

# The Enterprise Content Management can develop the Organizational Value through Knowledge Management

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## ABSTRACT

This study analyzes how Enterprise Content Management systems (ECMs), which manage enterprise knowledge directly correlated with learning in organizational memory, help generate such value by investigating the extent to which developing such technologies actually contributes to improving the efficacy and efficiency of the decision-making processes. For the analysis of the case study we used the action research method, and specifically Multiview2. Hence, a continuous interaction between analysts and method, including the present situation and the future scenario that originated by application of the methodology. The final effects of the reorganization process help reduce the time to market for the design, production, and sale of new products from 24 months to 18 months after the implementation. The ECM system thus optimizes information management in organizational memory, perfects the decision-making process, and improves company performance through competitiveness. Through empirical analyses, various authors have stressed that ECM systems increase efficiency and reduce management and research costs. Few studies consider the impacts of these tools on the organization or company processes. In particular, no research has highlighted the strategic role of the knowledge in “content” as a means to improve and speed up the decision-making process.

**Keywords:** *Knowledge Management, Knowledge-Based View, Enterprise Content Management Systems, Multiview2*

## I. INTRODUCTION

This study fits within the context of research that investigates the relationships between Information Systems (IS) and organizational design. That is, the content of information contained in the digital assets generated during the course of a company's activities and that coming from external stakeholders such as customers and suppliers must fulfill the requirement of being accessible and useable by organizational actors in their decision-making processes if it is to generate value for the overall organizational structure. The availability of content thus is necessary, but it is not a sufficient condition to improve the decision-making process and company performance. Rather, the company also needs to transform “passive” contents, such as unused information within the boundaries of organizational memory (e.g. regulations, operating instructions, reports), into “active” sources that are integral to the decision-making process [1, 2]. A study conducted by Glenn and Stahl [3] on a sample of 349 executives showed how important it is to integrate and automate all the knowledge-sharing processes present inside the organization. This leads to improvements in decision-making processes and converts all the information that is present into new knowledge. Approximately 88% of the executives interviewed found the agility factor to be the key to success by giving a competitive advantage. When content becomes active - that is, available and useable at the right time and place by interested users - it becomes information that can be managed and can enable a sustained competitive advantage [4-8]. To improve the decision-making process

and create value, the enterprises must enrich the quality and quantity of all information that provides critical input to a decision. The goal therefore involves an ability to manage knowledge in- and outside the organization by transforming data into knowledge. This study undertakes an analysis of Enterprise Content Management systems and how they might generate value within enterprises. The aim is to investigate the extent to which developing such technologies contribute to improving the efficacy and efficiency of decision making. Using ECM systems, decision makers can manage information, which correlates directly with learning by the organization, in terms of collecting knowledge, making decisions, and sharing their decisions [9, 10]. However, most organizations suffer from an inability to manage information, or their knowledge assets, effectively and efficiently. Instead, they experience real information overload [11-13], especially when, as is true in most cases, managing digital assets or content is not an automated process. Nor does information derived from business processes get shared widely. The operational priority for reaching satisfactory decision-making processes therefore consists of being able to effectively and efficiently manage all knowledge and learning inside the organization through ECM platforms. Using an action research-based approach, this study attains significant results in terms of the standardization of enterprise processes and content. The final effects of the reorganization process can reduce the time to market, including design, production, and sale, for new products from 24 months to approximately 18 months. Hence, this new information that can be managed and can enable a sustained competitive advantage.

The next section describes the theoretical framework proposed to address Knowledge Management. After analyzing ECM platforms in depth, this article presents the research methodology and case study [14]. The discussion and conclusion sections complete the text.

## Enterprise Knowledge Management

The data, information, and information collection processes both can and should be managed for decision making [15]. Yet because knowledge is a complex resource, it demands an articulated mental process of comprehension and analysis of the phenomenon. Knowledge combines information inputs with the experience and theories of each person [16], which entails the analysis of information and social interactions. Therefore, each organization needs a specific number of workers, depending on the required activities. As argued by Nonaka [17], knowledge creation should be a process of diffusion and cataloging at the organizational level the knowledge that each individual member creates. A company thus is a treasure trove of intangible resources [18, 19], which constitute input resources that are indispensable for the creation and build-up of new knowledge within the organization. Material resources usually can be identified quickly, because they are material and tangible. On the contrary, knowledge assets cannot be defined or identified, though they are equally important from economic and managerial points of view. Knowledge assets thus develop from the concepts of enterprise and economy, which revolve around the creation of knowledge, which itself catalyzes various intangible resources [20, 21]. Enterprises contain heterogeneous knowledge, know-how, and managerial abilities, which usually support competitive advantages. In particular, distinctive competences, routines used, and implemented processes enable the development of greater knowledge and thus more income [22]. Strategic and managerial studies adopt varied conceptualizations of the concept of enterprise, including both the determination of (tangible or intangible) resources and the enunciation of various internal capabilities [23]. Specifically, the knowledge-based view (KBV) constitutes a fundamental essence of the resource-based view (RBV) [24], reflecting the importance of knowledge assets. For example, Winter [25] defines enterprises as “organizations that are aware of the actions they undertake,” such that in performing their own functions, they behave as “knowledge repositories” [26]. It thus difficult to separate the RBV from the KBV.

According to several authors [23, 27-30], the RBV cites knowledge as a resource that can generate information asymmetries and thus a competitive advantage for the enterprises that possess it. Reconsidering the general theory on the RBV and including knowledge assets among an enterprise’s intangible resources easily results in the KBV. If the term “acquired resources” from the general RBV proposed by Lippman and Rumelt [31] and Barney [32] gets replaced by “knowledge,” the result is KBV theory, and knowledge represents one of the

strategic factors for maintaining a competitive advantage [33-38]. For this reason, the creation and development of new knowledge, within the sphere of the KBV, is a main component of innovation, which in turn correlates with cultural heritage and a sustainable competitive advantage [32]. The knowledge produced and distributed within the organization is not only a strategic resource but also a useful tool for developing and expanding the company’s ability to respond promptly to unexpected events (threats and opportunities) in the external environment [38]. For example, decision-making processes cannot occur without an identification of the critical elements of company success, including the variables that enable the company to acquire a distinct position from competitors’. The process of converting company knowledge assets into useful information is complex; if ill-managed, this conversion process may slow decision making, which creates multiple problems for a company. In turn, the complicated Knowledge Management research topic can be analyzed with different approaches, in studies focused on socio-organizational, managerial, economic, financial, and administrative/legal issues. All of these studies have one thing in common: knowledge is a complex system that makes the knowledge assets of a company tangible and material. Furthermore, it can manage intangible assets, which are very important but also potentially risky in terms of the threats of poor management [39]. Finally, it remains difficult to define Knowledge Management (KM) explicitly [40]. The most common definition considers KM the combined processes or applications used to generate, transform, represent, store, transport, and protect organizational learning [40-44]. In this study, the term refers to a tool that integrates processes, technologies, and applications to generate, transform, represent, store, protect, reuse, and evaluate organizational memory, whose boundaries must be defined *ex ante* during the implementation phase. In this view, ECM platforms are advanced KM tools that are fundamental for the development of a competitive advantage, in that they simplify and speed up the management (creation, classification, storing, change, deletion) of information, increase the productivity of each member, and improve the efficiency of the system [45-47].

## ECM system and Resource-Based View

There is no universally accepted definition of Enterprise Content Management. However, existing research contributions exhibit a few common characteristics, and their differences refer less to their content and more to the foci researchers have used to describe, analyze, and interpret the platforms. For example, Browning and Lowndes [48] do not address a product or technology but rather the vast array of processes that enable the development and large-scale use of content contained in Web pages. For this Web-based Content Management System (CMS), the authors do not define functions or processes, but they characterize it as an aggregated system. With this approach, the focus of ECM

platforms is the development, integration, and automation of processes that support ECM. Smith and McKeen [49] use an integrated approach to manage company information, which they consider synonymous with company content, such that it also includes documents, reports, Web pages, and digital assets in general. Nakano [50] returns to the concept presented by Vidgen et al. [51] and redefines content management as a useful system for developing, managing, and maintaining enterprise content within one or more organizations. Therefore, ECM platforms must be complex systems that perform different company functions, using an approach based on processes. In this sense, ECM cannot be associated with a product or technology but must be identified as a series of macro processes that support the business, whose boundary is not clear or well defined [50]. In contrast, Reimer [52] focuses on company processes and analyzes the impacts of the system on the performance of these processes and organizational structures [53]. Nordheim and Päiväranta [46] consider these assumptions and define ECM as an integrated approach to managing company information (structured and unstructured), processes, strategies, methodologies, and skills across the entire life cycle (figure 1). The ECM integrates all data within the organization, whether structured or not, and thereby supports the distribution and sharing of content across its entire life cycle.

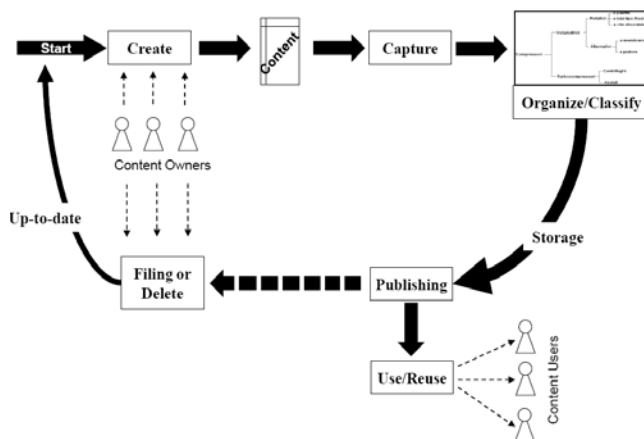


Figure 1. Content life cycle

Similarly, O'Callaghan and Smits [47] define content management as the methodologies, technologies, and processes used to classify and catalog company contents.

Enterprise Content Management platforms largely have been analyzed according to Transaction Cost Theory [45, 47, 49, 52, 54] and generally are described as useful for the reduction of ECM costs inside an organization [45]. Through empirical analyses, various authors have stressed that ECM tools increase efficiency and reduce management and research costs. Few studies consider the impacts of these tools on the organization or company processes. In particular, no research has highlighted the strategic role of ECM platforms in Enterprise Content Management [47, 49, 55, 56] as a

means to improve and speed up the decision-making process. Both KM tools and ECM systems in particular are “the eyes and ears for the control of company performance” [57]. To exert control or decide, it is necessary to manage information with high value added and in real time. At operational and tactical levels, the optimal solution is to have less information (in terms of quantity) at the right time to increase the value of the data and improve company performance [58]. By implementing an ECM system, the company has not only an effective means for creating, tracking, managing, and archiving all company content but also can integrate business processes, develop collaborative actions through the systemic organization of work teams, and create a search engine with specialized “business logic views.” Standardized contents and layout, associated with a definition of content owners and users (i.e., management of authorizations), and document processes support the spread of updated, error-free information to various organizational actors. By managing structured and unstructured content, an ECM platform increases the quantity [47] and quality of information that can be used by the organization and speeds up the research phase. This improvement in turn increases the input variables available to decision makers or in decision support systems. Such improvements relate not only to the quality and quantity of information but also to the speed with which it gets provided to decision makers. The time for the retrieval and receipt of information for the decision-making process correlates strictly with the decision itself, because even the best decision generates no value for the organization if it is implemented too late. In many instances, a late decision may even cause company inefficiencies and a loss in value. Similar to business intelligence systems, ECM platforms support decision making inside the organizations in terms of viewing and retrieving data and analyzing and sharing information—and thus increase organizational memory—as well as their storage and continuous maintenance along the life cycle of the enterprise (figure 1).

## The value created by ECMs: Alfa case study

### Scenario

The Alfa group produces and sells products and services for the building industry. In the past ten years, it has undergone a dramatic reorganization and developed internationally, from a matrix organization in the early 1990s to a holding form. At present, the company functions in more than 120 countries and employs more than 23000 people. Its earnings before interest and taxes (EBIT) from 2003 to 2007 almost doubled, reaching 340 million Euros in 2007. In 2008, the Alfa group made R&D investments of 133 million Euros (+14% compared with 2007), as well as hiring more than 1500 employees (+7%). As a consequence, even as sales increased (+5%), EBIT dropped to 260 million Euros. The critical feature was the

high volume of information inside the organization. Delays and inefficiencies in managing this knowledge generated serious organizational and productive inefficiencies, as reflected directly in its competitive advantage. The average time for the search, development, and marketing of a new product required approximately 24 months (time to market), compared to 19–20 months for its main competitors. By implementing an ECM system, the Alfa group intended to map and archive its explicit knowledge [21], contained within organizational memory. The company aimed to catalog all structured data in its Information Systems, then integrate them with the information contained within its unstructured data. The Alfa group therefore needed to maintain control over a large quantity of data and documents to reduce redundant activities and cut down wasted time used to track old data or documents or, even worse, to reconstruct them. To understand the potential impacts on the organizational structure, the group decided to experiment with and analyze the ECM platform preliminarily in its new product development (NPD) area, which represents a core business of the Alfa group and comprises several functions:

- Research and development of new products. In this phase, using market research, it discovers new needs of consumers and creates new models and prototypes that must be tested and evaluated by a group of preselected consumers. If approved, the products move on to the industrialization phase, testing, and marketing.
- Innovation, change, or elimination of products. Using information obtained from its customer relationship management (CRM) system, the Alfa group analyzes each product in its catalog (currently about 2500 items) to determine if it needs revision. Also in this phase, obsolete or unproductive products get discontinued.
- Control and management of product quality. The Alfa group uses basically three basic types of quality control: post-prototyping, pre-market (conducted by preselected consumers), and post-market quality controls.
- Management of production launch. After positive testing and evidence of consumer satisfaction, the engineering phase starts. In this phase, all components of the product are defined, as are the production time, production phases, and production site.

Approximately 50 content owners and more than 300 content users work in the NPD area, spread across Europe, the Americas, and Asia/Oceania. The organizational memory of this area consisted of approximately 80000 active documents, with another 20000 added each year.

In this paper, a qualitative data collection mechanism has been used, gathering information inferred from the analysis of documents on the company Intranet, and from meetings, brainstorming sessions and workshops held during the project implementation, as well

as interviews and observations (through shadow training) with the organizational actors directly and indirectly involved in the project.

## II. CONCEPTUAL FRAMEWORK

For the analysis of the NPD area, this study employs the action research method [59-65], and specifically Multiview2 [66]. The original Multiview concept assumed a continuous interaction between analysts and method, including the present situation and the future scenario that originated by application of the methodology. In some respects, the original definition was limited, in that it did not describe the function of each element and the trend of possible interactions [66]. Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework [67]. Multiview2 fills these gaps by taking into consideration the action and reaction generated by the interactions of the elements. The three macro-categories therefore must be aligned to conduct an organizational, socio-technical, and technological analysis [66, 68]. The theoretical framework adopted in the study of the New Product Development area may be summarized in the following four phases (figure 2):

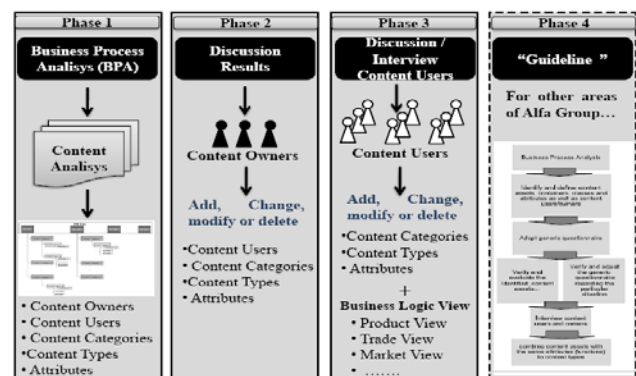


Figure 2. Theoretical framework [69]

The researcher provides a clear contribution that matches the theoretical framework used as a reference and measures and evaluates in subsequent phases the results obtained from those implemented actions. The researcher is not a mere observer but an “active participant” who uses (past and acquired) knowledge to lay out and improve the theoretical framework during practical experimentation. Research thus is cyclical and connects theory and practice [70]. To conduct an accurate analysis with Multiview2, the first step is defining the theoretical framework and planning related actions. For this study, the adopted theoretical framework entails content analysis [69], which consists of the elaboration of content, identification of content owners and users, and definition of content categories, types, and attributes. In a reiterated process, through observations and interviews with the main content

owners and users, the theoretical framework becomes aligned with reality, consistent with the approach derived from Multiview2. The definition and design of the theoretical framework and experimentation inside the division engaged the researchers in the field for six months, equivalent to 480 hours within the organization and 320 hours for the study and design of the theoretical component.

### III. FRAMEWORK TESTING

The existence, within organizational memory, of a huge amount of intangible resources constitutes a necessary but not sufficient condition to obtain a competitive advantage [71]. The main purpose of the processes and ECM system is to satisfy the specific needs of content owners and users [69]. A competitive advantage results only if the decision-making process improves, which helps perfect the processes of researching and classifying company contents. Information and knowledge within an enterprise help cut management costs, increase effectiveness and efficiency, and improve decision-making processes [72]. Therefore, using the company situation and established theoretical framework, the first phase carried out within the NPD division involved mapping company processes (business process analysis). Only processes directly related to content management were analyzed in detail.

Approximately 98% of the content included in the analyzed area was structured information, including Word files (~50%), presentations (20%), reports (10%), Excel sheets (8%), CAD drawings (about 5%), and product images (about 2%). In consultation with the chief information officer (CIO), two project managers, and a group manager, the research team decided to include only documents in the content category, which excluded other content that constituted less than 2% of the total (e.g. email). The processes and information contained on the company intranet also were analyzed using business process analysis, which revealed seven content categories: project manager, products, marketing, development, market, logistics, and sales. The categories contained 84 document types. The content analysis and process mapping enabled a definition of standard document types, based on the name of the document class, information content, and the document's macro-category. Including content inside the content category and content type occurs automatically, without support by users, through reading and interpretation of specific attributes within the document.

To apply Multiview2 to the Alfa group, after the definition of the theoretical framework (figure 2) and current scenario, the next step involved testing the findings generated by the content analysis in an effort to match theory and practice. Through workgroups and interviews with selected content owners (three product managers, two quality managers, one trade manager, two project managers), the content types obtained from the analysis of the company processes and content analysis

were integrated, modified, and eliminated, as appropriate. Specifically, the sales, market, and product categories were eliminated, and the content types included within them were reshaped and moved to preexisting or new categories. At the end of this first phase, the model fit real processes with a reliability rate of 84.7%. According to the Multiview2, this value was not high enough to be regarded as valid for the model. Hence, the third phase tested the model with another sample of content users and owners.

During this meeting, all types of content identified through the content analysis and interviews with the first group of content owners were re-elaborated. Together with the content owners and users selected for the interview, this step defined the types of standard digital assets (content types) contained in the organizational memory of the NPD area, namely, the name of the document class, information content, and the reference document's macro-category (content category). The standardization process for the information and primary and secondary characteristics of the document formats enabled grouping together or eliminating some document types (reduced from 118 to 52). The new classification also supported cataloging and certifying knowledge within the NPD area, which in turn offered homologation of the documents, content, and access to information. Following this approach, the various process owners can modify or create only a few of the 52 types (e.g., Report Repair Test, Plan Field Test, Project Risk Assessment, Prototype Test Results). Moreover, within a selected document, they can access only some available contents. To speed up search and storing, the 52 content types with similar characteristics were grouped and assigned to nine content categories.

Finally, the last step consisted of defining secondary characteristics ("metadata") for each document category. The metadata helped speed up and improve the search for information by providing users (e.g., quality managers, project managers, technical staff, administrative staff, researchers, repair staff) with a specific search engine that can be customized according to their needs. Running the conformity test of the theoretical framework on the company reality, the model fit real processes with a reliability rate of 99.7%.

### IV. DISCUSSION

As part of the analyses carried out with the Alfa group's NPD area, this study investigated the benefits generated by the ECM system with respect to the decision-making process and the general competitive advantage. For the "as-is" situation analysis, the content analysis, interviews, workgroups, meetings, and brainstorming included the participation of the CIO, project manager, group manager, three product managers, two quality managers, one trade manager, four project managers and about twenty content users. They revealed that time is a useful and valuable resource, and much of it was wasted performing unproductive, low added value jobs. The interviews and shadow training sessions consistently



provided comments such as, “I cannot spend half of my day searching for information on the intranet” or “I spend too much time searching and waiting for information and when I find it oftentimes I am not sure of which one is correct. Therefore most of the times I have to rewrite myself the same contents.” All interviewed organizational actors felt the need to access all necessary information quickly to support the effective operations of their decision-making process. These delays and inefficiencies in managing knowledge generated serious organizational and productive inefficiencies, as reflected directly in the lost competitive advantage by the Alfa group. As noted previously, it needed an average of 24 months to research, develop, and sell a new product, largely because its growth and internationalization led to an exponential growth in structured and unstructured information content. Together with “non-optimal” Knowledge Management, these elements combined to create a deadlock with uncontrolled increases in inefficiencies. To improve company performance, it had to transform passive contents into active sources. The most stringent need was to manage and coordinate the entire information life cycle in a unified way (figure 1). By implementing the ECM system, Alfa not only gained an effective system for creating, tracking, managing, and archiving all company content [54] but also has achieved an integration of business processes with the development of collaborative actions through a systemic organization of work groups and a sophisticated search engine specializing in business logics (e.g., trade, market, product view). Experimenting with the final model obtained from the NPD area reveals that the standardization of processes, company contents, and layout for defining content owners and users gives various organizational actors constantly updated and error-free information in real time. The interviews and shadow training sessions with a sample of 20 content users and 10 content owners indicated that the platform has improved the quality of used information, defined as the ease with which users can retrieve useful, thorough, reliable, clear information for their decisions, by 65%. In addition to improved quality and quantity of input information, the primary and secondary attributes of the search engine inside the ECM enable users to speed up their information retrieval. The average decrease in time observed during the first phase of testing was about 40–45%. To test overall ECM platform performance, a “sample” product indicated the time past across the initial phase, market search, and the test phase. The result was a significant decrease in the time to market, from 24 months before the installation of the ECM system to about 18 months in the post-implementation phase.

## V. CONCLUSIONS

With its focus on the importance of contents and knowledge for competitive advantage [24, 38], the KBV serves as the reference theory to interpret the case study [21, 34, 73, 74, 75]. The knowledge and enterprise content generated thus can be interpreted not only as strategic

resources to achieve or maintain a competitive advantage but also as useful tools for developing and expanding the company’s ability to respond promptly to unexpected events in the external environment [38] and therefore perfect decision making within the organization. To validate the assumption of correlations between the competitive advantage associated with improved decision making and content management through ECM platforms, this research uses case study methodology [76], which is qualitative approach. Through a reiterated, recursive process, in accordance with the action research method, the experimentation led to a mutual adaptation of the theoretical framework to the conditions of the environment. The actions within the framework partially, and in some cases totally, modified the document processes, contents, information formats, actions taken to access the documents, and work routines for the NPD area. The case study shows that implementing the ECM system enabled the company to reorganize the area completely. The 60% increase in the quantity of manageable information also enhanced explicit knowledge within organizational memory, improving its distribution within the Alfa group and encouraging the creation of a “knowledge spiral” [21]. Furthermore, the results provided a classifier, within the document management system. Together with the ontological search engine, this tool improved the quality of the information by 45% for NPD content owners and users. This aggregated value mainly consisted of four weighted variables: time to retrieve content (35%), thoroughness of content in the documents (30%), reliability and clarity of searched information (25%), and update and versioning of used documents (10%). This test revealed the improvement of the time between the search/development phase of a new product and its marketing. The ECM system thus optimizes information management in organizational memory, perfects the decision-making process, and improves company performance through time to market and competitiveness. It was possible to validate the initial hypothesis in the Alfa group at the origin of this work; the ECM platforms contributed to improving the decision-making processes within the organizational structure, in that they enabled a process of rationalization and shared wealth in the form of explicit knowledge inside an enterprise.

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