system of people, processes, and technology (APQC, 2001).

Types of CMS

There are different types of CMSs available and the organizations will have to choose the one most appropriate to them. The following are the most widely used CMSs.

- **Digital Asset Management (DAM):** systems that manage rich media assets, often including digital audio and video clips, for retrieval and re-purposing in media production environments (Rosenblatt, 2001). These systems are sometimes also called Media Asset Management (MAM).
- **Web Content Management (WCM):** tools that provide page template design, editorial workflow and publishing environments specifically for Web sites and other forms of Internet content delivery.
- **Enterprise Content Management (ECM):** systems that facilitate management of corporate documents and other types of information for use internally as well as externally with a company's business partners, customers, regulators, and the general public (Rosenblatt, 2003).

Some of the contents published using the CMS are: complex pages with specific layout and presentation, training materials, online manuals (policy and procedures, HR, etc) and general business documents (Robertson, 2002).

Common Technology Elements and Processes

- **Metadata creation:** Metadata i.e. information describing content (e.g., date and time of creation, image resolution) can be automatically extracted from file formats while other types of metadata, such as information about asset creators or detailed descriptions, must be entered manually. Metadata creation technologies also include text categorization, entity extraction, and image understanding.
- **Asset storage:** A CMS can store content in a native format or a format specific to an output medium (e.g., HTML). Content storage systems also include disk drives, storage area networks, and near line/offline storage, particularly for storage-intensive assets such as high-resolution still images and digital video.
- **Workflow:** Many CMSs provide for the identification of roles (e.g., author, editor, and producer) and their association with specific privileges on an asset, which could include reading, editing, or the ability to change the asset's metadata. Users can check content out for editing and check it back in again, and they can often use the CMS to send content to other users, whether in an

ad-hoc manner or according to fixed, predefined routing schemes (Rosenblatt, 2003).

- *Search and browse*: CMSs have interfaces for users to enter query terms to search for assets whose metadata fit those terms. Many also have browsing interfaces, where a user can scan a collection of asset descriptions (e.g., text abstracts, image thumbnails, short audio clips) to find assets of interest.
- *Distribution*: The final process that most types of CMS support is making assets available through some channel outside of the domain of the CMS (Rosenblatt, 2003).

Types of CMS Users

Usually there are three types of CMS users (Rogers, 2003):

- Normal users: they have access to a subset of the files available in the CMS. For example, these users can see (browse), edit and publish files in the collections area of the CMS, but cannot see files associated with projects.
- Supereditors: these users have automatic browse, edit and publish access to all files in the CMS.
- Superusers: these have the same access as supereditors, but can also manage CMS user accounts, as well as configure certain settings. Superuser accounts are strictly limited due to the potential for catastrophic deletion of directories and files, for security and for preservation of standards and appropriate use of the CMS.

CMS users are organized into groups. Each user has an individual username and password, while each group is assigned a set of access permissions by the superusers, thereby, preventing unauthorized access.

Functions of a CMS

Functions of a CMS can be placed into four categories: *Authoring*, *Workflow*, *Storage* and *Publishing* as shown in Figure 1. These four categories also represent the Content Life-Cycle (Browning & Lowndes, 2001). A CMS manages the path from authoring to publishing using a scheme of workflow (Doyle, 2000) and by providing a system for content storage and integration (Walker, 2001).

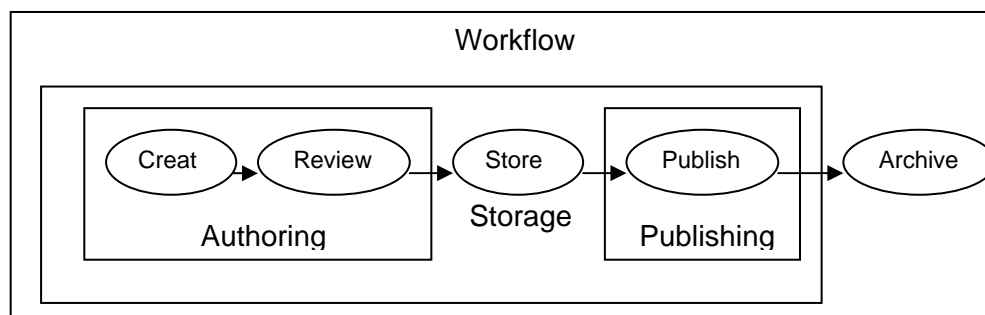


Figure 1: Content Life-Cycle [Source: Ort (2000) & Vidgen et al. (2001)]

- *Authoring* is the process by which many users can create content within a managed and authorized environment.

- *Workflow* is the management of steps taken by the content between authoring and publishing.
- *Storage* is the placing of authored content into a repository. Beyond this it is also the versioning of the content, so that access conflicts between multiple authors cannot arise and so that previous versions can be found and restored if required.
- *Publishing* is the process by which stored content is delivered.

Conceptual Model of a CMS

Figure 2 depicts the conceptual model of a content management system (CMS). Metadata is the first abstraction tier/level to store the content. This tier primarily determines the content's relevancy and accuracy before it reaches the other tiers (Intel, 2003). The metadata tier also helps build the solution's thesaurus. Metadata is often referred to as "data about data" (Rockley, 2000) or information about data. It is the encoded knowledge of an organization. It could be categorized based on the Taxonomy (A hierarchical representation of metadata in which every element within the structure can exist in only one location within the structure) or amount of reuse. Metadata can be used in a number of different ways to support knowledge goals (Robertson, 2003):

- Tracking content owners.
- Capturing relationships and links between different pieces of information.
- Capturing classification information such as keywords.

This provides a way for subject-matter experts to annotate pages to improve information accessibility.

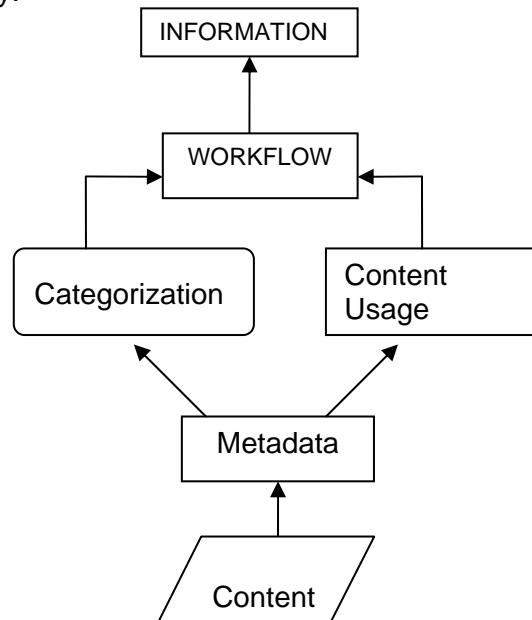


Figure 2: Conceptual Model of CMS [Adapted from Intel (2003)]

Moving from the metadata tier, the solution provides for two different consumption models. The first, and most common, model follows the content usage orientation tier. This abstraction provides for utilizing data in a number of ways that directly matrix to how an organization functions: results-oriented, task-oriented, technology-

oriented, or a hybrid of all three. Each of the workflows mentioned later in the workflow tier can have its own orientation abstraction. The second consumption model follows the categorization tier. In this tier, the content is distilled into further logical units that the organizational users maintain. The content could be stored based on a taxonomy or access rate of the user. This in turn helps the user in retrieving content from knowledge repositories.

Finally, the solution abstracts the content through the workflow tier. This tier abstracts the content into logical units that match the organizations taxonomy or correspond to the way members utilize the content in the workspace (Intel, 2003; Eleanor, 2001). Workflow is the way tasks flow through a cycle on their way to getting a job done (Rockley, 2000). Workflow rules are used to automate the approval and review processes for content, thereby increasing the manageability of the system. The analysis required to determine appropriate workflow rules is also a form of process mapping. In order to setup workflow rules, it is necessary to first understand how the organization currently operates. Effective workflow rules identify knowledge flows within the organization (Robertson, 2003). Workflows are usually depicted diagrammatically in a linear flowchart or a swimlane diagram (Rockley, 2000). Linear flowchart depicts a process from beginning to end while swimlane diagram shows processes in "lanes" to depict tasks that occur concurrently, illustrating who does what, and when.

Components of workflow are as follows:

- Players - the people who do the tasks as identified by their role.
- Responsibilities (tasks) - the steps to complete a particular piece of work; everything that must get done within a process (Rockley, 2000).
- Processes - the flow of tasks, as performed by the various players, showing the interactions and interdependencies among players.

Key considerations while designing an effective workflow:

- Determine a starting point for a workflow.
- Figure out a logical place for the workflow to end.
- Identify all players from beginning to end of the workflow.
- Sketch the tasks.
- Identify interaction patterns among players and tasks.
- Allocate time frames for tasks.
- Identify notification patterns - who needs to know what at any given stage of the workflow.
- Determine all the "what ifs".
- Check if the workflow can be simplified.
- Repeat these steps until a feasible workflow is designed.

A Structured Approach to Implementing CMS

Carol (2004) recommends a seven-stage approach to implementing a CMS:

- Analysis - Ascertaining what the user needs are and how to meet them.
- Structure - Building a database structure that will expand with the business.
- Design - Designing what the users want.
- Content - Bringing the user's content into the database structure.
- Construction - Setting up the server environment.
- Promotion - Making sure that all individuals are aware of the system and its applications.

- Maintenance - Training the personnel in the updating the database.

Requirements of a CMS

The list of requirements for an enterprise-wide CMS covers the full life-cycle of a content management system, which includes the tools from initially creating the content, through to delivering it to end-users. The list includes:

Content Creation: This is the functionality required by content creators using the CMS. Key requirements may include:

- **Integrated authoring environment:** Ensure authors and content creators have easy access to the full range of features provided by the CMS.
- **Multi-user authoring:** The CMS will have many simultaneous users.
- **Metadata creation:** Capturing metadata (creator, subject, keywords) is critical when managing a large content repository.
- **Ease of use and efficiency:** For a CMS to be successful, it must be easy to create and maintain content.

Content Management: The core of most CMS is a central repository, supported by a range of tools for manipulating and managing the content. Key requirements may include:

- **Security:** Adequate security levels must be in place to protect the integrity of the content.
- **Integration with external systems:** An enterprise-wide CMS will only be successful if it can be cleanly integrated with existing business systems. The mechanisms for achieving this must be fully documented and based on open or industry standards.
- **Reporting:** The CMS must provide an extensive range of reports for both users and administrators.

Publishing: The publishing engine takes the content stored in the repository and generates the final pages. Key requirements may include:

- **Style-sheets:** Final appearance is controlled through the use of style-sheets.
- **Page templates:** Overall page layout is specified via page templates.

Presentation: The published pages must meet certain standards if they are to be of value to users. It is important to specify these requirements to design the appearance and layout of the content. Key requirements may include:

- **Usability:** This covers aspects such as ease of use, learnability and efficiency.
- **Speed:** Specify the typical user access methods (LAN, modem, etc).
- **Effective navigation:** Users must be provided with consistent, comprehensive and usable navigation aids.
- **Metadata:** All pages must provide sufficient metadata to allow effective indexing and searching.

Contract & Business: Project management and business requirements must also be satisfied in a CMS project. Key requirements may include:

- **Training:** The vendor must list the training materials that exist for the CMS, and the training services that they can provide.
- **Documentation:** The CMS must be supported by adequate documentation for users, administrators and developers.

- Resources required: The hardware, software and operating systems required by the CMS.
- Skills required: skills and knowledge required within the organization to customize and maintain the CMS.
- Cost: Both the fixed costs for the CMS, and the per-user costs. The latter is generally more significant for a large organization (Robertson, 2002).

Common Features of CMS and Knowledge Management

The CMS is often mistaken with KMS as both deal with the integration of people, process and technology. So it is important to note the common features of these two systems.

- Content is for both internal and external people.
- Content conversion.
- Content capture and structure.
- E-Learning through intranet.
- Graphic portrayal of up-to-date versions of the data.
- Personalized searching.
- Expertise profiling (Niekamp & Corrigan, 2002).
- Capturing expertise interactions (Niekamp & Corrigan, 2002).
- Change management and training.
- Monitoring intranet usage and refining the system.

Strengths and Weaknesses of CMS

The strengths of CMS as a powerful information processing tool are enumerated below:

Content is edited in one place, one time, published many places, many times (Garshol, 2004).

- Reduced Staffing Requirements.
- Improved data integrity.
- Improved content quality and integrity.
- CMS offers ease of new product development and better reaction to market demands.
- CMS reduces time to market for new products and reduces time to update extant content.
- CMS allows for personalization features to be incorporated into content, improving the customer experience.
- CMS functionality offers improved flexibility in extracting content for resale. Extraction and reformatting are separated from content maintenance.

CMS also have certain weaknesses, with the following ones being the most common:

- A typical CMS system stores content objects in a hierarchical folder structure similar to that of the file system. And, as every computer user knows, such a structure quickly gets difficult to use, especially when maintained by multiple users.
- CMS's have offered additional capabilities such as attaching property-value metadata to content objects and allowing full-text search of the content object text. The full-text search capability, while useful for some purposes, does little to combat info glut.

- Poor integration into the overall CMS system (Garshol, 2004).

Conclusion

In the era of computer systems, the basic law on the use of computers is explained by acronyms such as GIGO (GARBAGE IN: GARBAGE OUT) and TITO (TRASH IN: TRASH OUT). In a similar manner, a disciplined database structure is absolutely necessary for the successful operation of a Content Management System. Selecting an enterprise-wide CMS is often a multi-million-dollar exercise. It is therefore critical that the new system meets the current and projected needs.

The knowledge in a CMS is not the words on the page. Instead, the knowledge is gained via the processes and opportunities used to capture organizational knowledge. This is further enhanced by the CMS's ability to support knowledge discovery, via the use of metadata and deployment of effective navigation. Finally, it is the people aspects and not technology that are the source of the knowledge. Hence, CMS serves as an effective enabler for knowledge management activities within the organization.

In particular, organizing information within a CMS has generally been its weakest point since pile up of content causes information glut. Versioning of content as pre-specified might help up to a certain extent but data redundancy cannot be avoided. Also one man's trash could be another's treasure, i.e., data regarded as trash by one could be information to another. CMS systems have tended to use ad-hoc models for organizing their content, which has made their functionality less flexible than it might otherwise have been. In part for the same reason, maintenance of the content has been made unnecessarily difficult.

This paper has presented a systematic approach for implementing Content Management System (CMS) in any organisation (manufacturing/service) with specific details such as its need, benefits, considerations for implementation etc. It also explains the conceptual model of a CMS. Type of users and the output produced are also described. The paper traces the importance and benefit of an efficient Content Management System (CMS) in any organisation. Finally, the limitations of CMS are also given consideration so as to caution the users to take enough care before its implementation. As Liberalisation, Globalisation & Privatisation (LPG) is sure to provide the opportunities for the organisations to grow, Content Management System (CMS) would pave the way to success with an efficient data management system.

About the Author

Morvin Savio Martis is a M.Tech. student at the Manipal Institute of Technology, Manipal, India. He has a B. E. in Mechanical Engineering and is currently working on his dissertation entitled: "Engineering Competence Pool Analysis Using System Dynamics: An Integration of Knowledge & Human Resource Management"

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