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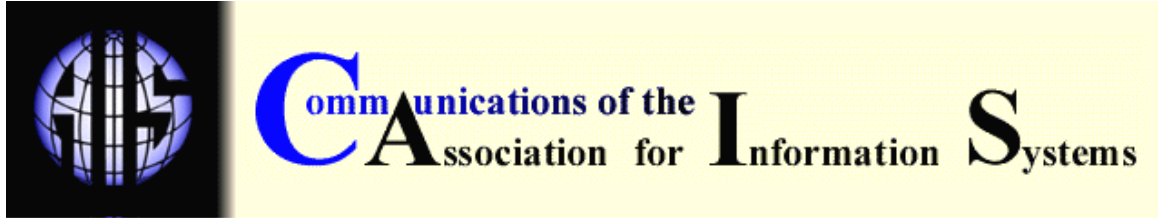
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AN ANALYSIS FRAMEWORK FOR THE EVALUATION OF CONTENT MANAGEMENT SYSTEMS

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ABSTRACT

The content published on the Web never stops growing. It is becoming essential to efficiently manage it. Organizations are increasingly searching for more efficient and feasible ways in which to manage the content of their websites. Content Management Systems offer a solution by facilitating the creation of websites and providing content management. Many organizations are now using Management Content Systems. This increasing interest is apparent in the growing market of such systems and in the updates of existing systems.

For an organization, the choice of a Content Management System is not easy, since this is a dynamic market shared among many different publishers. The offer evaluation process requires specific tools. In order to help these organizations in their choice, we have attempted to provide an analysis framework for these applications.

This analysis framework designed to help organizations choose their application contributes to the evaluation of these applications. This article puts forward a Content Management software analysis framework and explains its application to a sample of 23 products. The size of this sample allows us to asses the strategic grouping of Content Management Systems. Effectively, the analysis results in the identification of two strategic groups whose main differences lay in the software characteristics and their target markets.

Key words: Content Management, Content Management Systems, software market, software evaluation, strategic group.

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I. INTRODUCTION

The communication possibilities offered by the World Wide Web have led to an explosion in the number of websites, as well as in the richness of their content. This obvious trend is clear in the creation and management of Internet, Intranet, and Extranet sites. However, economic concerns require an increasingly efficient management of websites. Thus, organizations are searching for solutions facilitating the development of web initiatives while limiting the use of organizational resources. To respond to this demand, publishers have developed Content Management Systems offered as a support for web publishing of information using a simplification of web and content management processes.

Organizations were quick to respond to this new offer. Surveys in the Content Management Systems sector [BCR, 2002; Gartner, 2001; Gavazzi L., 2002a; McKean D., 2002] show that sales figures in this market are steadily growing. Organizations are adopting this solution. However, they have some difficulty evaluating these applications due to the inexistence of a specific analysis framework.

At the same time, Content Management System publishers are investing in software development directly resulting in constant updates and new developments. As a result, the position of Content Management Systems on the market is not very stable. Also, understanding of the Content Management System market distribution is obscured due to the fact that publishers have not yet been sufficiently established.

This research material will fulfil the two above-mentioned needs: i.e., the need for an instrument for the analysis of Content Management Systems and the need of an instrument to understand the strategy of publishers.

This article aims to describe the two tools built by this research conducted on the analysis of a sample of 23 content management applications.

II. THEORETICAL AND PRACTICAL SITUATION

DEFINITIONS

Unsurprisingly, on the application market the term "Content Management System" is generally used for sales reasons while there is no real recognized general term which sales persons may use. As a result, Content Management Systems are often confused with similar applications, particularly with Document Management Systems and Knowledge Management Systems.

In the context of our research, CONTENT refers to the information published on a given website [Pickett J. P., 2000]. This information may take many different forms, from the simple ASCII format to the most advanced multimedia formats [AIIM, 2002]. From the moment that the information is published on a website it is considered as content regardless of its format. Given this definition, web pages are documents made up of this content, a DOCUMENT is defined as an object containing certain information [Pickett J. P., 2000]. Content must not be confused with KNOWLEDGE, defined as "a mix of experiences, values, contextual information and expertise providing a framework for the evaluation and integration of new experiences and new information" [Davenport, T. H. and L. Prusak, 1998]. Davenport [Davenport, T. H. and L. Prusak, 1998] state that it is in the mind of protagonists that knowledge is generated and applied. Thus, CONTENT may be a source of Knowledge for a protagonist, but cannot be considered to be knowledge itself.

CONTENT MANAGEMENT is generally defined as the sharing of vital organization information [Bradley M., 2002]. Given that the definition of content is limited to the information presented on a website, content management therefore only refers to the management of website content [Hackos J., 2002; Robertson J., 2002b].

A CONTENT MANAGEMENT SYSTEM is defined as "an application permitting the creation, collection, management, publishing and modification of website content" [AIIM, 2002]. The difference between Content Management Systems and Document Management Systems/Knowledge Management Systems is as great as the difference in the definition of content and document/knowledge. In fact, DOCUMENT MANAGEMENT SYSTEMS are applications used to collect, manage, store, and distribute documents [AIIM, 2002; Sprague R. H. J., 1995], while KNOWLEDGE MANAGEMENT SYSTEMS are applications used to collect, manage, store, and distribute knowledge [AIIM, 2002; Alavi M. and D. E. Leidner, 2001].

THE CONTENT MANAGEMENT SYSTEMS MARKET

The Content Management Systems market is a very new market. The first Content Management System was put on the market in 1998 [Wilkoff N., 2001]. If we consider the standard lifecycle of a product [Gavazzi L., 2002b] then we can say that Content Management Systems were in the introduction phase in 2000 [Wilkoff N., 2001] and that they entered the growth phase near the end of 2002. Market studies [BCR, 2002; Gartner, 2001; Gavazzi L., 2002a; McKean D., 2002; Wintergreen Research, 2005] predict a considerable increase in the sales of Content Management Systems in the upcoming years (Figure 1); as well as, a sharp increase in the awareness of the need of organizations for Content Management (Figure 2) given that the expansion of this market is positively related to the growth of electronic business [Howard P., 2001]. However, the market increase may be curbed by potential customers who decide to develop their own Content Management System rather than buying a finished product. Frost & Sullivan [BCR, 2002] estimate that 70% of potential customers have already developed their own Content Management Systems.

While the Content Management Systems market expands, the products are continually changing as new functions are constantly being added to the previous ones and the technology used is increasingly advanced. Wilkoff [Robertson J., 2002a; Wilkoff N., 2001] highlights the fact that the growth in the number of functions of Content Management Systems has never stopped, while Gavazzi [Gavazzi L., 2001] notes a continual growth of the information type managed by Content Management Systems. Some of these new functions are typical of applications such as Knowledge Management Systems and Document Management Systems. The breakdown of the frontiers between these different types of system will, probably, eventually lead to the replacement of independent Content Management Systems by integrated solutions [Brooks J. D. and M. Princi, 2001; Howard P., 2001; Wilkoff N., 2001].

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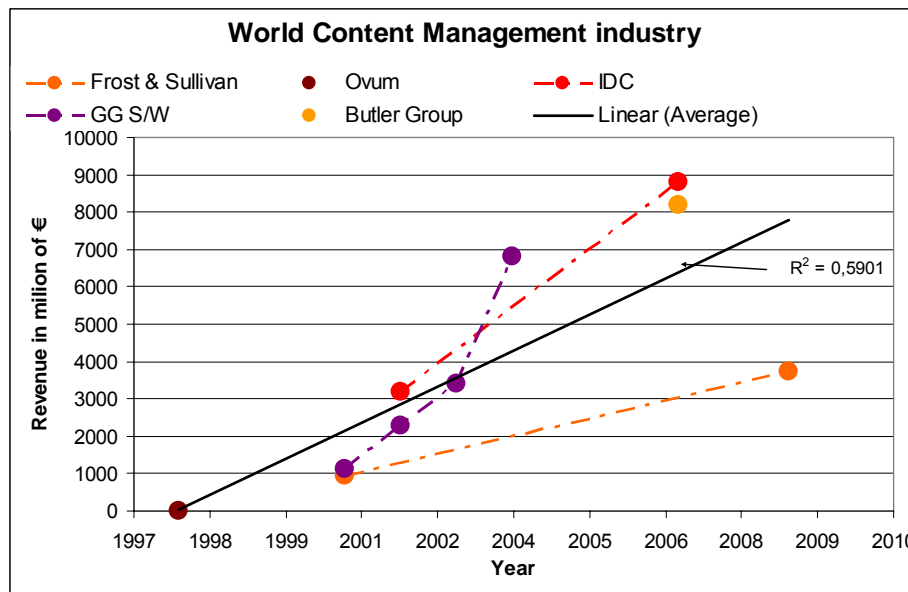
Research company	Revenue in billions of $	Year	References
Frost & Sullivan	0,83	2000	[BCR, 2002]
IDC	2,8	2001	[McKean D., 2002]
IDC	8,3	2006	[McKean D., 2002]
Butler Group	7,2	2006	[Gavazzi L., 2002a]
Frost & Sullivan	3,27	2008	[BCR, 2002]

Figure (and detailed table) 1: The Content Management Systems worldwide market (synthesis based on the main market studies available)
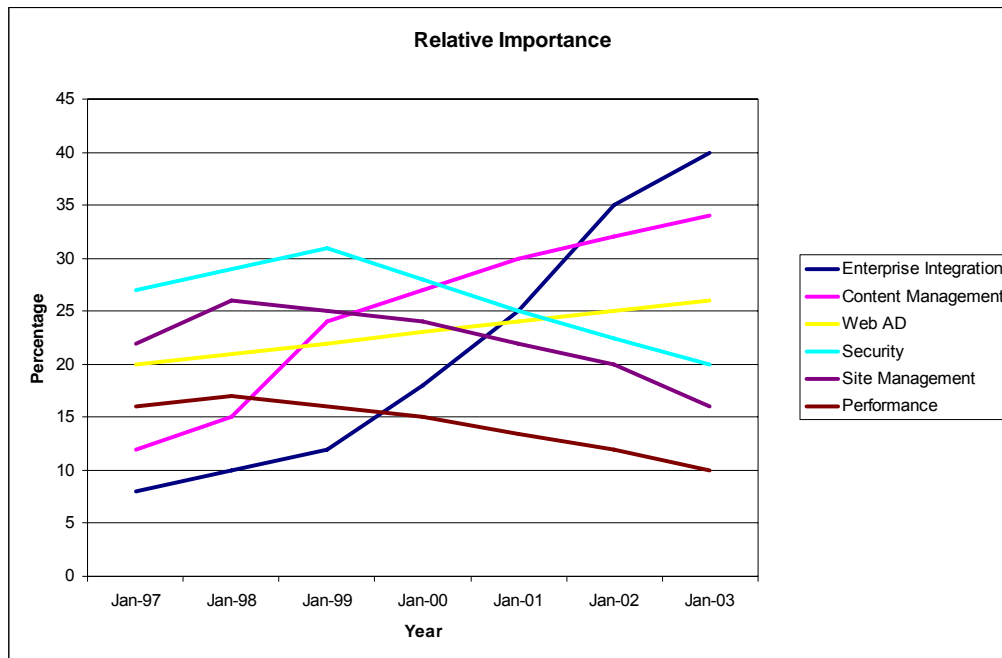
Figure 2: The relative importance of Content Management [Gartner, 2001].

STUDY PROBLEMATICS

There is a great variety of Content Management Systems on the market and these systems are in constant technological development. Therefore, organizations have difficulties to evaluate this systems. They do not possess tools for their evaluation and academic research offer few resources for the evaluation of these products. In this context, the choice of the most suitable Content Management System for the needs of an organization seems to be a difficult one for the organization protagonists. Also, this new market is relatively unknown and the strategies adopted by the Content Management System vendors have not yet been fully implemented.

Thus, this study specifically aims to identify the strategies of Content Management System providers and to provide an analysis framework of these products for the protagonists within organizations as a decision aid.

III. CONCEPTUAL FRAMEWORK

This study belongs to the general problematic regarding the evaluation of Information System (IS) and, more specifically, to that of professional business applications [Morisio M. and A. Tsoukiàs, 1997; Punter T., 1995]. The evaluation of an IS is done using an evaluation of its characteristics, based on specific procedures, in order to judge the suitability of IS properties to the user [Punter T., 1995]. This study is concerned with professional market applications sold as completely developed computer products [Beus-Dukic L. and J. Boegh, 2003; Kunda D. and L. Brooks, 2000; Oberndorf P., 1997; Sawyer S., 2000; Software Engineering Institute, 2004; Torchiano M., et al., 2002; Yakimovich D., 2001]. These programs are thus not developed for a particular customer, but rather are designed for a particular category of customers [Carney D. J., 1998]. Consequently, the issues of prepurchased software evaluation are crucial for investment success.

Different application evaluation frameworks are put forward regarding the subject (International Standard Organization [International Standard Organization, 1991], IBM [Albrecht A. J., 1979], Jeanrenaud [Jeanrenaud J. And P. Romanazzi, 1994], Kontio [Kontio J., 1995], Tran [Tran V. and D. B. Liu, 1997], Maiden [Maiden N. and C. Ncube, 1998], Kunda [Kunda D. and L. Brooks, 1999], Hallikainen [Hallikainen P., H. Kivijarvi and K. Nurmimaki, 2002]). However, according to Garmus D. and D. Herron, (2001), no evaluation method has yet been clearly selected due to the difficulties in using these.

We hope to contribute to this body of work by proposing an analysis framework in this article distinguished by its simplicity and ease of application.

IV. METHODOLOGY USED

To correctly complete this study, four phases are required:

1. Construction of a Content Management System analysis framework;

2. Construction of a framework to identify the strategies adopted by Content Management System suppliers;

3. Collection of data; and

4. Application of the two analysis frameworks to the collected data.

A CONTENT MANAGEMENT SYSTEM ANALYSIS FRAMEWORK

This framework is partly based on previous research concerning Content Management Systems [Nakano R., 2002; Robertson J., 2002a; Wilkoff N., 2002] and also on the actual characteristics of the Content Management Systems we have studied.

The existing literature, as well as our direct experiences with the Content Management Systems led us to offer five main characteristics for our analysis framework:

- the Content Management System functions;

- the technology used;

- the services proposed;

- the marketing strategy used by the vendors; and

- the vendor targets.

We then made a list of all parameters for each characteristic.

The functions offered by Content Management Systems

The functions gather the characteristics responding to customer needs together. A function is defined as all the operations with one common objective. Each function may be characterized using a set of elements, defined as aspects. The aspects are the parameters used in the analysis framework in order to evaluate the Content Management Systems. The aspects describing the functions, globally described below, are presented in Table 1.

Creation of Content

This function deals with the manner in which content is created. It implies the definition of the authors (content creators), the author rights, and the context of creation. In other words, the website where the content will be published.

The content creation can be done directly using the Content Management System, either with the available documents or created using different applications, such as text editors or image edition programs and then imported into the Content Management System. The content previously stored in the Content Management System may be edited and reused.

The content may also be directly created using HTML or any other language designed for web pages. Furthermore, content may be created by simply using a text editor; in this case, no particular technical skills are required.

Macros may be added to the content to facilitate searching. Given that content creation is inevitably linked to the context in which it is published, we also include the definition of the structure and organization in this function. Particularly, since the structure of a website is determined by hypertext links between the pages, the Content Management System should be able to search both internal and external links.

Finally, this function must support the prepublication of the website for testing functionality before the finished publication.

Activity Flow

The objective of this function is to define the flow of activities allowing the creation, approval, revision, and the suppression of content. The Content Management System may assist the activity flow on different levels of complexity and the generation of activity links, as well as the tractability of web users.

Storage and Monitoring

This function is used to validate internal and external data, content storage, and to discover the content version.

Publishing

This function defines the manner in which content will be published and updated on the Web site, as well as the way in which it will be deleted. This includes the definition of sheet style, the content format, and the manner in which pages are generated. Content Management Systems may be divided into two groups: static Content Management Systems generating static HTML pages, and dynamic Content Management Systems generating elaborate dynamic pages using the Web server in response to website visitor requests.

We should observe that Content Management Systems must generate small size files conforming to the international standards on web site publication. Also, ideally the Web pages created by the Content Management Systems should be compatible with the most popular browsers and with the technology used by customers. Content Management Systems must allow easy update of published formats so that they remain coherent with the evolution of standards regarding web page creation.

Internationalization

This function will permit the selection of different user interface languages and may also manage the translation of content parallel to the version management.

Document Management

This function will be used to organize the data and documents in order to distribute them among users and organizations. It will define the policies of use controlling access, display, and modification of documents.

Table 1**:** Parameters used to characterize functions

Functions	Aspects
Content creation	Users' definition
	Users' right definition
	Web site structure definition
	Content creation through the CMS
	Content importing from documents created through non-CMS applications
	Knowledge of HTML required to authors
	Knowledge of scripting language required to authors
	Knowledge of other editing languages required to authors
	Metadata definition
	Templates definition
	Internal links correctness verification
	External links correctness verification
	Simulation or pre-publication of the web site
Support to the content creation process	Definition of the authorization processes
	Definition of the reporting of content management activities
	Definition of tracking of hits on the web sites
Storage and control	Content check-in and check-out
	Storage of contents in a repository
	Versioning (version control)
Publication	Stylesheet definition
	Content dynamicity
	Content format: html, asp, jsp, php, hta, cgi, etc.
	Client-side technologies adopted (compatibility with browsers: Internet Explorer, Netscape Navigator, Opera, Amaya, Mozilla, etc.)
	Client-side technologies adopted (plug-ins needed: Flash, Real Audio, Quick Time, Media Player, etc.)
	Publishing format updating
Internationalization	Languages that can be set (English, French, Spanish, German, Japanese, Chinese)
	Parallel management of translations and versions
Document Management	Documents check-in
	Documents storage in repositories
	Definition of access rights
	Definition of the process of documents management
	Versions control
Knowledge Management	File search
	Content search
	Semantic analysis of contents
	File sharing
	Email system
	Real time messaging
	Discussion groups
	Message board
	Users profiling

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Knowledge Management

This function will provide assistance in knowledge research as well as be a collaboration aid.

As mentioned above, the characteristics of Content Management Systems are growing in number. This trend will undoubtedly increase significantly in the future as the evolution towards an integrated system appears. For these reasons the "document management" and "knowledge management" functions have been included here in order to complete the description of Content Management Systems.

Technological aspects of Content Management Systems

Besides the various functions, one important distinguishing factor between Content Management Systems concerns the technical solutions adopted by developers. The aspects chosen for the technological approach used are the following:

Architecture: This includes the number of required servers, the degree of the Content Management System modularity, as well as the programming language and the development environment adopted.

The channels: These allow the delivery of content published by the Content Management System using other channels than the Web.

Scaling: Scaling means that the Content Management System may be extended or reduced in its complexity in order to better suit the requirements of organizations adopting it.

The customer platform: This aspect will indicate the software required by the user in order to utilize the Content Management System correctly. More precisely, it will indicate the nature of the operating system (such as Windows, Linix, Mac), the type of browser (Internet Explorer, Netscape Navigator, Opera, Amaya, Mozilla), and the type of any other application used.

The server platform: This aspect will define the type of software required for the server in order to execute the functions where the Content Management System is installed. More precisely, it will indicate the operating system (Linux, Unix, Microsoft Windows NT, 2000, XP, Sun OS, OS 400, IBM OS 2, VMS, BeOS), as well as the type of web server (IIS, Apache, BeaWebLogic, IBM WebSphere, and any other J2EE server).

The database: This aspect indicates the database management system (Oracle, MS SQL Server, DB2, Sybase, Informix, MySQL) compatible with the Content Management System in order to connect it with the organization Information System.

Sharing: This aspect takes into account the possibility of sharing content with other organizations using the Content Management System.

Marketing strategy adopted by Content Management System providers

Potential Content Management System clients evaluate functions, technical solutions, and services according to the marketing strategy established by vendors [Harrell G. D. and L. F. Gari, 1999]. Therefore, it is important to include this aspect in the evaluation of a product by analyzing the traditional elements of marketing activities:

The distribution channels

The most usual are [Allen, 2002] :

- ASP: Application Service Provider. This method directly reduces the costs resulting from implementation, given that the application is only installed on ASP servers and the customer has access only by an Internet connection. Moreover, ASP includes activity maintenance and, until now, this method of distribution satisfies the needs of companies

that do not necessarily have the essential qualified interior personnel dedicated to handling the Content Management System.

- Licence distribution: This is the typical type of solution used by large companies who have the qualified human resources to manage Web sites characterized by a large number of pages and frequent updates. In actual fact, managing such Web sites using ASP would considerably increase costs above the advantages of ASP solutions. With the sale of a license, the vendor may also provide implementation and integration services.

The price
The price will include either periodic costs, or the price of a license and costs of application installation.

Promotions
Promotion involves any activity seeking to promote the development of a new product, the company strategy, and the product strategy.

The marketing target
This final list of aspects will provide identification of competition advantages resulting from the segmentation of the market operated by Content Management System vendors.

Geographic variables
These variables concerned countries and regions involved in the business activity.

Demographic variables
These variables are linked to the type of industry targeted, the Industry activities as well as the size of the potential client companies.

The financial variables
The budget that the potential customer may invest in the Content Management System is the main parameter characterizing the financial aspect.

The purchase and operation variables
These aspects concern the type of needs and characteristics to which the Content Management System attempts to respond. For example, here we are interested in the organization's methods for managing documents (what the levels of integration and automation of the Information System are), the quantity of data handled by a company in a given time unit, the complexity, the efficiency, the employee expertise, and so forth.

AN ANALYSIS FRAMEWORK FOR THE IDENTIFICATION OF STRATEGIES

Parallel to the definition of an analysis framework for Content Management Systems, we have developed a framework for the identification of the strategies used by Content Management System vendors. For the second framework, we chose the strategic groups model. The following section justifies this choice by a review of the literature about this model. It also explains the way in which this model was used in this research.

Review of the literature
The relationship between strategy and groups was introduced by Porter. He suggested that an industry may be considered to be composed of groups of companies identified by similar strategies [Porter M. E., 1979], where the group is identified using dimensions such as specialization, brand identification, product quality, and leadership technology [Porter M. E.,

1980]. Consequently, Aaker [Aaker D. E., 1984] expressed an idea according to which the analysis of strategic groups is an approach that may be used to identify key strategic variables in an industry. An in-depth examination of groups of companies adopting similar strategies provides concise and useful indications about the competition market and on the behaviour of organizations.

Day [Day G. S., 1984] used strategic groups in order to empirically determine the type and complexity of competitive advantages and to reveal the differences in strategies adopted by competition which explained differences in performance.

Keneeth J. Hatten [Hatten K. J. and M. L. Hatten, 1987] defined the strategic group as being "a group of organizations applying similar strategies and possessing similar resources". According to the author, the strategic group represents a powerful analysis tool [Hatten K. J. and M. L. Hatten, 1987; Simon H. A., 1964]. The groups may be used to preserve information about individual companies that is usually lost in industrial research using aggregated and averaged data. Also, the groups offer the possibility of analyzing several firms simultaneously. Finally, the analysis of groups may be used to summarize information in order to highlight key dimensions. In other words, to provide an understanding of the consequences of the collective movement by several firms with equal competition status or to verify similarities in strategic plans within a sector.

More recent studies confirm that the analysis of strategic groups may be used to identify companies who have gained a competition advantage on their rivals in a sector [Claver-Cortés E., J. F. Molina-Azorin and D. Quer-Ramon 2003-2004; Grover V. and K. A. Saeed, 2004; Hoyt J. and H. Sherman, 2004; Jianyuan Y. and Y. Ou, 2005; Soh C. S. Das and K. H. Goh, 2005]. In particular, Barbarito [Barbarito L., 1997] analyses different approaches to strategic groups and highlights a general framework based on the selection of the grouping method and on the identification of key variables.

Research model

The approach adopted by Barbarito takes five grouping methods into consideration. For each method Barbarito [Barbarito L., 1997] highlights the advantages and disadvantages. Corresponding to the main objectives of this research, an evaluation of the advantages and disadvantages lead us to select Porter's approach to strategic groups [Porter M. E., 1980].

Porter's approach bases grouping on two strategic dimensions called the key critical variables. This grouping requires the selection, from among all the key variables, of two dimensions considered to be strategically significant for the industry. As there is no statistical method for identifying key variables, identification is done by an expert. For each firm analyzed, the values of the two key variables are collected. Based on this data collection, each firm is represented by a point on a plane where the axes represent key variables. Grouping is completed by the identification of groups on the plane. In fact, special representation immediately displays the position of companies according to the key variables and can be used to group companies according to the similarity of the values of two variables.

The use of two key variables makes this approach particularly simple. However the simplicity of this approach has certain limits in that it is incomplete (only two variables cannot, of course, take the complexity of an industry into consideration). Also, in general, a comparison between different industries is possible when these two industries have the same key variables. The validity of the key variables is only based on the opinion of experts given that there is no statistic validation of the results. Finally, the possible change in two key variables will have a significant influence on the position of firms given that the selection of different variables will generate very different maps [Barbarito L., 1997].

Nonetheless, the validity of Porter's approach has been verified by other authors: Harringan [Harrigan K. R., 1980], Frazier [Frazier G. L. and R. D. Howell, 1983], Hinteruber [Hinteruber G., 1984]. The above mentioned disadvantages, as well as the appreciation of these authors, lead us to modify Porter's approach by adding a third key variable to the map.

Given the objectives of this research, a review of the relevant literature was made in order to choose the correct key values. The research available about the Content Management Systems industry [Askania, 2001; Gartner, 2001; Pelz-Sharpe A., A. Ashenden and C. Harris-Jones, 2002; Reynolds J. and A. Kaur, 2000; Robertson J., 2002a] suggests taking into consideration customer needs regarding completeness, practicality, and level of technology. These three variables were approved by an expert from the field.

Data collection

The list of Content Management Systems to be analyzed was composed by selecting the systems listed in the above mentioned research. In order to put together the most varied list, a review of professional journals traditionally dealing with software problems was done parallel to research using several different search engines on the Web. Among the systems found, we selected the Content Management System vendors with the largest turnovers on the Italian market, as well as the vendors with the highest turnover in the world. The resulting list of systems includes 30 Content Management System products sold by 25 different vendors.

However, while collecting this data some vendors were removed from the list when it became apparent that their offer did not concern Content Management Systems, but rather Document Management Systems (such as Hummingbird or Banc Tec). This reduced the list to 23 systems developed by 19 vendors (see Table 2). Some vendors offer different versions of Content Management Systems.

A database corresponding to the proposed framework was developed. The data was mainly collected from testing the Content Management Systems, by detailed examination of the vendor Web sites; and by other sources of information such as magazines, reports, articles, and other Web sites. Every time that the information was incomplete, an email was sent to the vendor sales service department in order to collect the missing information.

The applications of frameworks for the analysis of Content Management Systems

We proceeded with the examination of the five characteristics belonging to our analysis framework. To do this, we considered one system at a time and, regarding the functions, each time a given aspect was present in the Content Management System analyzed we assigned a score +1. When an aspect was not present, a score of 0 was applied. As another possibility, when the data collection regarding an aspect was not possible we used the sign NR (Not Remarked in the data) to mark this aspect. For each system, the score of a function is determined by adding the scores obtained by the corresponding aspects of this function. An overall score for the system is calculated by simply adding the scores for each function of Content Management System. However, in order to take the "not remarked" (NR) aspects into account, two values characterized all of the Content Management Systems: the minimum value, corresponding to score calculated regarding the aspects present, and the maximum value, corresponding to the possible score for a system if all the aspects for which we could not collect data had been present in the application. These two maximum and minimum values represent a measure of product completeness or, from another point of view, describe the extent of the Content Management System. Also, in order to increase the relevance of this measure for the comparison of Content Management Systems, all the aspects present in all of the systems analyzed, and all the aspects absent from all of the systems analyzed were excluded from this comparative table.

The technological aspects were examined using same approach. Each time an aspect was present a score of +1 was given. When an aspect was not present, then a score of zero was attributed and, finally, when it was impossible to find information regarding this aspect the sign ABS was used. As with the functions, for each Content Management System all the scores were added up: the two values resulting from this addition (the minimum score and the potential maximum score) can be used to measure the technological level of the system.

Table 2**:** Content Management Systems and the vendors analyzed in the research

CMS vendor	CMS Product name	Version	Offered since
Kora	Timeo	2,0	30/06/02
Vignette	Content Suite	6,0	30/01/02
Vignette	Content Suite with Extentions	6,0	30/01/02
Reddot Solutions	CM Server Express	4,5	06/05/02
Reddot Solutions	CM Server Professional	4,5	06/05/02
Evectors	IdeaTools	2,5	07/09/01
BroadVision	BroadVision CM	6,0	05/11/01
EidosMedia	Méthode	not available	01/11/01
Interwoven	TeamSite	5,0	24/04/02
B Human	B Site	2,1	01/03/02
TXT e-solutions	Polymedia	1,0	10/11/01
Microsoft	CM Server	2001	01/02/01
Documentum	4i ECM	4,0	29/04/02
FileNet	WCM (ex eGrail)	1,0	01/04/02
Infotecna	QuickWeb	1,1	01/04/02
Infosquare.com	Openshare	2,2	01/05/01
Ektron	CMS100	1,0	09/10/02
Ektron	CMS200	1,6	08/05/02
Ektron	eMPower	3,6	27/02/02
Handshake Technologies	HeliumServer	1,5	01/03/02
IdeaFutura	FlexCMP	not available	not available
NetSinergy	do-IT	not available	not available
Noze	Inflow	1,0	01/05/02

The third characteristic in our framework, regarding the services offered by the system supplier, is examined from a point of view of services offered during the implementation and integration of the product.

The marketing aspect is examined using the following information: the price of the system, the distribution channel used, and the key marketing aspects of the product and of the company.

Finally, the last characteristic in the framework, the marketing target, is examined by concentrating on the market segments that each product attempts to fill. The aspects of the marketing target are approached by identification, for each system, of the market segmentation criteria regarding geographic, demographic, financial, purchasing, and operational variables.

V. THE RESULTS

Each Content Management System was studied and analyzed based on five characteristics of each analysis framework. The main results are presented in the tables below. In the following five tables, each system (columns) is described using the functions (Table 3), technology (Table 4), services (Table 5), marketing (Table 6), and marketing targets (Table 7). The lines of each table list the aspects considered in the analysis. The character (○) indicates that the aspect considered is absent from the system while the character (●) indicates its presence. Finally, at the bottom of each table for each system, two total values are indicated: a minimum value (the minimum number of aspects present in the system) and a maximum value (the potential maximum number of aspects present in the system taking into account that the information concerning the presence of certain aspects could not be obtained).

Table 3: Analysis results of the functions offered by Content Management Systems

Product name / Vendor name	En théorie	Timeo (Kora)	Content Suite (Vignette)	CS Extentions (Vignette)	CMS Express (Reddot Solutions)	CMS Professional (Reddot Solutions)	IdeaTools (Evectors)	CM (BroadVision)	Méthode (EidosMedia)	TeamSite (Interwoven)	B Site (B Human)	Polymedia (TXT e-solutions)	CM Server (Microsoft)	4i ECM (Documentum)	WCM (FileNet)	QuickWeb (Infotecna)	Open-share (Infosquare.com)	CMS100 (Ektron)	CMS200 (Ektron)	eMPower (Ektron)	HeliumServer (Handshake Technologies)	FlexCMP (IdeaFutura)	do-IT (NetSinergy)	Iniflow (Noze)	Diffusion
Content creation																									
Content importing from documents created through non-CMS applications		●	●	●	○	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	NR	○	19
Metadata definition		●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●	○	●	●	●	21
Template definition		●	●	●	●	●	●	NR	●	●	●	●	●	●	●	●	●	●	●	●	●	NR	●	NR	20
Internal link correctness verification		●	NR	NR	●	●	○	NR	●	NR	○	NR	NR	●	●	○	●	○	○	○	●	NR	●	NR	9
External link correctness verification		○	NR	NR	●	●	○	NR	○	NR	○	NR	NR	●	○	○	○	○	○	○	○	NR	○	NR	4
Simulation or pre-publication of the web site		●	○	●	●	●	●	NR	●	●	●	○	●	●	●	●	○	●	●	●	●	NR	●	NR	17
Knowledge of HTML not required to create content		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	22
Support to the content creation process																									
Definition of the authorization process		●	●	●	●	●	○	●	NR	●	○	●	●	●	●	○	○	●	○	●	○	○	○	●	16
Definition of the reporting of the CM activities		●	●	●	○	○	○	○	NR	●	●	NR	NR	●	●	○	○	○	○	○	○	NR	○	NR	7
Definition of the tracking of hits on the web sites		○	●	●	○	○	●	●	NR	NR	●	NR	NR	NR	●	○	○	○	○	○	○	NR	○	NR	7
Storage and control																									
Content check-in and check-out		●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	○	●	●	●	●	20
Storage of content in a repository		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	22
Versioning (version control)		●	●	●	○	●	○	●	●	●	○	●	●	●	●	●	●	●	○	●	○	●	○	○	16
Publication																									
Stylesheet definition		○	NR	NR	○	○	●	●	●	NR	○	●	NR	●	●	●	●	●	●	●	○	●	○	●	13
Content dynamicity		●	●	●	●	●	●	●	●	○	○	○	●	●	●	●	●	●	●	●	○	●	○	●	19
Content format: html		●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	○	○	●	20
Content format: asp		●	●	●	●	○	○	○	○	○	○	●	●	○	●	○	○	○	○	○	○	○	●	○	9
Content format: jsp		●	●	●	●	●	○	○	○	○	○	●	○	○	●	○	○	○	○	○	○	○	○	○	9
Content format: hta		○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	1
Content format: php		●	○	○	●	●	○	○	○	○	○	●	○	○	●	○	○	○	○	○	○	○	○	○	5
Content format: cgi		○	○	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	2
Internationalization																									
CMS languages: English		○	NR	NR	●	●	○	●	NR	●	○	●	NR	●	NR	○	●	●	●	●	●	NR	○	NR	11
CMS languages: French		○	NR	NR	●	●	○	●	NR	●	○	●	NR	●	NR	○	●	●	●	●	○	NR	○	NR	9
CMS languages: German		○	NR	NR	●	●	○	●	NR	●	○	●	NR	●	NR	○	●	●	●	●	○	NR	○	NR	10
CMS languages: Italian		●	NR	NR	○	○	●	○	NR	○	○	●	NR	●	NR	●	○	○	○	○	○	NR	●	NR	8
CMS languages: Spanish		○	NR	NR	○	○	○	○	NR	○	○	●	NR	●	NR	○	○	○	○	○	○	NR	○	NR	2
Parallel management of translations and versions		○	NR	NR	○	●	●	○	NR	○	○	○	●	●	●	○	○	○	○	○	○	●	○	○	6
Document management																									
Document check-in		●	○	○	●	●	○	●	●	○	●	○	○	○	○	○	●	○	○	●	●	○	●	●	10
Document storage in repository		●	○	○	●	●	●	●	●	○	●	○	○	○	○	○	●	●	●	●	●	○	●	●	12
Definition of the access rights		●	○	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	4
Definition of the process of document management		●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	1
Version control		●	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	2
Knowledge management																									
File search		○	○	○	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	○	●	●	●	15
Content search		○	○	○	●	●	●	●	●	●	●	○	●	○	●	●	●	●	●	●	○	●	●	●	16
Semantic analysis of the content		○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	1
File sharing		○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	3
Email system		○	○	○	○	○	○	●	●	●	○	○	○	●	○	●	○	○	●	○	○	●	●	●	7
Real time messaging		○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	1
Discussion groups		○	○	○	○	○	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	4
Bulleting board		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	1
Users' profiling		○	○	○	○	●	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	3
Total																									
Minimum (based on gathered data)	0	23	14	15	23	27	16	16	21	21	5	19	13	24	22	13	24	18	20	20	7	11	16	16	
Maximum (if NR values would actually correspond to ●)	40	23	23	24	23	27	16	20	29	25	5	23	23	25	27	13	24	18	20	20	7	23	16	27	

Average of Minimum: 17,6; and Maximum: 20,9. Standard deviation of Minimum: 5,5; and Maximum: 6,1.

Legenda: ● : aspect present   NR : data not available   ○ : aspect absent

In general, we can see from the results that Content Management Systems are diverse, extremely heterogeneous and not really standardized. In fact, the systems offer different functions using various technologies, while vendors offer very different services. Different companies use various different marketing strategies in order to attract potential clients. Marketing targets are also very different.

Even more detailed analyses are possible regarding industry dynamics and Content Management System vendor strategies from the point of view of their product.

Table 4:   Analysis results of the technological aspects of Content Management Systems

Product name → / Aspect ↓	En théorie	Timeo	Content Suite	CS Extentions	CMS Express	CMS Professional	IdeaTools	CM	Méthode	TeamSite	B Site	Polymedia	CM Server	4i ECM	WCM	QuickWeb	Openshare	CMS100	CMS200	eMPower	HeliumServer	FlexCMP	do-IT	Inflow	Diffusion
Vendor name →		Kora	Vignette		Reddot Solutions		Evectors	BroadVision	EidosMedia	Interwoven	B Human	TXT e-solutions	Microsoft	Documentum		FileNet	Infotecna	Infosquare.com	Ektron		Handshake Technologies	IdeaFutura	NetSinergy	Noze	
Modularity of the CMS structure		●	●	○	●	●	●	NR	NR	NR	●	●	●	●	●	○	●	○	○	○	○	●	○	○	12
XML programming language		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	○	●	●	NR	20
.Net development environment		●	●	●	○	○	○	○	○	●	○	○	●	●	○	○	○	○	○	○	○	○	○	NR	6
Java development environment		●	●	●	○	○	●	●	○	●	○	●	●	●	○	○	○	○	○	●	○	○	○	NR	10
Multicanality		●	●	●	○	○	○	●	●	●	●	●	●	●	●	○	○	○	○	●	●	○	●	○	14
Scalability		●	●	●	●	●	●	NR	NR	NR	●	○	●	●	●	○	○	○	○	○	○	○	○	○	10
Authoring client-side platform: compatibility with Windows OS		●	●	●	●	●	●	NR	●	●	●	NR	●	NR	●	●	●	●	●	●	●	NR	●	NR	18
Authoring client-side platform: compatibility with Linux OS		○	○	○	○	○	●	NR	○	○	●	NR	○	NR	●	○	○	○	○	○	○	NR	○	NR	3
Authoring client-side platform: compatibility with Mac OS		●	○	○	○	○	●	NR	○	●	○	NR	●	NR	●	○	○	○	○	○	○	NR	○	NR	5
Authoring client-side platform: compatibility with browser Internet Explorer		●	●	●	●	●	●	NR	○	●	●	NR	●	●	●	●	●	●	●	●	●	NR	●	NR	18
Authoring client-side platform: compatibility with browser Netscape Navigator		○	○	○	○	○	○	NR	○	●	○	NR	●	●	○	○	○	●	●	●	○	NR	○	NR	6
Authoring client-side platform: necessity of other applications		●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	22
Server-side platform: compatibility with Linux and Unix OS		●	○	○	○	○	●	●	●	NR	○	●	○	●	○	●	○	●	○	●	○	●	○	○	10
Server-side platform: compatibility with Windows OS		●	●	●	●	●	●	●	NR	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	21
Server-side platform: compatibility with Sun OS		●	●	●	○	○	○	●	NR	●	○	●	○	●	●	○	○	●	○	●	○	○	○	○	10
Server-side platform: compatibility with IBM OS 2		○	●	●	○	○	○	○	NR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	2
Server-side platform: compatibility with web server IIS		●	●	●	●	●	○	NR	NR	NR	●	NR	●	NR	NR	○	●	●	●	●	●	○	●	NR	13
Server-side platform: compatibility with web server Apache		●	○	○	○	○	●	NR	NR	NR	○	NR	○	NR	NR	●	○	○	○	○	○	○	●	NR	4
Server-side platform: compatibility with Jigsaw, BeaWebLogic, WebSphere or other web servers		●	●	●	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	4
Database: compatibility with Oracle		●	●	●	○	○	○	NR	NR	●	○	●	○	●	●	○	●	○	○	●	○	●	○	NR	10
Database: compatibility with SQL		●	●	●	●	●	○	NR	NR	●	●	●	●	●	●	●	●	●	●	●	●	●	●	NR	19
Database: compatibility with DB2		●	●	●	○	○	○	NR	NR	●	○	●	○	●	○	○	○	○	○	○	○	○	○	NR	6
Database: compatibility with Sybase, Informix, MySQL, or other databases		●	●	●	○	○	●	NR	NR	●	○	●	○	●	●	○	○	●	●	●	○	●	○	NR	12
Syndication		●	○	●	○	●	●	●	●	●	●	●	○	●	●	○	○	○	●	○	●	NR	○	○	13
Minimum (based on gathered data)	0	21	18	18	9	10	13	8	5	17	10	13	13	17	17	9	11	9	10	13	7	11	8	2	
Maximum (if NR values would actually correspond to ●)	24	21	18	18	9	10	14	21	17	20	10	20	13	22	19	9	11	9	10	13	7	17	8	16	

Average of Minimum : 11,7 and Maximum: 14,4. Standard deviation of Minimum: 4,7 and Maximum: 4,9

Legenda: ● : aspect present   NR : data not available   ○ : aspect absent

Table 5: Results concerning the services offered by system vendors

		Services	
Product name	**Vendor name**	Implementation	Integration
Timeo	Kora	●	●
Content Suite	Vignette	●	●
CS Extentions	Vignette	●	●
CMS Express	Reddot Solutions	●	●
CMS Professional	Reddot Solutions	●	●
IdeaTools	Evectors	●	●
CM	BroadVision	●	○
Méthode	EidosMedia	●	○
TeamSite	Interwoven	●	●
B Site	B Human	●	○
Polymedia	TXT e-solutions	●	○
CM Server	Microsoft	○	○
4i ECM	Documentum	●	●
WCM	FileNet	●	○
QuickWeb	Infotecna	●	○
Openshare	Infosquare.com	●	○
CMS100	Ektron	○	○
CMS200	Ektron	○	○
eMPower	Ektron	○	○
HeliumServer	Handshake Technologies	○	○
FlexCMP	IdeaFutura	●	●
do-IT	NetSinergy	●	●
Inflow	Noze	●	●
		Diffusion 18	11
Legenda ●: aspect present, NR: data not available; ○: aspect absent			

Table 6: Results concerning the marketing aspects developed by Content Management System vendors

Product name	Timeo	Content Suite	CS Extentions	CMS Express	CMS Professional	IdeaTools	CM	Méthode	TeamSite	B Site	Polymedia	CM Server	4i ECM	WCM	QuickWeb	Openshare	CMS100	CMS200	eMPower	HeliumServer	FlexCMP	do-IT	Inflow	Diffusion
Vendor name	Kora	Vignette	Vignette	Reddot Solutions	Reddot Solutions	Evectors	BroadVision	EidosMedia	Interwoven	B Human	TXT e-solutions	Microsoft	Documentum	FileNet	Infotecna	Infosquare.com	Ektron	Ektron	Ektron	Handshake Tech.	IdeaFutura	NetSinergy	Noze	
Entry level price of the licence in thousand of €	10	100	NR	16	44	7,5	100	110	60	6,9	50	5	85	100	5	10	3,4	NR	NR	1	5	25	5	
Distribution																								
License	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	●	●	●	●	●	21
ASP	●	○	○	●	●	●	○	○	○	●	●	●	●	NR	○	●	○	●	●	○	○	○	NR	12
Key elements of corporate marketing																								
Completeness of the offer	○	●			●	○	●	●	●	○	○	●	●	●	●	●	○	○	○	○	○	○	○	10
Quality of services	●	○	○	○	○	●	○	○	○	●	●	○	○	○	○	○	○	○	○	○	●	●	●	7
Advanced technology	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	●	●	3
Specialization in CMS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	○	○	○	2
Key elements of product marketing																								
Easiness of use	●	○	○	●	○	●	○	○	○	●	●	○	○	○	●	●	●	●	●	●	○	○	○	11
Possibility of integration with other applications	●	○	○	●	○	●	○	○	○	●	○	○	●	○	●	○	○	○	●	○	○	●	○	8
Completeness of functions	○	●	●	○	○	○	●	●	●	○	○	○	●	●	○	○	○	○	○	○	○	○	○	7
Possibility of personalization	●	○	○	●	●	○	○	○	○	●	●	○	○	○	○	○	○	○	○	○	●	○	○	5
Opensource technology employed	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	●	2
Advanced technology employed	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	1
Modularity of installation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	1
Multichannel delivery of content	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	1

Entry level price: average € 39.147; standard deviation € 40.494

Legenda ●: aspect present, NR: data not available; ○: aspect absent

An Analysis Framework for the Evaluation of Content Management Systems by C. Vitari, A. Ravarini, and F. Rodhain

Table 7**:** Results concerning the marketing targets of Content Management System vendors

Product name → Vendor name ↓	Timeo (Kora)	Content Suite (Vignette)	CS Extentions	CMS Express (Reddot Solutions)	CMS Professional	IdeaTools (Evectors)	CM (BroadVision)	Méthode (EidosMedia)	TeamSite (Interwoven)	B Site (B Human)	Polymedia (TXT e-solutions)	CM Server (Microsoft)	4i ECM (Documentum)	WCM (FileNet)	QuickWeb (Infotecna)	Openshare (Infosquare.com)	CMS100	CMS200 (Ektron)	eMPower	HeliumServer (Handshake Technologies)	FlexCMP (IdeaFutura)	do-IT (NetSinergy)	Inflow (Noze)	Diffusion
Geographic variables																								
Italy	●	○	○	○	○	○	○	○	○	●	○	○	○	○	●	○	○	○	○	○	●	●	●	6
Europe	○	○	○	●	●	●	○	●	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	5
USA	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	2
World	○	●	●	○	○	○	●	○	●	○	●	●	●	●	○	○	●	●	●	●	○	○	○	12
Demographic variables																								
MLE	○	●	●	○	○	○	●	○	●	○	○	○	●	●	○	○	○	○	○	○	○	○	○	6
SME	●	○	○	○	○	●	○	○	○	●	○	○	○	○	●	●	●	●	●	●	●	○	○	10
Specific industries	○	●	●	○	○	●	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	4
Financial variables																								
Limited budget	●	○	○	●	●	○	○	○	○	●	○	●	○	○	●	●	●	●	●	●	○	○	○	11
Hgh budget	○	●	●	○	○	○	●	○	●	○	○	○	●	●	○	○	○	○	○	○	○	○	○	6
Buying and operative variables																								
Limited number of authors	●	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	2
High number of authors	○	●	●	○	○	○	●	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	6
High volume of content	○	●	●	○	○	○	●	○	○	○	○	○	●	○	●	○	○	○	○	○	○	●	●	7

Legenda ●: aspect present, NR: data not available; ○: aspect absent

INDUSTRY TRENDS

The industry trends have been identified using:

- comparisons of products recently released on the markets and, conversely, products that have been the market for a long time;
- identification of new elements in the latest versions of existing products; and
- interpretation of vendor marketing advertising.

In accordance with the observations of Wilkoff [Wilkoff N., 2001] and Gavazzi [Gavazzi L., 2002b], we directly verified the trend in the growth of the number of functions offered by Content Management Systems, that of technological advances, as well as of that regarding the extension of distribution channels and new entries on the market. Content Management Systems developers are aiming to satisfy the largest range of organization needs regarding technological compatibility and flexibility. Such a result corresponds to the expected life cycle for the Content Management Systems industry because, the higher the number of functions offered, the more the Content Management System becomes a type of multipurpose system. As a result, the difference from other systems such as Document Management Systems and Knowledge Management Systems is reduced. Until now, and in accordance with previous research [Howard P., 2001; Pelz-Sharpe A., A. Ashenden and C. Harris-Jones, 2002; Wilkoff N., 2001], we have empirically verified predictions according to which Content Management Systems should cease to be independent applications and become instead a new type of integrated application.

STRATEGIC GROUPS

The overall observation of Content Management Systems and industry trends lead us to the identification of some main industry strategies as well as the identification of the main groups

within this industry. As noted above, the three variables used to identify strategic groups are completeness, convenience, and technological advances. These variables are measured in the following manner:

The **completeness** of the system is measured by its functions score (direct proportion: a higher score indicates a more complete system).

The **convenience** of the Content Management System is measured by the initial price of the system (inversely proportional: a higher price indicates a greater convenience).

The **technological advances** of a Content Management System are directly measured by the technological score of the system (directly proportional: a higher score indicates more advanced technology).

The three variables are displayed using a graph showing the potential groups within a sample. This graph shows the technology score on the abscissas (X) axis (the measure of more advanced technology) and on the Y-coordinate axis the initial pricing per license (measure of convenience). The diameter of the bubble represents the functions score obtained (a measure of completeness). (See figure 3).

In order to avoid any error in the interpretation and given the absence of data for certain aspects, the figure includes two traces corresponding to the two lists of minimum results (obtained) and maximum results (potential - that which the Content Management System could reach if all of the aspects for which we were missing information were really present) for the functions and for the technology. However, the two graphs clearly demonstrate the presence of two strategic groups.

For each strategic group, we put forward a description of the main characteristics and the identification of the representative Content Management System products of the group. The representative products are the Content Management Systems for which the scores concerning the functions, the technology, and the initial price are closest to the average of this strategic group.

Basic Content Management Systems

The basic Content Management Systems are offered at an extremely competitive price. At the same time, they have lower than average scores regarding functions and technology (Table 8).

However, they do guarantee the most typical characteristics of Content Management Systems and respect the main requirements in terms of compatibility, whereas they are incompatible with more sophisticated needs. The characteristics of these products reflect the corresponding marketing target, usually SMEs. The vendors concerned are trying to sell large quantities of products and will usually compete on a price level in order to reach their market share objectives and to make a profit from this market. The representative product of this strategic group is QuickWeb, offered by Infotecna (Table 9).

Advanced Content Management Systems

Advanced Content Management Systems are quite expensive (the usual price is about ten times that of a basic system), they offer a long list of functions, using the most advanced technology, and provide extensive services in order to suitably respond to customer needs (Table 8). The most typical marketing targets for this type of product are publishing industry companies were content management must be both rapid and complex, and where the role of the content creator is already well defined thereby facilitating the Content Management System adoption process. As well as publishing companies, these Content Management Systems are aimed at very large companies with similar needs and with the financial means required. However, a large company may not necessarily have clearly identified needs in terms of Content Management Systems; and therefore to penetrate this market segment may represent a significant marketing effort to demonstrate the return on investment for such a costly product. Also, the requirements of this

kind of company imply a significant investment in terms of implementation and integration services. The largest vendors of Content Management Systems particularly aim for this market segment for a significant part of their turnover. The representative product of this strategic group is 4i ECM, offered by Documentum (Table 9).

A critical strategic position is occupied by a product called Timeo, offered by the company Kora, due to the fact that it is both a reasonably priced and a high-quality product from the point of view of functions and technology. (This product is represented on the lower right of both graphs). Given that it has the best price/quality ratio, Timeo is actually the most competitive Content Management System on the market, managing to fulfil the requirements of both SMEs and large companies. However, Kora is equally likely to leave the market in the future due to questions of long-term strategy if they do not quickly succeed in gaining a larger share of the market.

(a)   **(b)**
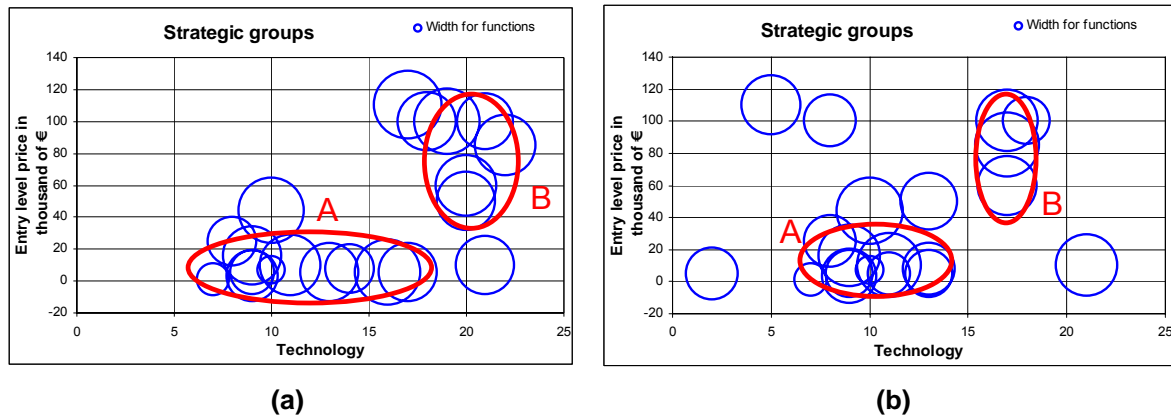
Figure 3: Distribution of Content Management Systems considering the cost and the minimum (a) and maximum (b) values regarding: Functions and technology

Table 8**:** Synthesis of strategic group main characteristics

	Name	Price	Functions	Technology	Tipical target market	Competitive factors
A	Basic CMSs	Low	Low	Low	SMEs	Price & volume
B	Large CMSs	High	High	High	Publishing industry and very large entreprises	Marketing & services

Table 9**:** Synthesis of strategic group representative product main characteristics

	Group	Representative	Entry level price	Min and Max scores of functions	Min and Max scores of technology	Distribution channels	Services	Tipical target market
A	Basic CMSs	QuickWeb Infotecna	€ 5.000	13	9	1	1	Italian SMEs
B	Large CMSs	4i ECM Documentum	€ 85.000	24-25	17-22	2	2	Large entreprises worldwide

V. CONCLUSION

The analysis of this sample of 23 Content Management Systems allowed us, above all, to verify the application of the Content Management System analysis framework developed by the research, and understand the qualities of Content Management Systems. We were then able to apply the theory of strategic groups to the Content Management Systems studied in order to understand the strategies of the developers for their Web content Management software.

This analysis of Content Management Systems has demonstrated the diversity of these applications. Effectively, each Content Management System seems to have a unique offer regarding technology, functions, service, marketing, and marketing target. However, at the same time, certain common points among Content Management Systems were discovered. In light of all the elements taken into consideration, there are three variables which best form the

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description of the Content Management System market: the cost value, the level of technology, and the range of functions. Using these three variables, Content Management Systems are divided into two strategic groups. The first group represents a lower price, but average values regarding technology and functions. However, in the second group, the price is considerably higher, the range of functions is much larger, and the technology is much more advanced. Therefore, the differences in price, technology, and functions divide the market distribution into two strategic groups with specific marketing targets: the first group is concerned with SMEs while the second group is aimed at large companies.

The results obtained should however be verified by further research in order to confirm the validity of external application of the results obtained within our sample. Among others, open-source Content Management Systems, rapidly spreading throughout the sector, should be studied given that they were mostly excluded from the sample used for this analysis. Also, the market dynamics require deeper understanding in order to define the strategic development of Content Management Systems and the possible growing similarity to other types of application, particularly Document Management Systems and Knowledge Management Systems.

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Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that

1. these links existed as of the date of publication but are not guaranteed to be working thereafter.

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