Viewpoint

Enterprise Content Management solutions—Roadmap strategy and implementation challenges

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ABSTRACT

Enterprise Content Management (ECM) solutions provide robust functionality to control and analyze information. ECM solutions help reduce search times, manage data, and enable institutions with regulatory compliance. The correlation between impact on a business process through ECM implementation stage is demonstrated and been shown to follow reported hypothesis by Reimer (2002). The objective of this article is to provide (1) a typical architecture of an ECM, (2) identify key challenges in implementation and (3) implementation road map strategy.

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1. Introduction

Enterprise content management (ECM) systems help organizations to cope with the increasing complexity and volume of data and information (Tyrvainen, Paivarinta, Salminen, & Livari, 2006). Laws are being passed in many countries mandating businesses to archive vital business communications for a period of time set by industry standards (Engel, Hayes, & Wang, 2007). ECM is broadly defined as the strategies, tools, processes, and skills an organization needs to manage all of its information assets (regardless of type) over their lifecycle. An ECM system can capture, process, access, measure, integrate, and store all of this information, regardless of whether it is in structured (databases) or unstructured (e.g., e-mail, word, spreadsheet, image, audio, video) format or in hard copy. ECM offers robust functionality for systematic analysis and control of all information throughout its life cycle with a complete suite of product options to manage and integrate data systems, automate document handling, and reduce the burden on IT departments for information storage and retrieval. The operational benefits include saving cost and reducing workload by streamlining tasks, traceability, version control, reducing duplication, and improving search and retrieval for information across platforms. Process efficiency, as the main driver, has led to accessing of data and information from a centralized repository at a central location (Bentley & Young, 2000). Regardless of its customer size or nature of business, each organization has diverse, unique needs for information management as its business processes require information related to product details, inventory, accounts receivable/payable, customers, research and development, financials, facilities, assets, and human resources, such as payroll, benefits, and retirements.

Transitioning to an ECM can help an organization improve customer service, streamline processes, enhance employee productivity, track information, comply with regulations, eliminate unneeded information on servers and in filing cabinets, and implement business continuity measures. The main goal of ECM implementation is to have transparent content sharing by making different and incongruent applications (for example, web content management, and records management) interoperable. One of the important considerations before implementing an ECM system is to clearly identify the needs, type of organization culture, data type and other Enterprise Resource Planning systems that ECM would be integrated with. The described strategic value of ECM includes increasing decision making capabilities and, facilitating creativity and enhancing the professional representation of the enterprise in the eyes of its stakeholders.

Paivarinta and Munkvold (2005) have demonstrated that the success stories from ECM practitioners should be supported by critical research. They have also noted a number of topics requiring further research, such as: the practical means of evaluating the main impacts sought by ECM investments, unwanted impacts, and realized risks of ECM development projects. A detailed study on how the functionalities of an ECM System and the nature of ECM-supported processes influence the impact of implementing an ECMS in an organization have been discussed by Grahmann (2010). The quantitative estimation of ECM impact on a business process is the culmination of several business process enhancements, such as: reduction of physical handling of paper documents; tracking of business processes; access to information to accomplish business...
Table 1
ECM development and pioneering research.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Focus/main theme</th>
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</thead>
<tbody>
<tr>
<td>Reimer (2002)</td>
<td>ECM basic structure and fundamentals</td>
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<tr>
<td>Rockley, Kastur, Manning (2003)</td>
<td>Development of unified content methodology</td>
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<td>Smith and McKeen (2003)</td>
<td>ECM information governance, benefits, content stewardship</td>
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<td>Nordheim and Paivarinta (2006)</td>
<td>Strategic development and ECM implementation method</td>
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<td>Nordheim and Paivarinta (2004)</td>
<td>ECM customization</td>
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<td>O’Callaghan and Smits (2005)</td>
<td>ECM development</td>
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<td>Munkvold (2006) (Meicher, 2013)</td>
<td>Improvement opportunities for ECM</td>
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<td>Paivarinta and Munkvold (2005)</td>
<td>ECM impact, objectives, content management, enterprise information architecture</td>
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process; and covering legal liability. Such quantitative estimations tend to be complicated due to various factors agreed to by industry and academic peers (Irani, 2002). To our knowledge, after reviewing existing literature, this is the first empirical evidence that reinforces Reimer’s hypothesis (Reimer, 2002). Research in ECM concepts including knowledge, data and information resource management, and compliance are still a nascent field (Brocke, Simons, & Cleven, 2011). Brocke (2007) provide a good timeline of ECM research and development in the field. Table 1 (adapted from Brocke, 2007) shows the selected contributions in ECM development.

2. ECM architecture

ECM solution typically consists of four essential components (Fig. 1): – (1) User interface – a process through which information (digital or non-digital) is brought into ECM. This is accomplished either by converting hard copy documents by image capture scanning or by uploading electronic version of information into ECM. The information consists of documents in the hard copy format or digital format (generated by Microsoft/Mac, or by Google Documents).

(2) Information governance – This is a key ECM functionality that separates ECM from other digital archival systems. The incoming information is now designated at this stage as an official record. ECM solutions offer a capability to assign a record with functional area specific records and retention rules. ECM automatically deletes such records after the records retention duration, which, thus, provides regulatory compliance.

(3) Attributes – ECM is equipped with features meant to achieve specific business purposes. Data archive provides a systematic approach to archive and retrieve the information using select keywords; Intelligent Data Capture – for converting image based information to a computer readable format by optical character recognition; Workflow – an automated process based on a pre-configured logic where information flows through different stages; Integration/Data processing – a built in information management solution to connect different data streams; and Information disposal – a deletion time affixed to certain information to be automatically applied in order to delete the documents to be in compliance.

(4) Repository – ECM systems provide a secure approach to store the information for on demand access. There is a variety of

Fig. 1. Typical ECM architecture in institutions of higher education.
information storage protocols that allow information to be stored on arrayed disks to allow for enhanced data security. The repositories can be on-site or through the cloud (cloud storage is discussed in following section).

3. ECM implementation stages

The primary goal of an ECM implementation roadmap strategy (Fig. 2) is to specify the information governance for the life cycle of the information based on establishing an amalgamated and interoperability space, and reducing the content classification burden for the end user. A well-developed ECM implementation strategy covers the following:

- Encompasses the majority of records, both paper and electronic, unstructured and structured.
- Meets the needs of a wide variety of stakeholders throughout the organization.
- Enables the organization to respond to legal discovery.
- Automates business processes, removing the inconsistency of manual processes.
- Up-to-date with respect to technology.

AIIM recommends the following steps for success in implementing an ECM system: (1) Concept of Operations, (2) Information Governance Framework, (3) Business & System Requirements, (4) Classification Scheme, (5) User Interface & Environment, (6) IT infrastructure, (7) Roll-out, and (8) Post implementation. These can be broadly grouped under three categories; (1) Organizational Requirements, (2) Access and Collaboration Requirements, and (3) Functional Requirements (Fig. 3).

3.1. Roadmap strategy

Long before considering an ECM solution, organizations need to assess their business needs, which are inherent and specific to the nature of the business and culture of the organization. The business needs should sufficiently cover the following aspects:

- Assessment of existing technology infrastructure/environment, readiness.
- Change management.
- Immediate and long term training considerations.
- Information security and alignment with regulatory compliance.
- Taxonomy and metadata requirements for data classification and retrieval.
- Records management and information governance.
- Storage capacity needs – on premise and cloud.
- Disaster recovery strategy.

These needs include identification of tactical benefits including improving internal and external collaboration, enhancing content quality and maintaining consistency, standardizing workflows, producing organizational metadata attached to content objects, and provisioning for regulatory requirements.

An information governance team comprising representatives from all stakeholder groups should act as a catalyst to enforce consistent governing policies, such as the adoption of an organization file plan or classification scheme; use of taxonomy; and application of retention, disposal, and archival rules. A minimal gap between perceived benefits and user adoption is a clear indication of a well-planned roadmap.

3.2. ECM design and development

ECM solutions are not plug-and-play and can be customized based on application data and content. Every business process is different with varying inflow of information originating internally and externally. Albeit, ECM solutions for the broader category of business types (viz., healthcare, finance, education, insurance, research & development) – provide some basic functionality that are specific to an industry, a certain degree of product
customization is necessary. The likelihood of ECM success depends heavily on the outcome of connected workflow execution order and process schedules. The following features are worthy of consideration in designing the ECM:

- Documents are routed in a standard, controlled, and prompt manner.
- Accommodate exceptions by assigning specific users with rights to add or exempt stages on an ad hoc basis.
- Forward documents without delay to each successive phase.
- Allows documents to be prioritized in each queue. If there is no priority assigned, the documents are sorted by the date and time they enter the lifecycle.
- Monitor and measure the time to complete a process.
- Audit queues for periodic review for quality assurance.
- Processes can be easily added or adjusted at the document, process, group, or enterprise level by specified users or administrators.
- Customization of both the routing and the user interface without programming by enabling Point-and-click configuration.

3.3. ECM deployment and training

The detailed deployment and validation plan is very critical to achieve timely implementation of ECM. The deployment should be piloted in a test environment for learning any process-related bottle necks before ECM is migrated to the production environment. There are industry standards on stress testing key functionalities, such as large data handling or varied types of data inflow, – see Table 2 for aid in identifying possible missing features during the course of deployment.

Training of personnel and keeping pace with upgrades on the deployed ECM solution should be part of product support. Some ECM providers require that power users, who are in an ECM administrative capacity, receive standardized testing certification. It takes an extra effort by an ECM implementation team to develop training methods that are carefully customized for user preference (video vs PowerPoint presentation) to engage the personnel through stages of testing, upgrades, and later extending other ECM functionalities.

Implementation is often hindered by incompatibility between the ECM platform and the existing technology environment. The ECM solution should be compatible to the existing software applications in use for routine job functions, such as editing documents, storing data files, searching, and electronic record fabrication, and preservation tools. In many cases, projects fail dismally because of a poor (or no) initial needs assessment not including a broad stakeholder pool; not developing a good deployment plan; or not having executive support.

The success of an ECM implementation lies in articulating the perceived benefits and potential of system efficiency. To achieve these benefits, organizations must involve all stakeholders in selecting the ECM product and vendor, developing the implementation plan, deploying the plan, and training users. Mapping the organization’s information management needs, culture, and business processes and, then, threading those into an ECM implementation roadmap strategy will enable organizations to weather the storm of big data transformation and be in compliance.

3.4. ECM solution implementation: lessons learned

- Identify areas and realistic needs and then configure ECM solutions to meet the functional area needs not the needs of the ECM solution – let the functional need drive the technology, not the other way around.
- Include all stakeholders early in the process and get buy-in.
- Analyze the content first to arrive at the decision to choose ECM technology.
- Be prepared to accept the fact that launching an ECM is just the beginning of a long process that involves training, routine upgrades, certifications.
- Define the quantitative expected outcomes for the organization.
- Delineate security access controls, roles, and responsibilities.
- Document access and approval procedures.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Stress test features for validation.</th>
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<tbody>
<tr>
<td><strong>Stress test type</strong></td>
<td><strong>Process</strong></td>
</tr>
<tr>
<td>Volume handling</td>
<td>Assume 50% of employee login as users to ECM handling at least 60% of total data/information volume. Repeat for 2 different scenarios</td>
</tr>
<tr>
<td>Processing power</td>
<td></td>
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</tbody>
</table>
- Based on information load, write at least 250 scanned pages per minute 
- Response to user input – retrieval rate 
- Recovery from server failure within 10 min 
- Multiple physical servers, hosted on VMWare and running VMWare for failover 
- Dynamic reallocation of computing resources across cluster |
| Test configuration | 
- Performance and capacity load test |

4. Business impact through ECM implementation stages

Fig. 4 shows the ECM implementation stage and its impact in improving business efficiency. Reimer (2002) has suggested a 3-stage process to monitor and fine-tune the ECM implementation process involving a transition from (1) physical handling, (2) partial – physical and electronic handling, and (3) complete electronic processing, as time progresses. In this study, we compared a typical impact on the student enrollment automation process with the theoretical correlation provided by Reimer between business impact and the ECM implementation process (Meicher, 2013). The data was collected from published business case studies for higher education when institutions implemented an automated ECM process at the various steps of student enrollment. The business impact curve for a typical process has a slower adoption rate initially as noted by a lag from the theoretical pattern predicted by Reimer. However, by the end of second phase of the implementation, the automation starts exhibiting the increased rate and takes over the theoretical curve at a faster rate as noted by a crossover in Fig. 4. The amount of lag is dependent on the business process and can be minimized by analyzing the type of information, implementing a suitable ECM platform, identifying the challenges, and training personnel.

5. ECM in the cloud: security and compliance

The idea of the cloud as an ever-elastic and infinitely available storage facility for all content is gaining momentum especially in the collaborative academic world. There are numerous advantages from cloud ECM (notably for mobile access as compared to the on-premises platforms). The important criterion when deciding on cloud ECM include data security, all time access to data, and detailed audit trail while at same time an ability to provide sufficient functionality to support and optimize business processes as that of on-premises ECM.

Cloud ECM can be installed in a very short period of time compared to on-premises ECM at a fraction of the cost with no hardware or software to install (approximately 2–3 months to implement with no capital and annual maintenance costs on the physical infrastructure). Cloud solutions are highly scalable, efficient, and cost effective, and hence, the cost of ownership is less. It is no surprise that many organizations have now shifted to cloud-based solutions for managing email communications, documents, and scheduling that make use of the virtual storage and access capabilities of cloud storage by decoupling the content from physical infrastructure and reducing the burden on IT departments. Microsoft and Google Apps provide a versatile suite of applications for online sharing of documents and data, through SharePoint/Lync and Google Docs, respectively. However, the major risk and challenge associated with cloud ECM are security and compliance. The transition from on-premises to cloud might require additional user training, password identification and logins, group filing systems, and integration with existing enterprise, facility management and maintenance systems.

An important aspect to consider while deploying cloud ECM is to ensure the safety of the cloud storage physical location, content management, the personnel managing the servers and their credibility. Cloud ECM information governance should cover cloud, network, security, data center architecture, in-transit connections, built-in redundancy, and data replication aspects. The cloud ECM vendor should be able to demonstrate a proven record of security and compliance. The real challenge would be to have a clear idea of the physical location and contents of the cloud storage. A cloud’s routers, servers, and technical data storage devices are typically located across multiple systems across the globe.

6. Conclusion

ECM solutions offer robust functionality in handling information regardless of their origin, minimize operating costs, improve customer service, and minimize risk. Understanding the true nature of data and information streams is very critical to automate the process. The ECM implementation stages play a key role in business impacts and can be accelerated by scoping the type of enterprise content, type of architecture and user training. The lag in implementation can be minimized by analyzing the type of information, implementing a suitable ECM platform, identifying the challenges, and training personnel.

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References


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