II. CMS: Concepts and Technology Developments

Today, according to Web directory DMOZ (www.dmoz.org)[7], more than 800 products in the software marketplace call themselves "Content Management Systems." They all attempt to solve some or even most of the content problems which we have introduce and discuss in the previous chapter, albeit in different technical ways an on different platforms.

Similarly, there are also almost as many definitions of "Content Management System" as there are CMS vendors and analysts, whether in the U.S. or in Europe. When you review the available academic researches or materials on the "CMS" products and the related terms, you will soon find yourself get totally lost in this chaotic terminology jungle. The solution or the definition that you are looking for is likely to be as unique as your different needs.

Though this fact shows the robust developments of CMS technologies, the enormous needs from enterprises/customers and the rapid growth of the market, it also implicates that there are different management factors, technical consideration and system development perspectives which we should not neglect, either for academic research purposes or simply for making a purchasing or implementing decision for CMS products.

In order to make our observation on the CMS concepts and the technology developments to be more systematic and precise, in this chapter, we start from the industry definitions on CMS first and then try to explain the developments of the related terms and technologies.

2.1 Why Content Management System? And What It Is?

One of the most interesting phenomena in the CMS markets is: It seems that the industry, CMS vendors and solution providers, goes further than the academic researchers.

Maybe it's true, due to the fact that the industry sectors nowadays tend to have more R&D budgets than the universities or research institutes. However, it might also be possible that these "NEW" terms are nothing but buzz words from the businessmen who eager to get money from customer's pockets.

After reviewing more than 100 related materials[8], here, we pick up the most distinguished definitions and followed with our comments:

> ***"Content management is the storage technology that enables reuse of information at the granular level. Content is stored at the information level, not the document level.*** [9]***"***
>
> – Business Objects Inc.

This definition helpfully distinguishes Content Management (CM) from Document Management (DM).Nevertheless, although granular element storage is central to Business Objects Inc.'s approach to WCM and can be a very good idea for many CMS Developers. However, it doesn't address the key business processes around the validation, publishing and distribution of online content. Decision makers could hardly imagine how their companies could apply the CMS technology from this definition.

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[7]   In comparison with other commercial search engine as Yahoo, MSN or Google, DMOZ aims more at IT professional communities and have a more systematic category structure for hardware or software developers.

[8]   See literature list and Appendix B. Categorized Online Professional Comments and Active Commentator List

[9]   User manual of software product Crystal Report v.10, 2004, Business Objects Inc., p.46~48, see http://www.businessobjects.com. Business Objects Inc. is a leading developer in the field of Business Intelligence Software since 1995.

"Content Management Systems (CMS) are software toolkits that automate the rapid deployment of content from multiple sources. CMS are collections of application programs and middleware that automatically organize the content for your web site according to rules you set up. [10]*"*

– Bernd Völker, Infopark AG, Germany

This is an excellent description of CMS packages from a wise CEO of a CMS Total solution/product provider. In this definition, "product" and "software technology" take the priority of conceptualization. It makes the CIO feel rather curious for CMS. But, for people who don't really understand business information systems, it still does not speak to what people actually *do* with that software.

"A combination of clearly defined roles, formal processes, and a supporting systems architecture used by companies to produce, collaborate on, monitor, and publish Internet sites. [11]*"*

– Forrester Research

As the most famous American market survey institute, the definition of Forrester Research emphasizes more on roles and processes, obviously from business logics and perspectives. It helps illuminate the non-technical challenges to building a good CMS. But the definition may be too restrictive in its detail, if we consider the possibilities of industrial vertical and horizontal integrations of CMS in the future.

"Content management represents a combination of knowledge and infrastructure. Imposing order on chaos requires investment from real people who are domain experts. [12]*"*

– Heckman JM & Glantz EJ: Web content management: A collaborative approach

Heckman and Glantz point out the difficult, but often hidden task of classifying and annotating content accurately, which is how its true value can be exploited. Whatever the tools at their disposal, only *people* can effectively organize and give meaning to content. This definition seems to be more related with the knowledge management and storage perspectives.

In the end, after summarizing the above mentioned definitions, here we try to give our own definition of a Content Management System:

"A set of business rules and editorial processes applied to content by people and organizations to align online publishing efforts with business objectives."

In our definition, "CONTENT" moves to the center of the equation, where it belongs. "PEOPLE" play a decisive role in what happens to it. What they do with content can be encapsulated into "BUSINESS RULES" (organization) and "EDITORIAL PROCESSES" (workflow). The goal of these efforts is to support specific "BUSINESS OBJECTIVES" (strategy). Perhaps the most important content management problem that modern enterprises face is that their publishing processes do not advance business goals. The purpose of implementing a CMS should be to put those two back in sync.

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[10] Interview Bernd Völker, CEO Infopark AG, Germany. In Berlin 2003.10.15 (Vincent, Chung-Wei Lin)

[11] Infopark AG, 1998 ~ 2001 Continuous Market Research Project of Infopark AG and Forrester Research, Berlin, 2003, p.03. This research results are "exclusive authorized" by the Infopark AG to privileged academic uses. Pls see the appendix for more Info

[12] Heckman JM; Glantz EJ: Web content management: A collaborative approach, INFORMATION PROCESSING & MANAGEMENT 2003, Vol 39, Iss 4, pp 667-668, PERGAMON-ELSEVIER SCIENCE LTD

2.2 The Landscape of CMS Related Concepts and Technologies

Our definition to CMS provides a simple principle and a clear perspective to observe and understand the content management problems in digitalized enterprises nowadays. However, with this definition, when enterprise IT decision makers feel that they have an content management problem and turn themselves back to the ultimate products in the market, they still tend to have problems to understand all those fancy terminology, slogans and products. Why? Simply because of the fact that: There are really too many factors to consider for implementing a enterprise-wide, even a partner cooperation oriented, information system!

However, summarizing the interviews with different professionals and consultants in the CMS field, we could point out that: Mostly, the CIO's dilemma could be answered by a sounds-easy yet hard to fully accomplish cliché:

> ***Defining the exact nature of the problem is always half the battle to finding a solution!***

In order to make us become better aware of our content related problems in the enterprise and to clearly distinguish the differences among the available technologies/products in the market, we apply an industry structures, which is proposed by AIIM in 2004, for a systematic review on the CMS related technology and market developments **(CHART 2.01)**.

Let's take a look at this chart first. In this visual mapping of technology and market developments, technology solutions to business problems that are associated with the production, storage, and distribution of information have historically gelled around different types of management software:

- Imaging
- Collaboration
- Digital Asset Management (abbr. **DAM**)
- Document Management (abbr. **DM**)
- Knowledge Management (abbr. **KM**)
- Source Code Management, or Software Configuration Management (abbr. **SCM**)
- Digital Rights Management (abbr. **DRM**)
- Web Content Management (abbr. **WCM / CMS**)
- Product Data Management / Catalog Content Management (abbr. **PDM / CCM**)
- Learning Management, and Learning Content Management (abbr. **LM / LCM**)
- Portals
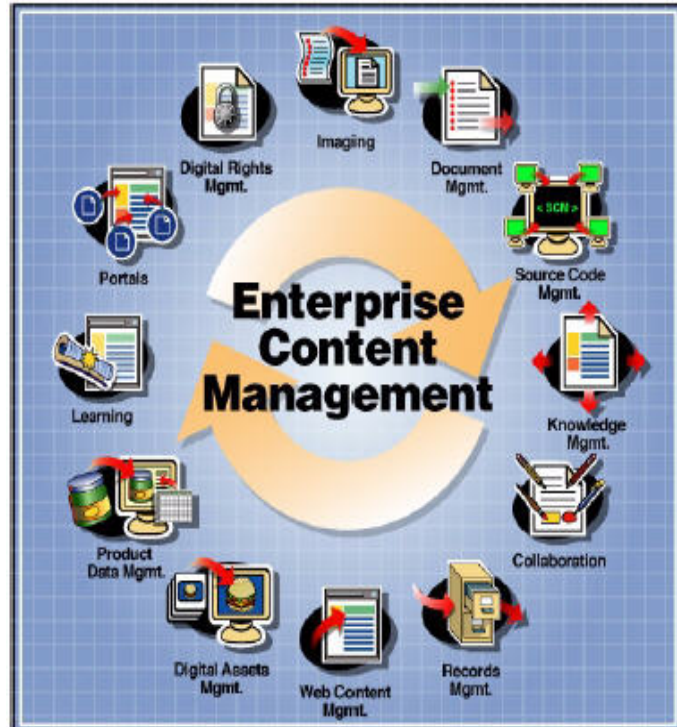
(Chart 2.01) Mapping Enterprise Content Management Industry – The fundamental software concepts and elements, in ECM Market Forecast 2003 – Annual Industry Report, AIIM, U.S.A. http://www.aiim.org

This industry mapping offers us an overview on the key function-oriented elements in the CMS related technology. However, the question is: "Why AIIM calls it "Enterprise Content Management, ECM" instead of "Content Management Systems, (CMS)"?

The reason why AIIM calls the whole industry as "ECM" could be simply summarized as followed:

Today, the lines among these product segments have become increasingly blurry, and there is consequently broad confusion around what is increasingly being called "Enterprise Content Management," or ECM. For example, when is a document a "digital asset?" Shouldn't my Knowledge Management portal also control versions of its associated code base? Don't all digital files represent "content" of some kind?

Compounding this confusion is the rapid expansion of feature sets among ECM products in the rush to web-enable existing client-server products, capture larger market-shares, or simply lay claim an ECM mantle. While some companies have taken a partnership approach – particularly among the more niche-oriented SCM and DAM vendors – the marketplace as a whole has seen substantial convergence, consolidation and overlap. This, coupled with vague yet expansive marketing information, can make it difficult to discern the core capabilities of the solution a vendor may be offering.

Moreover, a vendor may only provide a single function-point solution, such as Imaging or RM or WM, but call themselves an "Enterprise" Content Management vendor because they are "TARGETING" enterprise-level customers – or simply because that term makes their software sound more sophisticated and valuable.

2.2.01 Enterprise Content Management and CMS

This dissertation focuses on web-based Content Management System (also generally referred to as "CMS") as opposed to Enterprise Content Management (ECM). According to our literature reviews and interviews with IT Professionals, ECM itself is a term still in search of a commonly-accepted definition. ECM could mean:

• "Enterprise-level" function-point solutions

This could be a very big DM, DAM, or WCM implementation that crosses departmental silos, and essentially promises a highly scalable approach to a common, practical need. This is a nice strategy in theory, and some large, cohesive enterprises (especially in the tech sector) have executed successfully on it.

However, we see a some backlash against this approach today, for financial reasons and because the implementation times across multiple silos can be highly impractical. At the same time, many enterprises are beginning to provide content management as a central service to different business units. In any case, this definition means that any large vendor from among the all the various categories above could call themselves an ECM player (and many of them do).

• Combined functional solutions

The idea here is to combine various functions under one management umbrella. This is what Gartner[13] promotes as "Smart Enterprise Suites." As a strategy, it speaks to vendors like Stellent, OpenText, and Documentum that are assembling nominally integrated

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[13] Content Management Software Market Research 2003, Gartner, p.34~36. See http://www.www3.gartner.com/news20040206.htm

functional solutions under one brand. In reality of course, the individual products are typically marketed and sold separately, and in most cases (including Documentum), the offerings are far from integrated. Moreover, it is not at all clear that the marketplace actually will want combined suites even when the vendors finally get there.

• Ubiquitous Content.

This school of thought says that ECM is not an application, but a framework for making content as accessible as possible to the right people from wherever it lives, and that the prime function of disparate repositories is to feed the right information in he right format to key line-of-business applications that truly drive profitability (like Relation Management, RM). This is where content integration vendors are trying to get noticed. Many enterprises want to experiment incrementally here, but the fundamental concept of "content anywhere, any time, any format" remains highly utopian. Nevertheless, we believe that understanding ECM" as a framework for threading together content-rich applications across the enterprise is a useful way of trying to obtain more value from heretofore isolated function point solutions[14].

In short, no one agrees on what ECM is, and the various definitions touted today don't really help technology buyers very much. So we will try to break down some of the basic business functions a bit more to begin to isolate the core features of Web content management versus related disciplines.

At a very basic level, all content management systems do the same thing: take in content, add value to it by applying approval and other business processes, then output it in some format. The simple input/output chart above can be applied to nearly the entire class of "ECM" solutions. Within a content management system, regardless of content type, several standard features are typically available to support these business processes. This set of core features spans the ECM functional spectrum from DM to DAM to WCM, and can be found in almost any major vendor package in those spaces. Whether the content in question is text, images, binary documents, XML nodes, multimedia files, forms, or something else, we conclude these core capabilities are essential in any content management system:

- Contributor and managerial **rights and privileges** must be managed, usually according to pre-set roles; this promotes security and insures that participating staff/people are only undertaking suitable and appropriate tasks.

- Content must be **authored or ingested** into the system, and sometimes transformed into a consumable format; this enables corporate information to be actively managed.

- **Repositories** must be managed, through versioning and version control; this insures the integrity and authority of the core content.

- Content must be **tagged with metadata**; this enables content to be subsequently retrieved more easily and reused more widely, with minimal human intervention.

- **Workflow** mechanisms must be emplaced; this helps assure consistency, quality, auditability, and reliability of content and business processes alike.

- Content must be **localized** for multiethnic or multilingual audiences as well as authors; this enables enterprises to extend their content management efforts across national boundaries.

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[14] Similar comments see also: Kampffmeyer: Enterprise Content Management - The new message, CONTENTMANAGER.NET 03/2004, http://www.contentmanager.net/magazine/article_394_enterprise_content_management.htm

However, the function-points domains of Content Management, Document and Records Management, Digital Asset Management, etc. all still represent distinct solution sets, each with their own unique business and technical drivers.

2.2.02 Imaging

Sometimes also called "document capture," this entails either using digital imaging technology to convert paper documents to electronic images, or performing a forms capture, where data is extracted from either a paper form or an electronic form. Imaging requires using character recognition technologies to accurately convert printed text to digital data. In both cases, some kind of validation is required, against a set of quality-control rules. And usually a human is needed to "index" – think classify – the documents. Upon passing a QA check, documents are then "released" into a repository, for workflow and other value-added services.

Imaging is the oldest of all the ECM technologies and therefore perhaps most deserving of that mantle. When companies started making serious investments in imaging two decades ago, though, it created a problem: how to manage all these new electronic files? And so, Document Management was born.

2.2.03 Document Management (DM)

Document Management is an important precursor to Web Content Management. Indeed, many of the famous DM companies, like FileNet and Documentum, have recast themselves as Web-savvy CMS companies in the Internet era.

DM products function to help companies better manage the creation and flow of documents – in particular structured documents – through the help of databases and workflow engines that encapsulate metadata and business rules. Perhaps more importantly, they represented the first manifestation of effective library services: versioning, version-control, and cataloguing.

DM systems have grabbed a significant toehold in heavily regulated or document-centric industries such as insurance. In their more advanced versions, they initially took advantage of much of the power behind SGML, and have been relatively quick to migrate to XML. Much of what we know about automated editorial workflow comes from the DM world.

Note that there are at least two very different use-cases for Document Management: managing and assembling compound documents from discrete content chunks, and managing binary files (who's innards have not been disassembled) in a file repository. The latter is sometimes called "fixed content management." This is an important distinction, because many CMS vendors purport to manage documents, but sometimes they mean file management, and other times they mean compound document management[15]. You'll need to decide which type you need.

In any case, DM vendors have tended to weather the recent IT recession more successfully than pure-play CMS players, due to:

- A more diverse product line and larger, less dotcom-heavy installed base;
- More experienced professional services teams;
- Successful adaptation to business processing needs, like forms processing.
- Renewed corporate focus on DM, especially for Intranets.

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[15] See also: Warzecha, A: Differentiating content management, document management, and portals, ELECTRONIC BUSINESS STRATEGIES Nov.2003, META GROUP Inc

In our judgment, DM packages tend to remain weaker in certain web content management functions, such as templating and content deployment. However, they usually excel in workflow and repository services.

2.2.04 Software Configuration Management (SCM)

Also known as "Software Change Management", or more colloquially as "Source Code Management." SCM tools help technical teams manage the development and roll-out of software engineering projects through a coordinated, documented system of platform builds and enhancements. Think Document Management for techies. These tools have broadened their footprint in the market as IT projects have become more complex and as web development operations – perhaps belatedly – have begun to turn to the kind of established, formal methodologies that have typically characterized more traditional IT activities.

Like all ECM disciplines, the SCM problem domain mirrors many challenges found in content management, including workflow, versioning, and version control. Similarly, maintaining a sophisticated online publishing system requires that systems and controls exist for the behind-the scenes software code as well as publicly-accessible content. SCM vendors have argued that as web-sites become increasingly like applications and less like than brochures, there is a natural parallel with content management.

As a practical matter, moreover, IT departments are typically responsible for managing the health of a CMS at some level, and are usually involved in any software selection process. Thus, since they already have the ears of important back-office stakeholders, SCM vendors moved aggressively earlier this decade to find WCM tools that they could integrate and market with their legacy products.

2.2.05 Knowledge Management (KM)

The purpose of KM is to capture and distribute the knowledge held among individuals within a corporation to other co-workers and partners, according to set rules. It is not so much about the content itself, but how people interact with content[16].

Not surprisingly, KM is especially well suited to the internal needs of organizations in knowledge-oriented industries, such as tech-intensive manufacturing, professional services firms in general, and consulting outfits in particular. KM has traditionally more of an academic discipline than a technology sector, and in the software realm has been represented by a plethora of different types of packages, from search engines and specialized retrieval software to Collaboration tools.

Today, the KM mantle is perhaps most strongly assumed by a class of products known as "Enterprise Information Portals (EIP)," that apply a standard web interface overlay above corporate content. From the users' perspective, the most important feature of an EIP is its search engine, and indeed, several search-engine vendors have recently recast themselves as EIP products.

A critical distinction here is that the target content is often quite heterogeneous in nature. A company's HR handbooks may reside in word-processing files that could easily be indexed and

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[16] Frommholz I; Brocks H; Thiel U; Neuhold E; Iannone L; Semeraro G; Berardi M; Ceci M: Document-centered collaboration for scholars in the humanities - The COLLATE system, RESEARCH AND ADVANCED TECHNOLOGY FOR DIGITAL LIBRARIES 2003, Vol 2769, pp 434-445, SPRINGER-VERLAG BERLIN

shared within a DM or CMS. But what about corporate pronouncements or other content residing in e-mail archives (where much knowledge lives in the contemporary corporation), or sales data buried within your ERP system? To integrate that all together – at least at the interface or presentation layer – you may need a Portal. By redefining themselves as "portals," KM products have breathed some new life into a stalling KM market, even though EIPs have arguably not displaced groupware vendors (Lotus Notes, Microsoft Exchange) as the central corporate collaboration space.

At their best, enterprise portals serve as the end-user prism into complex corporate content. Then an intersection with CMS becomes readily apparent[17]. Content still remains at the heart of any portal, and therefore, the management of that content, including versioning, workflow, and presentation control – all typical CMS features – is required. Without CMS, an enterprise portal is "read-only."

According to our market investigation, many American portal vendors have smartened up to this duet and offered prepackaged integration modules to plug into major CMS packages. For example, Plumtree offers specialized "gadgets" (its term for portlets) to plug into the Documentum and Interwoven TeamSite products, as well as its own, very simple CMS.

2.2.06 Collaboration

CMS products have not traditionally been seen as collaboration utilities in the marketplace. Most buyers tend to employ them initially to automate procedures that have become too sclerotic for the volumes of content enterprises are trying to process, as well as to exploit various options for content re-use.

However, enterprises are discovering that collaboration is an important attribute in content management.

First of all, by devolving control and authority for managing content to actual business users via non-technical interfaces, the number of people collaborating on a document (or some other digital product) can expand dramatically under a DM or CMS system, often with little forethought for the consequences. At the same time, traditional workflow features have been typically somewhat immature in their support peer-based collaboration. Many packages often assume that any collaboration has already taken place – perhaps offline – in some way during the content creation phase.

Some CMS and Portal vendors have recognized the need for greater collaboration by adding richer annotation features to traditional workflows (e.g. digital "stickies."). But others, like Documentum, Vignette, Stellent, Oracle, and OpenText, have aggressively purchased or developed fairly sophisticated collaboration tools to add onto their CMS offerings. These new capabilities include project-based categorization for workgroups, threaded discussion boards, and real-time, collaborative document editing facilities. In this connection, however, they are bumping up against traditional groupware vendors (MS Exchange, Lotus Notes), who already command dominant market shares[18].

The key distinction for would-be CMS buyers is whether the enterprise needs full-blown collaboration functionality for workgroups that are collaborating on specific projects, or whether

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[17] Same comments could also beend found in: Frommholz I; Brocks H; Thiel U; Neuhold E; Iannone L; Semeraro G; Berardi M; Ceci M: Document-centered collaboration for scholars in the humanities - The COLLATE system, RESEARCH AND ADVANCED TECHNOLOGY FOR DIGITAL LIBRARIES 2003, Vol 2769, pp 434-445, SPRINGER-VERLAG BERLIN

[18] Fowell S: Bridging the gap between information resource design and enterprise content management, DIGITAL LIBRARIES: PEOPLE, KNOWLEDGE, AND TECHNOLOGY, PROCEEDINGS 2002, Vol 2555, pp 507-515, SPRINGER-VERLAG BERLIN

the enterprise simply wants his content management processes to be more collaborative and for the CMS system itself to be able account for multiple actors working together and on – and communicating about – a single piece of content while it exists in any particular status (e.g. draft, edit, approved, etc.). A full-blown collaboration package may help you manage ad-hoc projects run by distributed teams of staffers, but it may not help you improve cooperation in your content-approval workflows.

2.2.07 Digital Asset Management (DAM)

Also known as simply Asset Management (AM), or Brand Asset Management, or Media Asset Management (MAM), the business case for DAM traditionally argued that companies whose life blood revolves around their digital assets – such as entertainment and media companies – should actively organize and repurpose those assets to streamline costs and enhance revenues.

The DAM systems are especially suited to managing multimedia content[19]. Unlike other products, DAM products tend to offer "HOOKs" into specialized desktop media authoring systems and cull specialized metadata from multimedia assets. If streaming video is your company's main web content, you may want a DAM instead of a CMS. If multimedia content serves as your company's products itself – rather than supporting other products – then you almost surely want a DAM system.

Recently, DAM vendors have been focusing on "brand asset management," asserting that marketing departments of major corporations require sophisticated capabilities to manage key audio and graphical assets that comprise the critical foundations of a company's brand equity. Whereas most traditional CMS products manage these assets as generic binary files (or "BLOBs"), new-generation DAM offerings understand their native file types and can use information accordingly.

Thus, for a typical video file, a DAM product might be able to generate video logs, storyboards, text indexes, streaming snippets, and dynamically-generated thumbnails – functions unreachable through almost any WCM package.

Some companies need both types of software, which is why WCM/DAM partnerships are common. For example, Artesia, a famous American solution provider of the popular TEAMS asset management platform, has teamed with Vignette for content management. In late 2001, Documentum acquired DAM vendor Bulldog outright, and in its latest edition (Version 5) has integrated asset management features into its core product line. Then Interwoven acquired DAM vendor MediaBin in 2003.

Indeed, many analysts have touted a convergence between DAM and CMS. Much the same way that CMS grew out of publishing roots to insinuate itself among the Global2000 by empowering everyday businesspeople to manage text content, DAM is slowing expanding out of its media and entertainment roots to a broader corporate audience by enabling marketing staff to better control the creation, archiving, and custom retrieval of media assets[20].

But at the same time, the market for DAM remains relatively small, and only the largest and most sophisticated marketing departments appear prepared to make a significant investment in asset management systems.

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[19] A relevant and valuable research on this issue, please see: Thomas P: Influence of integrated content management systems on operational sequences in the broadcasting corporation, NFD INFORMATION-WISSENSCHAFT UND PRAXIS 2001, Vol 52, Iss 5, pp 283-291, DEUTSCHEN GESELLSCHAFT DOKUMENTATION E V

[20] Trippe B: Content management technology - A booming market, ECONTENT 2001, Vol 24, Iss 1, pp 22-27, ONLINE INC

Our suggestion is: An important choice for you to make is whether you need to develop a management system for your media assets at large – regardless if web delivery is the principal outcome and channel. If the answer is "yes," you may want to look into a DAM package. If the answer is "no," or "maybe," you could probably suffice with the asset-management features found in a Web content management product. Many WCM products are beginning to incorporate just the basic DAM features (like browser-based image cropping) required for Web publishing.

2.2.08 Records Management (RM)

In theory, records management enables information to be easily accessed and reproduced on demand, regardless of location or form. Enterprises implement records management to reduce costs and risks through classification and profiling of inactive documents. In practice, few organizations manage records comprehensively or well, although this is changing. The events of 9/11 in the U.S. and securities industry investigations in North America and Europe have elevated the profile of records management in those two regions.

Moreover, the extensive costs around legal "discovery" in more litigious countries like the USA are prompting a greater awareness of records management and compliance. Like WCM and DM, records management (RM) is partly a technical challenge, and partly a reflection of enterprise practice and policies.

Records management systems do very similar things that DM systems perform, albeit with a principally archival and retrieval purpose. A core feature is to back up –or take a "snapshot" of a content repository. Like DM and WCM, records management relies heavily on metadata, especially to determine a document's authenticity or "chain of custody." RM systems typically have an indexing mechanism, so that backed-up information can be found and retrieved subsequently, according to particular access controls and a user's privileges.

Finally, RM systems must deal with disposition. Many enterprises maintain records according to their intrinsic value. Not everything is kept, and not everything that is kept is maintained forever. Proper disposition eases the records management burden by reducing storage volumes and controlling potential sources of future liability and discovery expense. RM software allows enterprises to assign explicit record schedules to classes of documents, and specific disposition instructions to a record.

Records managers are quick to point out, then, that RM is really a way of life, and not easily solved by software alone (we could say as much about all ECM applications!). As a practical matter, you may need record-keeping facilities built into several or all of your ECM applications, and not just those governed by a formal RM tool.

For example, you may need to be able to point out what your web-site(s) said on a particular date in time, possibly as legal evidence or to meet a compliance mandate. Some content management systems can create this snapshot. Other systems – typically at a lower cost-point – cannot.

2.2.09 Learning Management (LM)

Learning Management Systems help companies manage and administer training, especially e-learning programs. Traditional LMS software will manage student profiles and log-ins, serve course materials, administer tests as required, track student performance, and generally allow the host company to manage the delivery of entire e-learning program.

LMS packages, therefore, are essentially content delivery systems. Not surprisingly, a subset of Content Management products called "Learning Content Management Systems (LCMS)" has emerged to help organizations manage the development and approval of learning content before it goes live.

These packages work very similarly to Web and Document content management systems, but natively offer certain content types germane to online learning (like "multiple choice questions") and connect directly to important e-learning authoring tools (like Flash or Authorware).The LCMS marketplace today is extraordinarily fractured; there are no dominant vendors, so take great care in vendor diligence here.

2.2.10 Product Data Management (PDM)

Product Data Management, also known as "Product Lifecycle Management," or more simply, "Catalog Content Management," refers to tools and methodologies for managing information – really both data and content – related to a company's product and service offerings. As a product family, it emerged in the 1980s as a distinct alternative to DM systems inasmuch as PDM packages had to manage more than just documents, they had to account for all product-related information, including digital files, and database records. Moreover, the digital files tended to be highly specialized – and often rapidly-changing – outputs from CAD/CAM systems.

PDM systems attempt to keep track of all the heterogeneous sources of information required to design, build, and then support and maintain products and services. It typically requires substantial integration with legacy systems (such as ERP applications), so not surprisingly, PDM has attracted major platform vendors, such as Baan, IBM, EDS, SAP, and others.

PDM today is often subsumed under the broader and more fashionable label, "Product Lifecycle Management" (or PLM). PLM has attempts to encompass more broadly the creation, management, and use of product-associated intellectual capital and information throughout its lifecycle, and includes project management, collaboration, and other such functions and methodologies.

2.2.11 Digital Rights Management (DRM)

DRM tools enable content owners to regulate and control information distribution by applying granular access rights and downstream privileges to specific pieces of content. Some solutions work on the server side, others control distributed materials at the desktop level, and some employ a combination of both approaches. On the server, these technologies are sometimes labeled "privileges management."

If CMS is enduring its adolescence, then DRM remains in its infancy. DRM is a product space awaiting true definition in terms of competitive rungs, product and service definitions, and a common problem domain. DRM may be approaching lift-off, though, because the core need for Rights Management is potentially a powerful one, and not just for content vendors. To the extent that content is a key corporate differentiator, and you need to distribute it beyond the enterprise in digital form, then clearly, some sort of control is in order.

Moreover, an important assumption of content management is that:

Information carries dynamic value in Internet space and time. As a company, you may want to set one price or privilege level to view a document, another to print it, another to save it, another

to archive it longer than 30 days, and yet another price/privilege level to re-distribute the information further. This requires DRM tools.

Nevertheless, you'll want to find the balance point between the inevitable overhead and potential user hassle of control mechanisms and the likelihood of lost sales or uncompensated value. CMS Watch elected not to implement any formal rights management mechanisms in the report you are reading now. We protect this information via our copyright and the license agreement you "signed" via submit button.

DRM vendors presently focus intently on vendors of content, as well distributors of value-added content, but expect them to broaden their target markets over the next year. Be sure your DRM vendor can tell you where and how its products integrate with major CMS packages.

2.2.12 Web Content Management (WCM)

Major web content management packages typically offer the canonical ECM features listed earlier in this section, although with a particular purpose: moving content to the Web according to enterprise business rules.

As newer, web-based products, these packages also tend to emphasize web-based interfaces over proprietary, client-based tools. More so than other ECM segments, web content management also concerns itself more closely with actual content delivery to end-users. In addition to core ECM functions, Web CMS packages bring special capabilities to the mix, including, potentially:

- **Specialized authoring and transformation tools,** to enable business users to input content into the system and have it normalized to HTML or XML.

- **Aggregation and Component Management,** to combine and publish discrete chunks of content that may originate from a variety of sources.

- **Templating,** to ensure consistent, predictable renderings for the Web environment.

- **Deployment Path,** to publish to standard Internet platforms (development, stage/testing, production)

- **Page Assembly and Delivery,** for dynamic production and submission of content to end-users (content consumers)

- **Personalization,** to deliver targeted sets of content to individual consumers.

- **Caching and Replication,** to ensure high performance in public environments characterized by spikes in demand.

- **Syndication,** to add value to content through advanced Internet-based distribution.

- **Producing Wireless and Other Formats,** to push content through multiple channels.

2.3 CMS Software Development Trends – A Short Summary

The above described landscape of CMS concepts and technologies provides us a clear overview on the conceptual and technological developments in the last 10 years. Besides, it also helps to

understand the historical and practical correlations among these terms, ideas, concerns and the technologies behind.
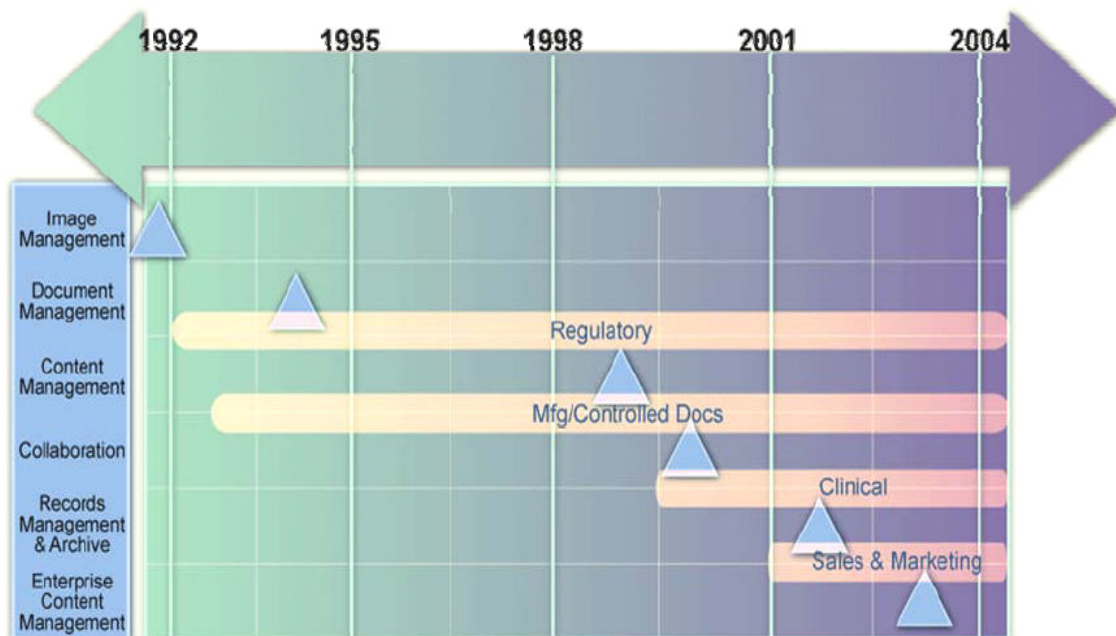
(Chart 2.02) The CMS concept and technology development, AIIM, U.S.A. http://www.aiim.org/library/case.htm

As a short summary of the developments of CMS software, here, we would like to take a chart by the Association for Image and Information Management (AIIM) in the U.S. to illustrate the main stream of the CMS concepts and technology developments.

Let's take a closer look at the chart above **(CHART 2.02)**, and don't forget, with some memory on the technical development of the IT technologies in the last decade. Then, it is clear to us that:

At the beginning of 1990s, when scanning technology and computer word processors were realized to the general uses in the business world, step by step, "Image" and "Document" Management soon became a big concern in the industry.

Then, with the spread of networking and EDI systems, the expansion of data/content forced the industry to take more care of "Content Management". Especially, since 1995, the rapid growth of Internet, especially the Word Wide Web (WWW), enabled the possibility of a more interactive way of "Collaboration". And through the developments of new Media after Millennium, ultimate "Expansion" and "Need" of Information/Content become the drives of "Records Management & Archive" and goes on its way to "Enterprise Content Management",

The developments of CMS software also follow the changes of concepts. CMS packages have been especially acquisitive in adopting key features from KM, DM, DAM, SCM, and DRM segments. For example, CMS vendors today have been increasingly aggressive about adopting DAM features as customers' graphical assets become more sophisticated.

On the other hand, the CMS packages have been slower to recognize key infrastructural considerations around code and asset promotion and thus left the door open for SCM vendors to provide a more reassuring story to internal IT managers.
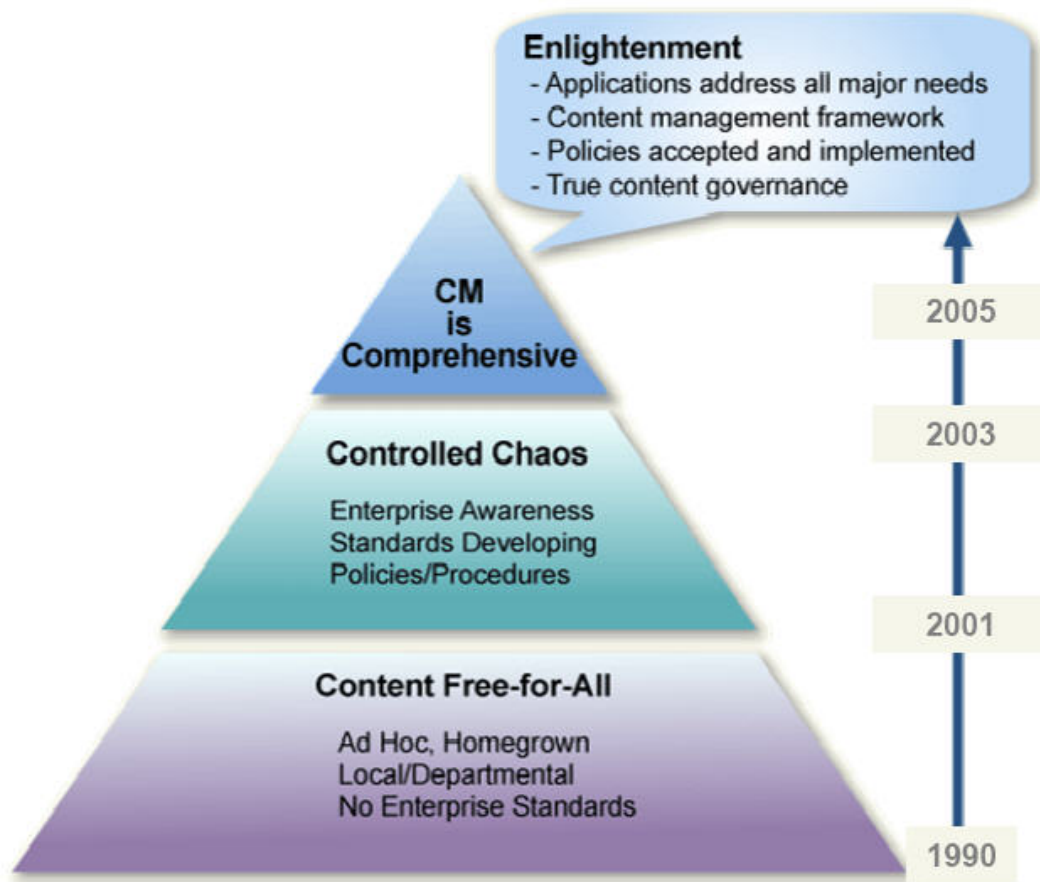
(Chart 2.03) The CMS concept and technology development by Miller R in Content management - Case studies, ECONTENT 2003, Vol 26, Iss 5, pp 23-26, ONLINE INC

A famous American CMS researcher, Miller R., also illustrate the development tracks of CMS from another perspective. As what we can see in the chart above **(CHART 2.03)**, he divides the CMS concept and technology developments since 1990 into three phases: "Content Free-for-All", "Controlled Chaos" and "CM is Comprehensive". In his opinion, the next generation CMS software should be heading the following four directions:

- Applications address all major needs
- Content management framework
- Policies accepted and implemented
- True content governance

Obviously, the first two targets belong to the technical dimensions, which the computer system specialists continue devote themselves to. But the last two targets: "Policies accepted and implemented" and "true content governance" seem to have less with IT system to do. A computer engineer is professional for programming jobs, but never good at administration. The last two developing targets of CMS belong far more to the "business management" and "communication" dimensions.

Why? Let's discuss in the next chapter…