

### III. CMS: The Study and the “Collaborative Function Model”

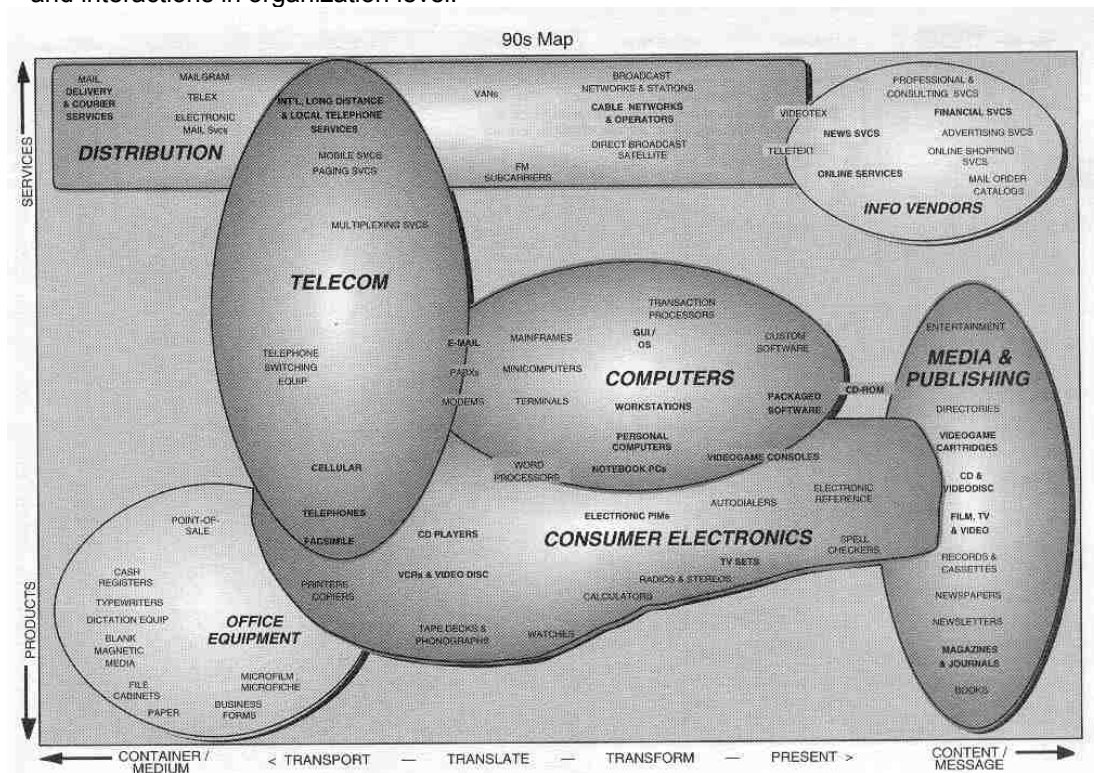
#### 3.1 Why a Study on CMS with Communicative Perspectives?

As what we've mentioned in the end of the previous chapter, the American CMS researcher Miller points out that, in the latest developing phase of CMS “CM is Comprehensive”, there are some more important factors which is far more than simply better technical solutions. They are:

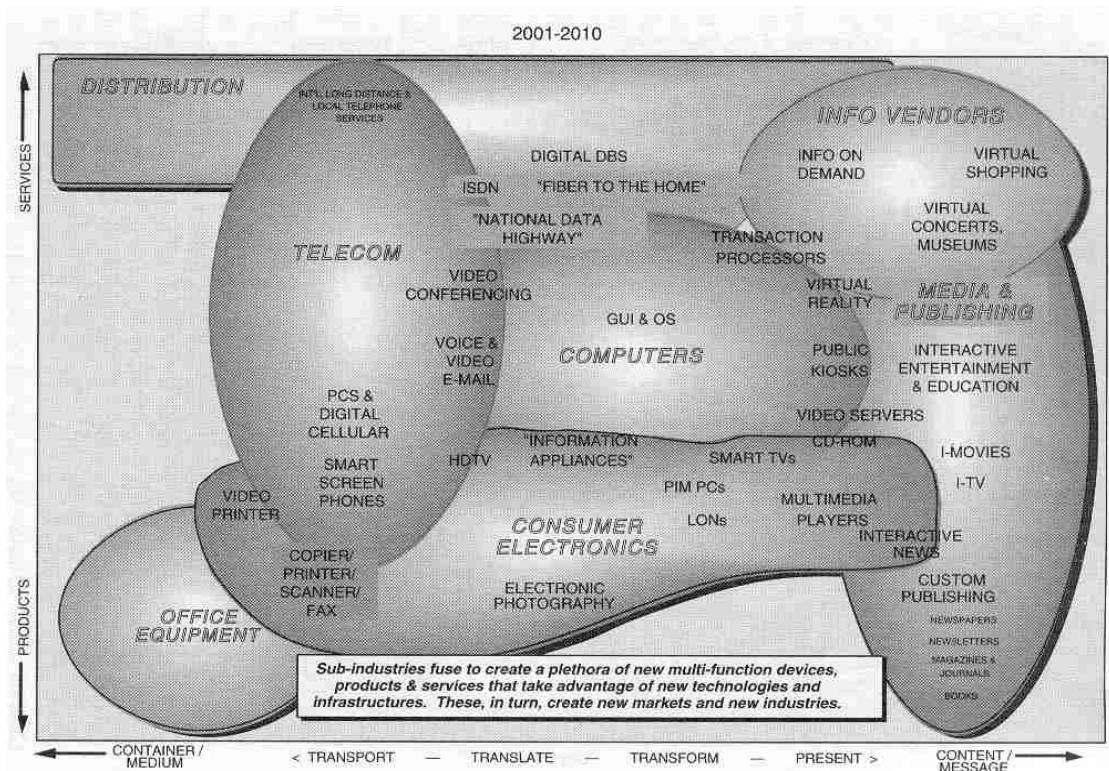
- Policies accepted and implemented
- True content governance

These two developing targets of CMS belong far more to the “business management” and “communication” dimensions. They indicate that, the design and implementation of CMS are not merely the development of a more powerful computing system or the installation of software products. In addition to system analysis and programming jobs, CMS has close relationships with the marketing goals, organizational structure and culture, most important of all, the internal and external communication behaviors of the enterprise/organization.

This is a particular interesting point for the communication/information researchers, especially when the boundaries between information and communication, or let's say, among the industries which are illustrated in the two charts below (CHART 3.01/3.02), vanish and melt gradually. Now, we could do much more than the traditional communicative studies on the distribution/adoption of New Information-Communication Technology (ICT), Human-Machine Interactions. With integrated and systematic interdisciplinary approaches, now, communication/information researchers should try to understand the changes of relationships and interactions in organization level.



(Chart 3.01) Mapping the Information/Communication Technologies and Industries in 90s, Ministry of E-Commerce, U.S.



(Chart 3.02) Mapping the Information/Communication Technologies and Industries 2000-2010, Ministry of E-Commerce, U.S.

Following the above mentioned idea, let's take a look at CMS again. CMS itself is a mix of information/computer system and communication technologies. When facing CMS (or other similar information systems/products) as a research “object”, for many communication researchers, they will take it as a “device”, which serves for the computer mediated communications (CMC). Then, in the traditional ways, their analysis falls on the understandings of “Effects” and “Efficiency”, that is, the “Before/After” comparisons. Or, they might do it with psychological or social perspectives and make researches on the new technology “adoption” and “distribution” processes”.

However, what we like to point out is that we should to think the CMS as a “Place” rather than a “device”, where CMC occurs, and most important of all, continue to happen, function interactively and repeat itself, till the “Tasks of Organization” have been (temporarily) finished.

How about other information systems (software) or let's say other ways of CMC? “Email” is absolutely a one-way communication, you have no “instant” response until the person you write answers you. With “Instant Messenger (e.g. ICQ/MSN/YAHOO)”, you have bidirectional (“some” also multidirectional) instant response, but seldom have common consensus with the counterpart. Similar problems could also be found in other Groupwares, such as “Forum”, “News Group”, “Message Boards” and so on. People are “quatsching”, giving different ideas to the topics (some have even nothing to do with the topic), sometimes also quarrelling.

Only in CMS, communications between the related parties are ongoing with the same goal. According to the CMS workflows, each party knows the “rules” and has his/her own jobs. This makes the whole communication processes to be much more “meaningful”, especially when the “thing” they are handling with is “Content”.

Why is “Content” so special? According to Oxford Dictionary, in English, the word means:

- (usually in plural) what is contained, esp. in a vessel, book, or house.
- amount (of a constituent) contained (high fat content).
- substance (of a speech etc.) as distinct from form.
- capacity or volume.

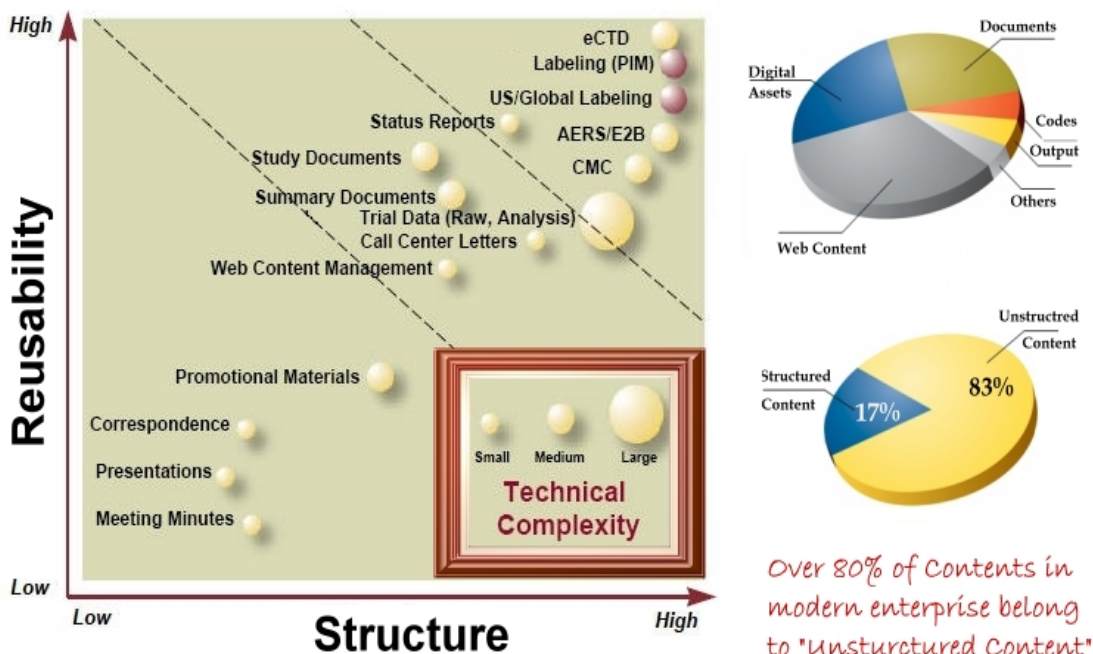
It comes from the Medieval Latin and it is close related to the verb “contain”. Following, the first definition: “what is contained”, “Content” could be defined as “all the information in the electronic information systems of modern enterprise” and could be roughly categorized in two “Types”:

“**Structured Contents**” are data in standardized layout from databank-supported systems, for example, data from ERP systems, statistic reports for managements, etc..

“**Unstructured Contents**” are data in different layouts or content-layout embedded and come mostly from non databank-supported systems, for example, pictures, Videos, management reports, faxes and etc..

Then, here comes the problem: what kind of content do we have in the enterprise practices? A study made by one of the major business player in the CMS field, the Documentum Inc. in U.S. (2004 merged by EMC and now EMC Documentum) offers us a very good reference:

### Types of Content in modern Enterprise - Examples from a company in life science industry



Source: EMC Documentum Whitepaper. <http://www.documentum.com/literature/literature.htm>

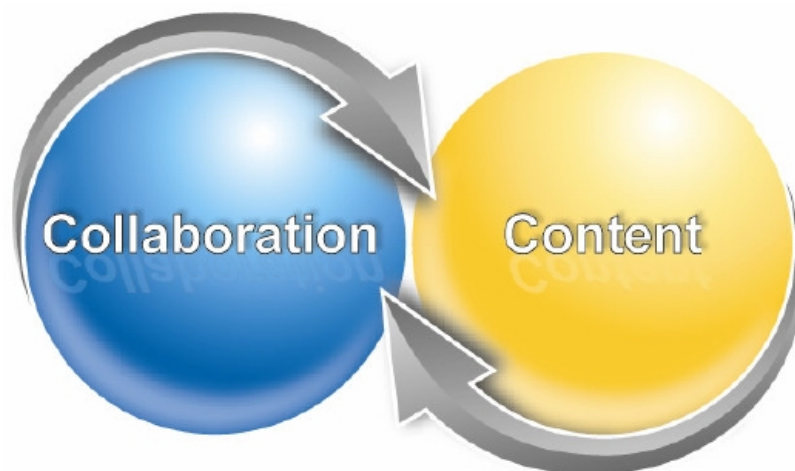
(Chart 3.03) Types of Content in Modern Enterprise – Study on a Company in Life Science Industry, EMC Documentum Online Whitepaper databank, <http://www.documentum.com/literature/literature.htm>

Same as what is shown in the chart above (**CHART 3.03**), the content are categorized from three different perspectives “Structure”, “Reusability” and “Technical Complexity”. We see clearly that, over 80% of contents in our daily enterprise jobs belong to “unstructured content”. They are “promotional materials”, “correspondence”, “(business) presentations”, “meeting minutes” and so on. Most of them are not technical intensive works, yet we spend most time/resources working with them. Besides, the technical complexity of the named types of content is also relatively low in comparison with the “structure content”, such as “analysis data”, “patent management data” and so on.

Think a bit further on the mentioned examples of “Unstructured Content”: “promotional materials”, “correspondence”, “(business) presentations”, “meeting minutes”, we might also find out that there is still some big differences between “structured” and “unstructured” contents. That is, by “unstructured content”, it’s more like “a temporary output of a business process”. The output is temporary, ‘because they all need to be “updated”. Without “Updating Works”, there content are less “valuable” by its business meaning. And the key point is “process”! Most of the “unstructured contents” are rundown results of the process. They are the results of a serious of interactive communication activities, in which people have to “COMMUNICATE” and “COLLABORATE” with each other to create the content, and most important of all, give meanings to the content.

So, this makes a study on CMS from communicative perspectives special and important for communication researchers, because the “object” which we handle in the CMS is the result of series of interactions/communications! And our goal is, definitely, to find out the way, how to make the communications among the related parties in the system to be more efficient (“smooth”) and effective (“productive”)!

By doing this, the CMS is exactly like what we’ve mention above: it’s a “place” (not a “device”) where series of communications and interactions take place. We try to call the ideas here “collaboration”, to indicate that the series of communications and interactions are with “goal”. The goal is “content”, because as a counterpart in the mechanism, which we illustrate below, “collaboration” and “content” are in a circulate situation, just like a loop without ending that we illustrate in the chart below (**CHART 3.04**). Completely different from the “structured” data, the most “unstructured” data must go through these processes to gain its meaning. Otherwise, it’s will be “garbage in” and “garbage out”.



(Chart 3.04) The Conceptualization of the relationship between “content” and ”collaboration”

So, it's obviously to us that it's human intelligence - "collaboration" - that plays the most important role by content management. This is also the reason why the title of this dissertation is named "Content, Management and System", because we frankly believe that these three words are not just ordered by literally orders, but also by conceptually order. Only when we understand that "Content" is in the essence of "the result of the internal/external interaction/communication processes", and only when we understand that "the meanings and roles of the Content in the related Management purposes and processes", can we talk about the designing and planning of such "System". The dissertation is therefore organized following this logic, too. But before we introduce this, let's have some small introductions on the background information of this dissertation first.

### 3.2 The Study: First CMS Knowledge Portal in the Chinese-speaking areas

The author of this dissertation is a Taiwanese Journalist and consultant in the Media and IT industries. At the same time, he is also an active Researcher at Soochow University, Taipei, Taiwan. Since 2003, sponsored by the German Academic Exchange Service (Deutscher Akademischer Austausch Dienst, DAAD<sup>21</sup>) (**APPENDIX C.**) he works in Department of Information Science, Institute for Media Studies and Communication Science, at Free University Berlin, advised by the Dean of the Institute, Univ- Prof. Dr. Gernot Wersig. (For detailed information, please see the attached CV of the author (**APPENDIX H.**))

In this dissertation, we are not trying to pretend Prophet in the CMS field. The judgment criteria and evaluations concerning CMS concepts and products are all based on the literature reviews, market surveys, interviews with IT professionals and the researching conclusions of this dissertation.

However, "Reality is in the eyes of beholders!" Only when one jumps into a real situation, then he/she will have more understandings of the problems domain and find his/her own way to overcome the difficulties!

Therefore, when trying to find out how to design a CMS for the company and, most important of all, how to make it works in the enterprise. We take a very practice oriented approach in this dissertation. That is, we create a REAL CASE to build up a CMS based web-site.

In this REAL CASE, we cooperate with two German CMS developers, INFOPARK AG (<http://www.infopark.de>) and STRUKTUR AG (<http://www.struktur.de>), and a Taiwanese business intelligence service vendor, the Creative Network Solution Co., Ltd. (<http://www.creative-lab.net>)<sup>22</sup>, to make an experiment on CMS with the following three goals:

1. Trying to build the first Knowledge Portal of CMS and the related document related technologies (to some degree, also refers to Enterprise Content Management, ECM) (<http://www.dcms.org.tw>) (<http://www.dcms.org.cn>)
2. Trying to build a CMS based cooperation platform and information exchange system for this trilateral project. And this international cooperation aims to push the CMS knowledge and technology developments in the Chinese speaking areas and, of course, to open the CMS market there.

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<sup>21</sup> The certificate of sponsorship form DAAD could be found in Appendix C of the dissertation.

<sup>22</sup> In Appendix D/E/F of the dissertation, we offer the scanned copies of the business contracts of the above mentioned international cooperation project for CMS in the Chinese speaking areas. For further details and information of the cooperation, please directly contact the author: Mr. Vincent, Chung-Wei Lin at [Vincent@creative-lab.net](mailto:Vincent@creative-lab.net)

3. Obviously, in this three parties' cooperation project, there will be surely many problems which we might be able to resolve by implementing a CMS based cooperation platform and information exchange system.

By starting the international CMS business cooperation and by building up the mentioned CMS Knowledge Portal in the Chinese speaking areas, just like all other companies, we have to consider the whole project from the business value perspectives and facing exactly same technical and organizational challenges by choosing, evaluating, designing and implementing an “appropriate” CMS system.

So, the above mentioned initial of an international cooperation for CMS makes us exactly in the similar and “quasi-enterprise” situations and conditions like all other companies. We start this project since March 2003 and spent more than 2000 man/womanpower/hours to put it into practice. Based on the lessons learned and the experiences gained, mostly from our working diary and developing notes, we try to offer a CMS Implementation Compass to the companies which are interested for such an application. And at the same time, these practices are also good materials for further communication researches in the CMS field.

### **3.3 Structure and Method: the “Collaborative Function Model”**

The title of this dissertation is “*Content, Management, System – The Construction of a CMS Evaluation Prototype from Communicative Perspectives.*” Under this title, we believe that the CMS, which is developed from more-human communication and collaboration perspectives, should be able to avert the technical problems for the users when they work with information systems. And in this way, the internal communication and collaboration mechanisms in modern enterprises will be improved and to be more effective and efficient, which is one of the most important competitive advantages nowadays.

The main title is “Content, Management, System”, we divide them into three separated elements because it's our belief that these three words are not ordered just by literally order, but also by conceptually order. Only when we understand that “Content” is in the essence of “the result of the internal/external interaction/communication processes”, and only when we understand that “the meanings and roles of the Content in the related Management purposes and processes”, can we talk about the designing and planning of such “Systems”. The whole structure of the dissertation is also organized following this logic.

In this dissertation, we try to do the following FIVE things:

- A.) Understand the content management problems and challenges in modern enterprise;**
- B.) Make an review and overview on the CMS related concepts and technologies to define our own ideas of “Content”, “Management” and “System”;**
- C.) Identify the CMS conceptualization in the communication research field and propose a systematic evaluation prototype that could combine “content”, “management” and “communication” perspectives/concerns, both conceptually and technically;**
- D.) Evaluate CMS from business management perspectives/concerns and it's solutions;**
- E.) Record our CMS experiment, both conceptually and technically, to propose a CMS project procedures and system features for future researches**

For the above mentioned targets, in **Chapter I** “Introduction”, we describe the critical challenges and trends that enterprises face today, especially focusing on the problems of Content, Management and (IT) Systems. This chapter describes the development trends and technologies and tries to define the problem factors and challenges of the current software solutions. By reading our introductions, business owners or IT staffs in the company might feel: if there’s a solution that could solve the problems which we’ve mentioned above, that should be definitely a great idea!

Ironically, in fact, there are many solutions (software packages) in the market already! But the problem is: with different start points, emphasis and software development perspectives, entrepreneurs and IT decision makers (mostly CIOs) start to get lost in this “**professional terminology jungle**”, which is created by IT freaks or Vendors who eager to get money from your pocket.

Therefore, in **Chapter II** of this dissertation, we start from a simple discussion on the definitions of Content Management System (CMS) and then, using this definition as a compass, to take an overview on **the Landscape of CMS related concepts and technologies**. These include:

- Enterprise Content Management and CMS
- Imaging
- Document Management (DM)
- Software Configuration Management (SCM)
- Knowledge Management (KM)
- Collaboration
- Digital Asset Management (DAM)
- Records Management (RM)
- Learning Management (LM)
- Product Data Management (PDM)
- Digital Rights Management (DRM)
- Web Content Management (WCMS/CMS)

The above listed terms could go without ending! But it is worth to have some ideas of them, because the concepts and definitions will help you to realize the problems in your company more, to identify your own problems more precisely and to find out the solutions in the right way. We make a short summary in 2.3, in which we organize the developments if technologies in historical order and concept divisions.

In **Chapter III**, we start our discussions from the meanings of a study on CMS from communicative perspectives. Then we define CMS as a “place” but not a “device” of series of communications and interactions. Most important of all, we also define the key word “content”, explain our thoughts to make “content” to be related with “collaboration”, which represents the process of series of communications and interactions.

By literature review, we found Nakano’s theory for designing a collaborative web site to support our ideas<sup>23</sup>. In Nakano’s prototype, he describes two concepts for applying web content management: “Collaboration operations” and “work cycle development”.

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<sup>23</sup> Nakano, R: Web content management: a collaborative approach , ADDISON WESLEY PROFESSIONAL 2002, BOSTON

According to Nakano, “Collaboration operations” include the following five operations:

- (1) **Submit** — when you move web assets from a work area to a staging area;
- (2) **Compare** — identifies whether the assets that were submitted were new, modified or deleted assets to the staging area;
- (3) **Update** — copies new, modified or deleted assets from staging area to the given work area;
- (4) **Merge** — resolves conflicts between the work area and staging area and
- (5) **Publish** — is a snapshot of the staging area.

And “Work cycle development” is important to people who are ready to start a web project. They must follow these basic rules:

- **Update** — get the most recent assets from the staging area;
- **Edit** — make changes to the assets,
- **Test** — make sure that the edits work properly;
- **OK** — if the edits work, then submit to staging area (then goes back again to the beginning of the Collaboration Operations).

Nakano’s prototype is very constructive, theoretically. It provides a fundamental, well-organized, and easy to follow observing and designing perspective for CMS. When working with many web developers, it is very important to follow these two concepts. If they are not followed, the web content can become unusable and starting over may be unavoidable.

However, Nakano’s prototype provides only a linear and process oriented perspective. He mentioned only the five important ideas (**SUBMIT, COMPARE, UPDAE, MERGE, PUBLISH**) for CMS designing and the basic work cycle procedure (**UPDATE, EDIT, TEST, OK**). It’s, in the essence, a simple CMS prototype, and there’s no further ideas and implications from other perspectives. And most important of all, in this prototype, “content” is the “result”/“product” from a linear production line! Hence, by really engaged to design, set up and launch the purposed web site, most important of all, a collaborative platform (web-site) for our international cooperation project we need a more function oriented methodology to help us.

For an international cooperation project like what we are attempt to establish, the CMS, which serves as the collaboration platform, should provides more functional mechanisms to improve the interactions among workers, speaking three different languages and locating themselves in t countries and 5 cities, to be easier and straight forward to create value-full contents together. That is, from a communication perspective, we believe the relationship between “content” and “collaboration” (now, it means the mechanism which helps people to manage content) should be more dynamic and interactive, just like the chart that we illustrate on page 25 (**CHART 3.04**).

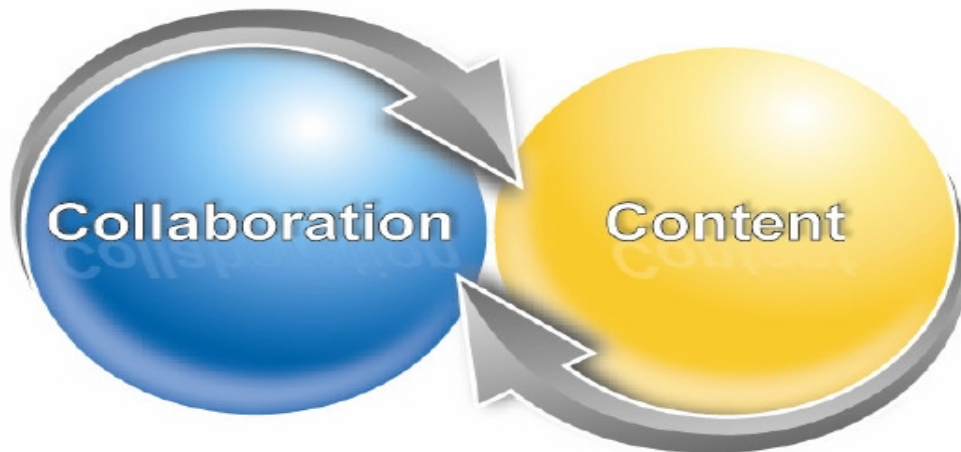
Following this concept and based a Nakano theory for designing a collaborative web site, we established a function oriented model on our won as the critical consideration and judgment criteria to design and implement a CMS based web site for our international cooperation web site. We call it “**Collaborative Function Model**” of CMS, ‘cause it stresses the importance of understanding the internal/external communication needs and processes in any CMS Designing Project.



In this model for international business collaboration/ communication, a (perfect) CMS should be firstly divided in two dimensions:

1. DIMENSION I. **Production**, where content goes “from thought to click”.
2. DIMENSION II. **Delivery**, where content actually gets “consumed by end-users”.

Nakano hasn't mentioned the dimension II “Delivery” or he did by take this part simply as “publish”. However, as the boundaries between information and communication, or let's say, among the industries which are illustrated in the two charts in 3.1 (CHART 3.01/3.02), vanish and melt gradually, it is necessary to expand discussions in this dimension. So, we conclude the “Collaborative Function Model” in the following chart below (CHART 3.05). Both “content production” and “content delivery” dimensions contain its specific attributes that must be carefully considered in any CMS projects:



Dimension	Content Production	Content Delivery
<b>ATTRIBUTES</b> The sub-attributes are the function oriented mechanisms that we think most essential for improving the interactive effectiveness and the business value achievements of a CMS platform	Role Management (5.2.01)	Page Generation (5.2.10)
	User Interfaces (5.2.02)	Searching (5.2.11)
	Author System (5.2.03)	Personalizing (5.2.12)
	Integration (5.2.04)	Privileging (5.2.13)
	Metadata (5.2.05)	Caching (5.2.14)
	Workflow (5.2.06)	Syndication (5.2.15)
	Templating (5.2.07)	Cross Media Publishing (5.2.16)
	Versioning (5.2.08)	
	Globalizing (5.2.09)	

(Chart 3.05) The Structure and Attributes of the “Collaborative Function Model”

In this “Collaborative Function Model”, the interactive and dynamic relationships between “content” and “collaboration” is on the bottom of the prototype to remind all the designers the symbiosis of these two elements. That is, CMS serves a “place” of series of communications and interactions.

The in table listed 9 attributes in the dimension of “content production” and 7 in the dimension of “content delivery” could be regarded as the expansion of Nakano’s simple CMS prototype. Based on our lessons learned and the experiences by designing and implementing the CMS

Knowledge Portal in the Chinese-speaking areas, we found the attributes, mostly the function-oriented mechanisms, essential for improving the interactive effectiveness and the business value achievements of a CMS platform. That is also the reason why we name our prototype the “Collaborative Function Model”, because the attributes are functions needed to enhance the “collaboration”, in other words, to improve the communications in CMS.

Each of the attributes mentioned will be discussed in details, both technically and practically in chapter V. These discussions will help us to get clear on the latest technological developments and the factors that we must think about if your web site has the needs in the attribute related criterion. And, therefore, the **“Collaborative Function Model”, which is both IT-and communication- oriented (“Function” and “Collaboration”), is especially useful for the CMS project managers and IT related staffs to evaluate and to design their own CMS based web site and project.**

In **Chapter IV**, we use the “functional” and “business value” perspectives to make utility analysis on CMS. The former approach **“functional perspective”** is for IT decision makers to understand the advantages by implementing CMS in their information structures. That is, ***how can CMS help you solve your current troubles or how can it release you from the annoying burdens.*** These include six main concerns:

- Enable Faster, Less Expensive Content Updates
- Increase Content Accuracy, Quality, and Value
- Decrease Information Retrieval Time
- Centrally Manage Site Usability and Branding
- Centrally Manage Site Development and Deployment
- Facilitate New Opportunities for Innovation

On the other hand, the latter approach **“business value perspective”** is for entrepreneurs or all the NON-IT guys to understand the benefits of CMS. The discussions here are further divided in two viewpoints: “Quantitative” and “Qualitative”

By **“Quantitative”**, we focus on the “short/mid- term” Cost & Revenue analysis. This is, of course, the central concerns of all the CFOs (Chief Financial Officers) and business owners. We introduce the possibilities to cut down the costs by implementing CMS and, of course, the potential increase of sale by applying CMS for marketing activities.

By **“Qualitative”**, the emphasis falls on the “mid/long- term” benefits of implementing CMS in your company. This viewpoint could help CEOs (Chief Executive Officer), CSOs (Chief Strategic Officer) or CIOs to consider CMS as a tool to enhance the competitive advantages of their companies, such as to strengthen customer relationship management, to improve internal communication mechanism and collaboration with business partner, etc..

If your company is considering or decides to deploy a CMS, then **Chapter V** will be a must-read for you. As a matter of fact, this chapter is proposed based on ***our REAL experiences by implementing a CMS based web site for international business collaboration and the design and launch of the first CMS Knowledge Portal in the Chinese speaking areas.*** The whole Chapter is designed for the purpose to discuss two BIG questions:

1. **How should I implement a CMS in my company?**
2. **How should I design a CMS in my company?**

Based on the lessons learned and the experiences that we had by realizing our business cooperation, in the second section of chapter IV (5.1), we list **13 steps that you should follow by initializing or running a CMS Business Project** in your company. They are:

- **Identify Stakeholders**
- **Build and Prioritize Your Initial Requirements**
- **Develop Use Cases or Scenarios**
- **Solidify Your Business Case**
- **Design the Outlines of the System**
- **Review Technology Alternatives**
- **Perform Due Diligence**
- **Download Trial Packages When Possible**
- **Evaluate Security Implications**
- **Consider Requiring a Proof-of-Concept**
- **Choose a Platform**
- **Prototype as Early as Possible**
- **Recognize When you Need Help and Seek Outside Assistance**

Then, for the people who already decided for a CMS deployment and are about to evaluate their requirements, to select proper (or the most suitable) CMS packages and vendors, to design the CMS in accordance to enterprise's strategic objectives, the second section of chapter V (5.3) will definitely enlighten your minds.

The business project perspectives provide useful criteria to evaluate your CMS projects and create the possibilities to the “use and gratification” linkage to your enterprises business goals and strategies. By our international cooperation project for building up the first CMS Knowledge Portal in the Chinese speaking areas, this methodology has been proved very effective and efficient in the whole project running processes.

Besides, we also make an “**Author's Checklist**” at the end of each attribute discussion. This “Author's Checklist” is both a review to the discussion and the additional remarks to the related discussion. ***It is a questionnaire that aimed to help you focus on your own analysis for planning the appropriate CMS platform for your unique needs.***

The following is the list of our discussion topics:

- **Role Management: The Groundwork of Your CMS**
- **User Interfaces: The Usability of Your CMS**
- **Author System: The Core Function of Your CMS**
- **Content Integration: The Puzzling Game of Your CMS**
- **Metadata: The Value-Adds of Your CMS**
- **Workflow: The Gate-Setting of Your CMS**
- **Templating: The Cinderella's Dresses of Your CMS**

- **Versioning: The Reliability of Your CMS**
- **Globalizing: The Multi-nationality of Your CMS**
- **Page Generation: The Dynamics of Your CMS**
- **Searching: The Readability of Your CMS**
- **Personalizing: The Uniqueness of Your CMS**
- **Privileging: The Access of Your CMS**
- **Caching: The Speed of Your CMS**
- **Syndication: The Sharing of Your CMS**
- **Cross Media Publishing: The Variety-Show of Your CMS**

This dissertation should be a very good compass for people who are interested in CMS, especially for enterprises who attempt to deploy a CMS in their own companies. However, just like the old saying goes: “There is no royal way to success!” CMS is not an all-can solution! In the last “Conclusion”, we pointed out “WHAT CMS WON’T DO?!” to eradicate the over-exaggerations of CMS vendors and the myths that enterprise tend to have for CMS.

Instead of the above mentioned parts, we have some more distinguished achievements:

#### **In Appendix A**

It is a **“HAND-MADE” Glossary for Content Management Related Terms and Definitions**, based on the researching notes and writing digests of us. The selection of the Terms and followed Definitions are from the author’s perspective and, most important of all, from the perspectives of CMS to its relevant technologies. Unlike other “COPY” glossary, it will help you the most.

#### **In Appendix B**

In this appendix B, we make a **detailed list of the more than 250 online literatures** which we’ve collected through the whole researching processes. For the convenience of people who are really interested in CMS and its related technology developments, we even categorize these online resources in four main sectors:

- a.) **CMS Market Analysis and Technology Developments**
- b.) **CMS Concept Definitions and System Analysis**
- c.) **CMS Applied Uses and Developments**
- d.) **CMS Project Planning and Case Studies**

Besides, each reference has a tag (Metadata!) at the beginning, which is arranged as the following format:

**Title of the literature**

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**Source**

**Author**

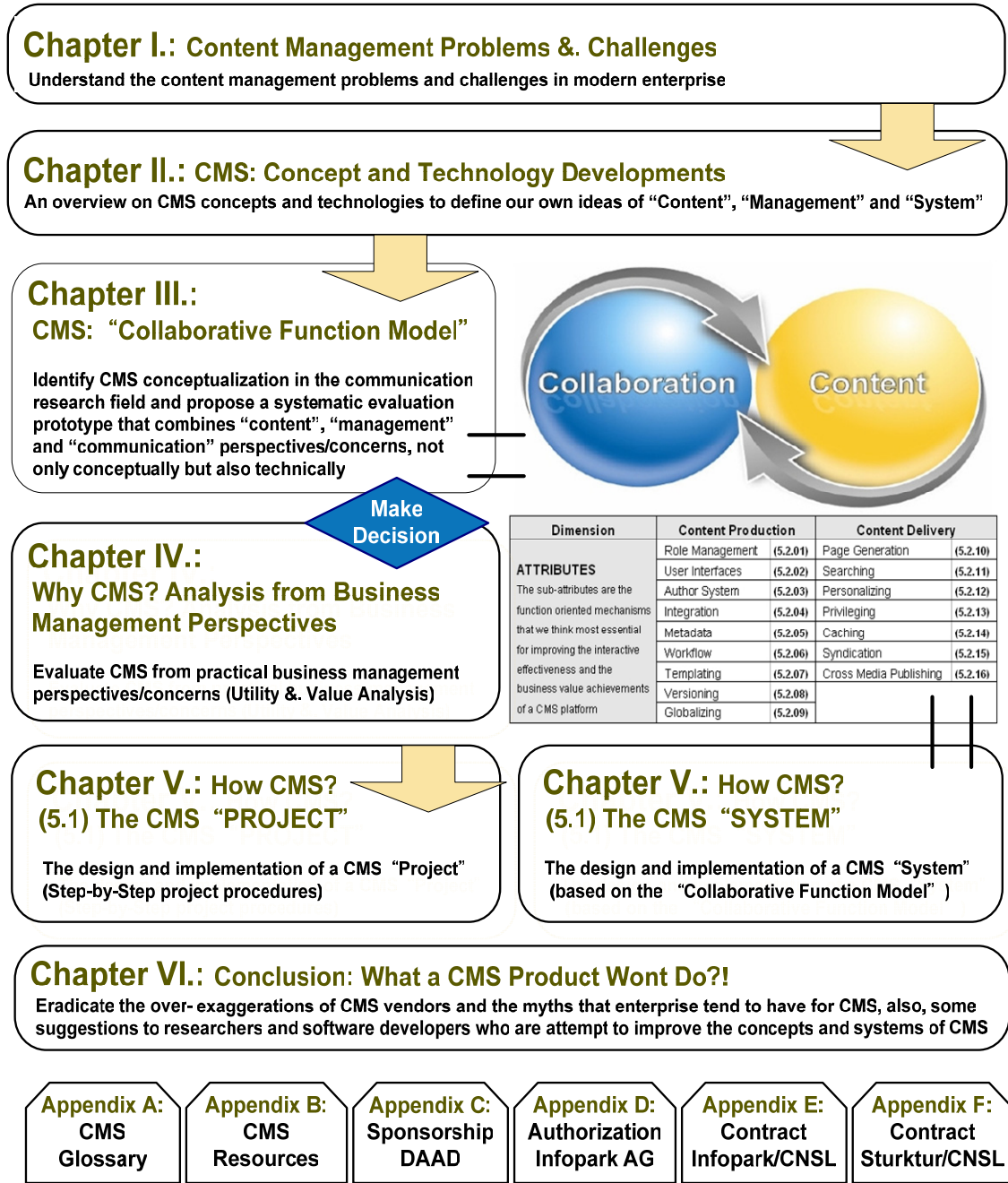
**Short Introduction to the Author’s Professional Backgrounds**

**WWW Link to the literature**

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The literature itself can help you to understand the topic that you are interested more. And the reason why we also list the author and his/her professional backgrounds information is that we think this might be good hints for further researches. Or, at least, you know who you should contact, if you have further questions on the literature or its related topics.

As summary of this chapter, here is a concept structure chart of this dissertation, which offers you an overview on our works.



(Chart 3.06) The Concept Structure of the Dissertation and the “Collaborative Function Model”