

**Chemical Management:
Overcoming Barriers to Diffusion**

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**Chemical Management:
Overcoming Barriers to Diffusion**

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Published by:

Illinois Waste Management and Research Center
One E. Hazelwood Drive
Champaign, IL 61820
www.wmrc.uiuc.edu

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Table of Contents

Executive Summary

Chapter 1 Overview	1
1.1. Top 10 Activities to Expand the CMS Market	1
1.2. Chemical Management Services (CMS)	4
1.3. Promoting CMS is in the Public Interest	6
1.4. Study Methods	6

PART 1: ENHANCING CMS INDUSTRY STRENGTH

Chapter 2 Assessing Industrial Competitive Position	8
2.1. Introduction to Part 1: The Importance of an Industry Assessment	8
2.2. Distinguishing the Chemical Industry from the Chemical Management Industry	8
2.3. A Structural Analysis of Industry Competitiveness	10
2.3.1. Intensity of Rivalry Among Existing Competitors	
2.3.2. Bargaining Power of Suppliers	
2.3.3. Bargaining Power of Customers	
2.3.4. Threat of Competitor Entry	
2.3.5. Threat of Substitute Products	
2.4. Cultivating Market Allies	13
2.5. Conclusions	13
Chapter 3: The Chemical Industry	14
3.1. The Chemical Industry	14
3.2. The Specialty Chemical Sector	15
3.3. Size of the Chemical Industry	17
3.4. Competitive Position of the Chemical Industry	17
3.4.1. Rivalry Among Existing Chemical Companies	
3.4.2. Bargaining Power of Suppliers	
3.4.3. Bargaining Power of Customers	
3.4.4. Threat of Competitor Entry	
3.4.5. Threat of Substitutes	
3.4.6. Overall Competitive Position	
3.5. Conclusions	22
Chapter 4 The Chemical Management Industry	23
4.1. Potential Market for the Chemical Management Industry	23

4.2. Competitive Position of the Chemical Industry	25
4.2.1. Rivalry Among Existing Chemical Management Companies	
4.2.2. Bargaining Power of Suppliers	
4.2.3. Bargaining Power of Customers	
4.2.4. Threat of Competitor Entry	
4.2.5. Threat of Substitutes	
4.2.6. Overall Competitive Position	
4.3. Cultivating Market Allies	30
4.4 Conclusions	32

PART 2: ENHANCING DEMAND

Chapter 5 Useful Lessons from Marketing	34
5.1. Introduction to Part 2: The Importance of Understanding Demand	34
5.2. Innovations Diffuse Over Time	34
5.1.1. Stages in the Individual Decision to Adopt	
5.1.2. Diffusion Through a Population	
5.3. Characteristics of the Innovation	35
5.3.1. Relative Advantage (Consequences)	
5.3.1.1. Cost Reduction	
5.3.1.2. Other Benefits	
5.3.2. Compatibility	
5.3.2.1. Jobs	
5.3.2.2. Process Stability ("Control")	
5.3.2.3. Existing Chemical Use	
5.3.2.4. Outsourcing	
5.3.3. Complexity	
5.3.4. Observability	
5.3.5. Trialability	
5.4. Characteristics of the Adopter	43
5.5. Social Context and Communication	44
5.5.1. Communication Networks	
5.5.2. Opinion Leaders	
5.5.3. Social Norms and Consequences	
5.5.3.1. Social Status and Power	
5.5.3.2. Company Culture	

5.6. Other Marketing Concepts	47
5.6.1. Product positioning	
5.6.2. Market segmentation	
5.7. Conclusions	48
Chapter 6 CMS Adoption in Plants	50
6.1. Organizations as Adopters	50
6.1.1. Anyone can initiate CMS and anyone can kill it.	
6.1.2. Is adoption top-down or bottom-up?	
6.2. The Adoption Process	54
6.2.1. The Stages	
6.2.2. Perceived Benefits and Risks	
6.3. Stages in Adoption	58
6.3.2. Awareness	
6.3.2.1. First knowledge	
6.3.2.2. The internal "sales" process.	
6.3.3. Analysis	
6.3.4. Supplier Selection	
6.3.5. Pilot	
6.3.6. Implementation	
6.3.7. Confirmation	
6.4. Conclusions	63
Chapter 7 - Targeting Key Stakeholders	65
7.1. Corporate Management	66
7.1.1. Corporate management concerns	
7.1.2. CMS and the corporate manager	
7.1.3. Reaching corporate management	
7.2. Plant Management	72
7.2.1. Plant management concerns	
7.2.2. CMS and the plant manager	
7.2.3. Reaching plant management	
7.3. Purchasing	74
7.3.1. Purchasing concerns	
7.3.2. CMS and purchasing	
7.3.3. Reaching purchasing personnel	

7.4. EHS	79
7.4.1. EHS concerns	
7.4.2. CMS and EHS	
7.4.3. Reaching EHS personnel	
7.5. Chemical Users	82
7.5.1. Manufacturing	
7.5.2. Maintenance	
7.5.3. Engineering	
7.5.4. Unions	
7.6. Financial Management	87
7.7. Conclusions	88
REFERENCES	90
APPENDIX: Estimating the Potential CMS Market	92

List of Tables

Table 3-1. The chemical industry organized by primary chemical customer	15
Table 3-2. The four sectors of industrial chemicals (Kline & Company, 1990)	16
Table 4-1. Potential CMS Allies	31
Table 5-1: Tone of marketing message by "innovativeness" of target audience	44
Table 5-2. Needs-based segments of the business energy market.	48
Table 7-1: Priority aids and barriers to CMS for each of the key stakeholder groups.	66
Table 7-2. Top concerns of global CEOs.	66
Table 7-3. Global corporate priorities for the new century	67
Table 7-4. Barriers to forming effective supplier partnerships, North American CEOs.	68
Table 7-5. Promising business publications to reach senior management.	70
Table 7-6. Promising channels for reaching plant management	74
Table 7-7. Issues of importance to purchasing/supply executives (in descending order).	74
Table 7-8. Promising channels for reaching purchasing personnel.	78
Table 7-9. Selected priorities for the new EHS manager	79
Table 7-10. Promising channels for reaching EHS personnel.	81
Table 7-11. Promising channels for reaching manufacturing personnel.	82
Table 7-12. Selected key issues of the plant maintenance profession	83
Table 7-13. Promising channels for reaching maintenance personnel.	84
Table 7-14. Selected key issues of the plant engineering profession.	85
Table 7-15. Promising channels for reaching engineering personnel.	85

Table 7-16. Promising channels for reaching financial managers (in addition to those for reaching corporate managers).	88
Table A-1: U.S. specialty chemical market in 1999 and estimated potential CMS market. (source of specialty chemical market data: SRI Consulting as quoted in Reilly, 1999).	93

List of Figures

Figure 1-1. The 10 Top Activities and the CMS "Market Pump."	2
Figure 1-2. Traditional supplier relationship - a supplier's incentive to increase chemical volume.	5
Figure 1-3. Shared Savings relationship - a supplier's incentive to decrease chemical volume.	5
Figure 2-1. Comparison of tradition chemical supply and chemical management programs.	9
Figure 2-2. The five factors influencing the competitive strength of an industry (adapted from Porter, 1980)	10
Figure 3-1. The Chemical Industry	14
Figure 3-2. The five factors influencing the competitive nature of the chemical industry.	18
Figure 4-1. Chemicals, CMS, and the value chain.	24
Figure 4-2. The five factors influencing the competitive nature of the chemical management industry.	25
Figure 5-1. Stages in the adoption process.	35
Figure 5-2. Pattern of Cumulative and "First Time" Adoption Over Time	36
Figure 6-1. Stages in the CMS Adoption Process.	54
Figure 6-2. Stakeholder accepts and then embraces CMS.	55
Figure 6-3. Stakeholder accepts CMS.	55
Figure 6-4. Stakeholder resists CMS.	56
Figure 6-5: The "Market Pump" is composed of the stages in the CMS adoption process.	57
Figure 7-1: The relationship between key stakeholder groups.	65
Figure 7-2. Two purchasing trends and the implications for CMS	77

Executive Summary

Introduction

Chemical management services (CMS) is an innovative alternative to traditional chemical supply, resulting in lower chemical costs and reduced chemical waste. However, we estimate that only 3%-6% of applicable companies have adopted CMS. This report identifies the most significant barriers to diffusion and provides a "Top 10" list of recommendations for strengthening and expanding the CMS industry. These 10 priority activities were derived from a comparison of the CMS and chemical industries (Part 1 of this report), and from an evaluation of the factors governing market demand for CMS (Part 2). The "Top 10" list represents broad initiatives for CMS growth; specific marketing activities must be developed by CMS suppliers, industry associations, and other organizations, such as WMRC, that seek to accelerate diffusion of CMS.

Top 10 Activities to Expand the CMS Market

(see Chapter 1 for details)

1. Clearly differentiate CMS from its inferior substitutes in the mind of prospective customers.
2. "Pre-sell" CMS to key stakeholders using targeted marketing strategies.
3. Develop internal marketing materials that are readily available and targeted to key stakeholders.
4. Demonstrate the total cost of chemical ownership.
5. Develop low-risk pilot programs.
6. Develop CMS "user groups" in local markets.
7. Develop demonstration sites in local markets.
8. Cultivate market allies.
9. Develop an ongoing system of market intelligence.
10. Leverage resources through a CMS industry association.

The CMS Industry

CMS is an innovative approach to chemical supply for manufacturers and other large-volume chemical users. Instead of buying chemicals, companies using CMS buy chemical performance; that is, they pay their suppliers a fee in exchange for meeting the chemical needs of the plant. Since chemical costs are borne by the supplier, there is a powerful incentive for the supplier to find ways to improve processes and reduce chemical usage. In other words, the interests of chemical supplier and chemical user are the same - reduce chemicals! As we have demonstrated in our previous WMRC report, the result is dramatic reductions in both chemical waste and chemical cost.

Economically and environmentally, CMS is superior to traditional chemical supply programs. It presents an opportunity not only to help meet environmental protection goals, but to promote national and global economic growth as well. Unfortunately, there are many barriers to rapid adoption of CMS programs. It is in the best interest of public environmental agencies to promote adoption of CMS.

The current CMS industry is probably in the range of \$0.5 to \$1 billion in revenues. In its current form, CMS could potentially reach a U.S. market of about \$16 billion, based on the approximate size of the large-volume, specialty chemical market. Thus, current market saturation is probably less than 6%, providing ample room for industry growth. The international market is perhaps twice the size of the U.S. market. In addition, variations on the current CMS model could potentially expand the industry into smaller-volume users, agricultural chemicals, specialty resins, pharmaceuticals, and other untapped markets.

The greatest threat to the CMS industry is from a flood of inferior substitutes. CMS is very different than traditional supply programs and can be difficult for chemical users to understand. This creates an opportunity for some suppliers to provide traditional chemical supply programs under the banner of "chemical management." These programs offer some immediate savings but lack the long-term ability of CMS to significantly reduce chemical waste and cost. The single most important activity to expand the CMS industry is to establish clear product differentiation in the minds of chemical users between CMS and its inferior substitutes.

In addition, there are many potential "market allies" that can help support the CMS market. Organizations such as EPA, OSHA, and even environmental activist groups can provide credibility and recognition to companies using CMS. WMRC, the Chemical Strategies Partnership (CSP), and other industry-oriented environmental organizations can serve as third party "facilitators" to help chemical users through the difficult adoption process. Finally, companies that share an economic interest in CMS, such as pollution prevention technology firms, can be valuable partners.

Growth of the CMS Market

A "market pump" drives growth in demand for CMS. As companies adopt CMS and have a positive experience, that experience is shared with other companies, stimulating demand. In a sense, positive CMS experiences "pump" energy into the market. Factors that promote the adoption and success of CMS, as well as factors that help disseminate those success, will increase the "market pump" rate, thereby expanding CMS market growth.

We believe that most companies follow a series of stages in adopting CMS: Awareness, Analysis, Supplier Selection, Pilot, Full Implementation, and Confirmation. Together, these comprise the "market pump," and are presented in Figure 1-1 along with the 10 priority activities. Many stakeholders are involved in the plant's adoption decision, including management, purchasing, environmental health and safety (EH&S), and the chemical users (manufacturing, maintenance, engineering, unions, etc.) Significant resistance from any of these stakeholders may be sufficient to prevent CMS adoption.

Many prospective customers have yet to become aware of CMS. Those that begin the Awareness stage often do not complete it due to the difficult "internal marketing" job that early CMS champions face. The information to which stakeholders are initially exposed usually does not effectively address the benefits and risks that are relevant to the stakeholder. Recognition of CMS from organizations such as EPA and OSHA can help stakeholders identify some of the important CMS benefits.

Among companies that enter the Analysis stage, many do not adopt CMS because they fail to recognize the total cost of chemicals and the ability of CMS to reduce those costs. Third-party facilitators, such as WMRC and CSP, can help companies move through this difficult stage. Many companies fail to adopt CMS because they lack the opportunity to experience a low-risk pilot, or "test drive" program.

Partnerships with process technology firms, such as makers of membrane filters, can enhance the success of CMS programs, providing continuous improvement in chemical efficiency. Demonstration sites and CMS "user groups" can help convey CMS successes to prospective customers, completing the "market pump" cycle.

Finally, the efforts of individual CMS suppliers to expand the CMS industry will be helpful. But pooling these resources through an industry association can provide far greater leverage in gathering key industry intelligence as well as strengthening the CMS industry and expanding CMS markets. The CMS Forum (www.cmsforum.org) represents a positive step in this direction.

Chapter 1

Overview

Chemical management services (CMS) is an innovative alternative to traditional chemical supply, resulting in lower chemical costs and reduced chemical waste. This report identifies means by which the CMS industry can be strengthened and expanded. Below, we list 10 activities that we believe should be top priority. These 10 activities are presented in this chapter as one way to approach the report. Each activity includes a list of report sections that pertain to the activity. The interested reader can refer to these sections for additional information.

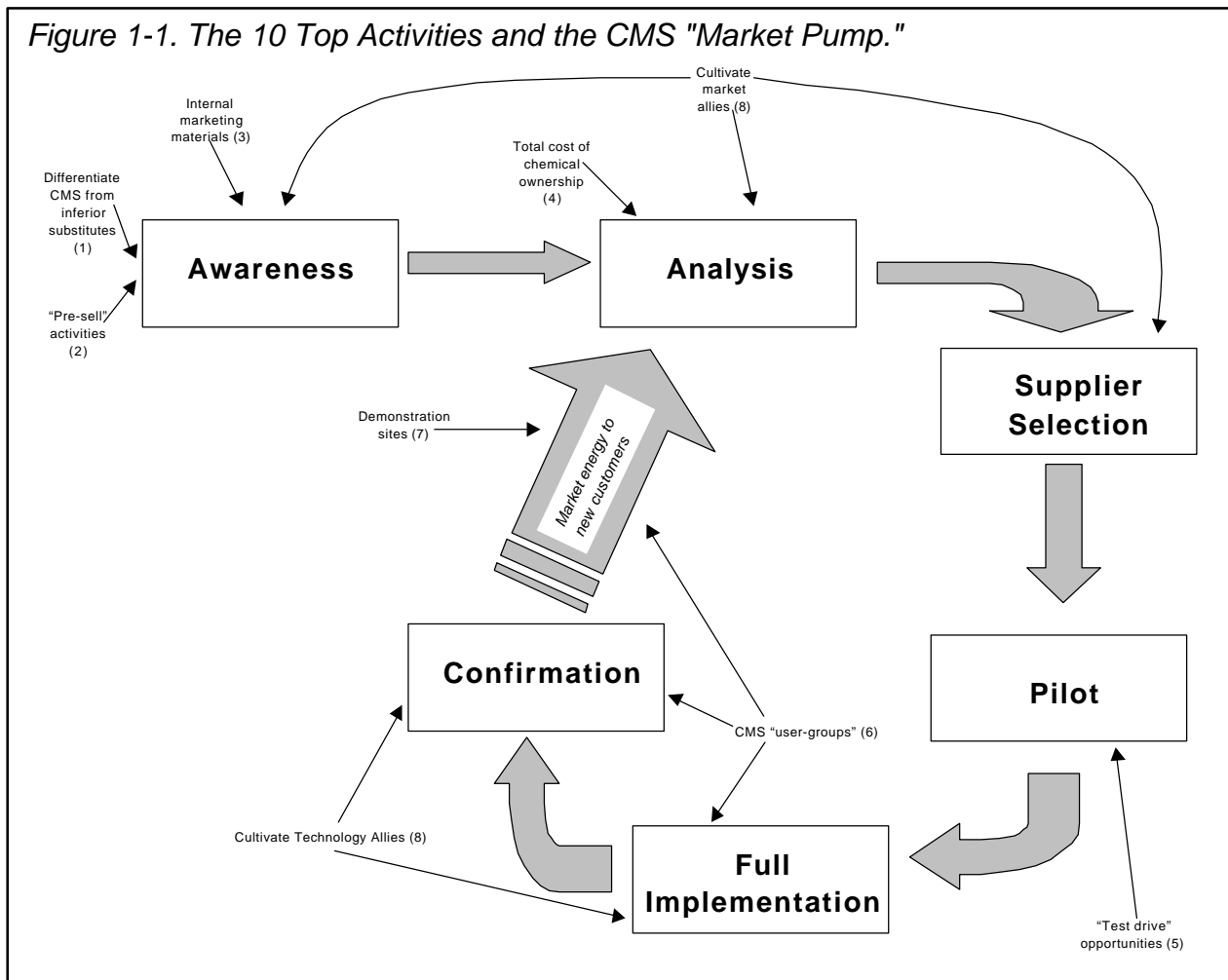
However, the entire report can be read sequentially for a more thorough analysis of how to strengthen and expand CMS. The analysis has two parts. In Part 1 (Chapters 2-4), the CMS industry is evaluated against the chemical industry. Gaining and sustaining competitive advantage represents the primary means for long-term growth of the CMS industry. In Part 2, factors governing market demand for CMS are evaluated. This includes general lessons from the field of marketing (Chapter 5), implications of the CMS adoption process in a company (Chapter 6), and addressing the concerns and interests of key company stakeholders (Chapter 7).

1.1. Top 10 Activities to Expand the CMS Market

To strengthen the CMS industry and accelerate demand for CMS, 10 priority activities have been identified. Figure 1-1 uses the concept of a "market pump" to illustrate the way in which each of the first 8 activities can contribute to expansion of the CMS market (see Chapter 6 for a further explanation of the "market pump"). Activities 9 and 10 apply to all aspects of the "market pump."

1. Clearly differentiate CMS from its inferior substitutes in the mind of prospective customers.

The single greatest threat to the CMS industry is inferior substitutes such as integrated supply, supply chain management, and similar purchasing strategies focused on chemical price and logistics. While many of these strategies can be included in a CMS program, they cannot, alone, provide the same long-term reductions in chemical cost and waste. Whether through advertising, industry definitions, technology certification programs, or standards, CMS must be clearly distinguished from supply programs that lack the capability and financial incentives for suppliers to continuously improve chemical efficiency. (see Part 1, particularly Section 4.2.5.)



2. "Pre-sell" CMS to key stakeholders using targeted marketing strategies.

Most stakeholders' initial knowledge of CMS is characterized by incomplete or even inaccurate information, creating a negative disposition towards CMS before it is ever seriously considered at a company. A comprehensive "pre-sell" marketing strategy is needed, targeted to reach CMS stakeholders with positive and informative messages about CMS. This strategy can include:

- advertising in print media
- advertising on the World Wide Web
- exhibiting at trade shows and conferences
- presenting case studies at trade shows and conferences
- publishing case studies in print media and World Wide Web
- creating news events with market allies (see #9 below)

The goal is not only to increase the number of CMS champions, but also to favorably dispose all stakeholders to CMS thereby easing the process of "internal marketing." (see Part 2, including many sections of Chapter 5, section 6.3.1.1, and Chapter 7).

3. Develop internal marketing materials that are readily available and targeted to key stakeholders.

The early marketing of CMS within a company is done almost entirely by an internal CMS champion, not by a CMS supplier. Currently, champions are poorly equipped to do this. Many prospective CMS customers are lost because a CMS "champion" is not able to effectively market CMS internally. Materials are needed that are specific to each stakeholder group, addressing relevant CMS benefits and risks. These materials must be readily available, including access via the World Wide Web. ." (see Part 2, including many sections of Chapter 5, section 6.3.1.2., and Chapter 7).

4. Demonstrate the total cost of chemical ownership.

Most managers grossly underestimate the total cost of chemical ownership. The result is an obsession with chemical price and a failure to recognize the benefits of CMS. Several case studies are needed that demonstrate the total cost of ownership for common CMS chemicals, such as coolants, cleaners, solvents, and water treatment chemicals. A simple way for companies to roughly estimate their total cost of chemicals is also needed. (see section 5.3.1.1.).

5. Develop low-risk pilot programs.

Risk can stop the adoption of any innovation in the absence of overwhelming perceived benefits. Though many CMS suppliers provide pilot programs, these often contain significant risk for the customer. Innovative approaches to reduce customer risk - through "test-drive" programs or benefit guarantees - could significantly increase customer experience with CMS, and therefore, CMS adoption. (see sections 5.3.5. and 6.3.4.).

6. Develop CMS "User Groups" in local markets.

An effective way to reduce risk is to bring the experiences of successful programs to prospective customers. Local markets with a relatively high concentration of CMS programs, such as the Chicago area, could support CMS "User Groups." These groups, composed of stakeholders at plants with successful CMS programs, would meet periodically to discuss issues and problems, as well as spotlight successes. Not only does this provide an opportunity for CMS suppliers to improve their programs, prospective customers can attend meetings to better observe the benefits and support system inherent in CMS programs. Several CMS users in the Chicago area have expressed an interest in a CMS User Group (see sections 5.3.4. and 6.3.4.)

7. Develop demonstration sites in local markets

Another way to reduce risk is to bring prospective customers into plants with successful CMS programs and technologies. It is difficult for prospective customers

to accurately understand CMS and the technologies that CMS suppliers can introduce into plants. Demonstration sites of successful CMS programs allow prospective customers to observe CMS in progress and discuss issues and concerns with their counterparts at other plants. WMRC, the Chemical Strategies Partnership (CSP), and other third-party organizations can play an important role in establishing demonstration sites. (see sections 5.3.4. and 6.3.4.)

8. Cultivate market allies.

Many organizations other than CMS suppliers can help establish a healthy and vibrant CMS industry. These include special interest groups (EPA, OSHA, environmental activist groups, etc.), industry-oriented environmental organizations (such as WMRC, and the Chemical Strategies Partnership), and companies from other industries (such as technology suppliers). Such allies can improve the "market pump" at many stages, from initial awareness to conveying market information and energy to new customers. One particularly promising arena for developing allies is the synergy between CMS and environmental management systems such as ISO 14001. (see sections 2.4 and 4.3).

9. Develop an ongoing system of market intelligence.

The information presented in this report provides the basis for beginning a comprehensive marketing strategy. However, it is only a beginning. An effective marketing strategy will require more detailed information on an ongoing basis. This includes information on key stakeholders such as their level of awareness and attitudes toward CMS; their priority needs and concerns; and relevant marketing channels for reaching them, including print media, Web sites, and trade shows. A system for gathering and sharing key market intelligence is needed on an ongoing basis.

10. Leverage resources through a CMS industry association.

The nine activities above could be pursued by individual CMS suppliers. However, expansion of the CMS market will benefit all CMS suppliers. It is logical to leverage individual company resources by acting collectively in efforts to strengthen and expand the CMS market. Suppliers must first collaborate to expand the CMS market, and then compete to capture the market. The CMS Forum (www.cmsforum.com), a recently-formed association of CMS suppliers, is a useful step in this direction.

1.2. Chemical Management Services (CMS)

In traditional chemical supply relationships, the supplier increases profit by increasing the volume of chemicals sold (see Figure 1-2). The supplier is continuously driven to increase chemical sales to increase profit. Aside from promoting waste, this "volume

conflict” creates an inherent adversarial relationship that inhibits the free flow of useful information that could reduce chemical usage and costs. Subsequently, it creates a degree of mistrust between users and suppliers, reducing the ability of both parties to work together to improve the total financial potential of the relationship.

A chemical management services (CMS) program, however, is very different. In a CMS relationship, financial incentives align the supplier’s performance goals with those of the chemical user. The goal is to continuously reduce chemical use and waste while continuously improving product and process quality. The supplier and the user then “share the savings” gained from reduced chemical volume and improved processes. To achieve these chemical efficiencies, the responsibilities associated with all aspects of chemical management programs are divided between the two parties based on respective core competencies. The user defines chemical performance specifications and the supplier takes direct responsibility for insuring the performance of all chemicals.

In most CMS programs the chemical user pays a fixed fee (per month or per unit of production) to the supplier. The supplier agrees to meet the “chemical performance needs” of a plant or process. Since the supplier’s revenues are fixed, it has an incentive to reduce chemical costs in order to increase profits. Cost reductions come primarily through improvements in chemical management and process efficiency. As shown in Figure 1-3, the cost reduction incentive aligns the interests of the chemical supplier with the interests of the chemical user - to drive chemical volumes down. This is just the opposite of the typical chemical sales relationship (Figure 1-2). Simply stated, CMS turns the inefficiency and waste of traditional chemical sales relationships into profit for both the chemical supplier and user.

Figure 1-2. Traditional supplier relationship - a supplier’s incentive to increase chemical volume.

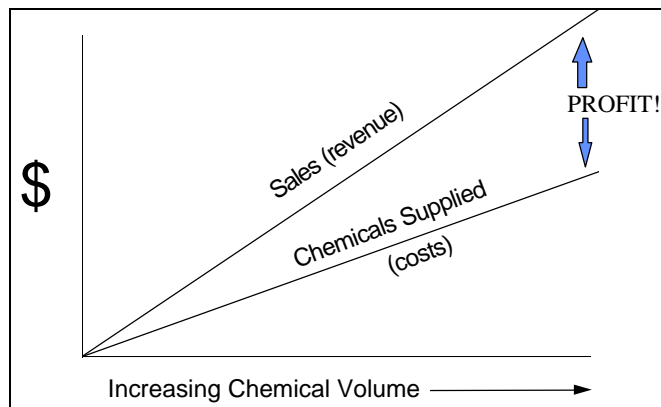
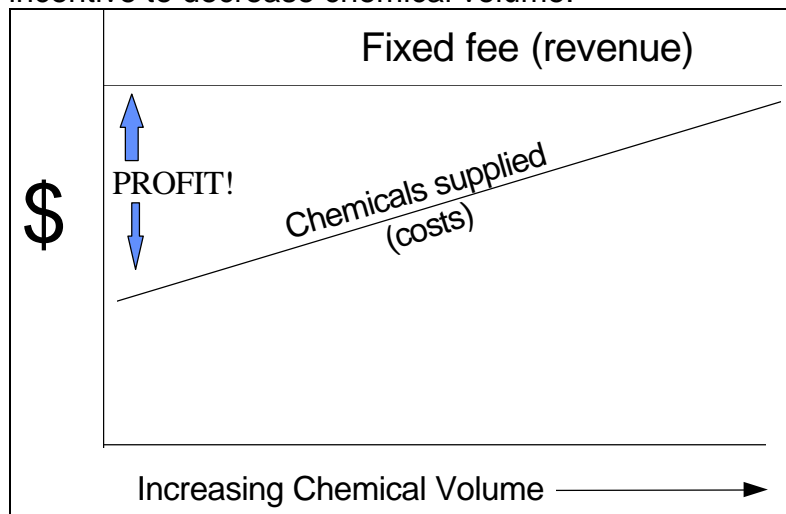


Figure 1-3. Shared Savings relationship - a supplier’s incentive to decrease chemical volume.



1.3. Promoting CMS is in the Public Interest

Economically and environmentally, CMS is superior to traditional chemical supply programs. It reduces waste – not only in terms of pollution, but also the wasted resources of businesses that use inefficient chemical processes. Thus, CMS presents an opportunity to both help meet environmental protection goals *and* to promote national and global economic growth.

Unfortunately, there are many barriers that inhibit the rapid adoption of CMS by chemical-using companies. In the absence of a concerted effort to expand the CMS industry, CMS adoption will be quite slow. It is in the public interest to help accelerate adoption and promote a healthy and competitive CMS industry.

1.4. Study Methods

To identify the barriers to CMS diffusion and the means to overcome these barriers, it is necessary to not only understand the CMS industry, but also the lessons from economics and marketing that have helped other industries grow. Thus, research for this report can be divided broadly into two categories: 1) research related to the CMS industry, and 2) research related to lessons from economics and marketing.

To better understand the CMS industry, we conducted a series of interviews with CMS suppliers, current CMS users, and companies that have yet to adopt CMS. The latter group included companies ranging from those that had never heard of CMS to those that had considered CMS and rejected it. Some interviews were conducted in person and some were conducted by telephone. Initial contacts for the interviews were from our previous research, referrals from CMS suppliers, and referrals from the Illinois Waste Management and Research Center (WMRC). Many interviewees provided additional referrals.

We used an iterative interview process to enhance quality assurance. Conclusions from earlier interviews, as well as our literature review (below), were shared with interviewees for their reactions. This was typically done toward the end of each interview to avoid influencing the comments of the interviewee. As in our previous research, we found that this approach guided our conclusions toward a general consensus of interviewees.

We relied heavily upon the literature for useful lessons from the fields of economics and marketing. We used seminal texts in each field (such as Porter's *Competitive Advantage*, and Roger's *Diffusion of Innovations*), as well as recent developments in theory (such as Moore's *The Death of Competition*). Journal articles provided valuable

empirical evidence on purchasing behavior, resistance to innovation, stock performance and other relevant issues. Internet sources were extremely valuable in tracking recent business news, accessing economic census data, and identifying relevant professional organizations and journals for key stakeholders.

PART 1

ENHANCING CMS INDUSTRY STRENGTH

Chapter 2

Assessing Industrial Competitive Position

2.1. Introduction to Part 1: The Importance of an Industry Assessment

The chemical management services (CMS) industry is in competition with the chemical industry. Supplier revenues in a CMS program come primarily from the program's ability to displace chemical expenditures. The long-term survival and growth of the CMS industry depends upon its ability to maintain and extend its competitive advantage.

Thus, to understand and promote the long-term survival and growth of the CMS industry, it is necessary to assess its competitive strengths and weaknesses, as well as those of the chemical industry. This chapter presents the basic distinctions between the CMS and chemical industries, and then presents a simple model by which the competitive position of each industry will be assessed. Chapter 3 uses this model to assess the competitive position of the chemical industry. Chapter 4 applies the model to the CMS industry. At the end of the chapter, we briefly consider some important implications of a relatively new perspective on industry competition using the model of an ecosystem.

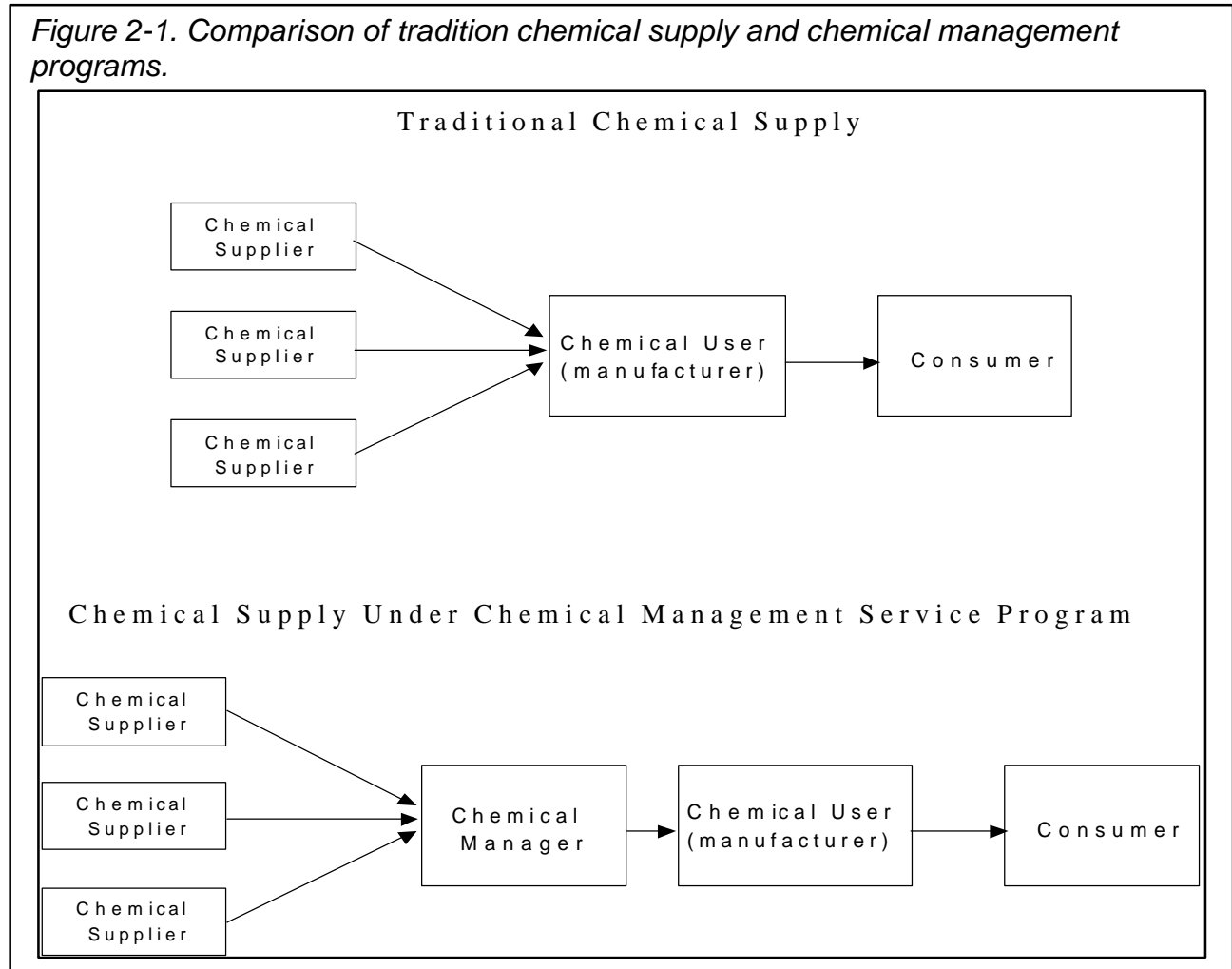
It should be noted, however, that although the CMS and chemical industries are in competition, this does not prevent a company from operating successfully in both industries. These two businesses need not be in competition with a company, since both contribute to overall success. In fact, most of the leading CMS companies today also have highly successful chemical sales programs. Thus, when we refer to "chemical companies" and "CMS companies," this can include the same companies operating in both industries.

2.2. Distinguishing the Chemical Industry from the CMS Industry

Though CMS may appear to be simply a new marketing approach for the chemical industry, there is good reason to consider CMS and chemicals to be separate and competing industries. The key distinction between the two industries is their source of revenue. Revenue in the chemical industry is derived primarily from the sale of chemicals, and profits generally increase as chemical volume **increases**. Revenue in the chemical management industry, on the other hand, is unrelated to chemical volume, and profit generally increases as chemical volume **decreases**. Thus, the two industries are direct competitors: one seeking to increase chemical volumes, the other seeking to decrease them. This is analogous to the typewriter and personal computer (PC) industries. Since the PC is a substitute for the typewriter, they were competing industries, and the growth of the PC market has meant a dramatic decline in the typewriter market.

One way to visualize the two industries is presented in Figure 2-1. In a traditional chemical supply program, suppliers provide chemical directly to the chemical user, such as a manufacturing facility. Since supplier revenue is linked to the volume of chemicals supplied, the greater the volume of chemical supplied the greater is supplier profit. Each supplier has incentive to continuously increase the volume of the chemicals they supply.

Figure 2-1. Comparison of tradition chemical supply and chemical management programs.



Under a chemical management service (CMS) program, however, a chemical management provider serves as an intermediate between chemical suppliers and the chemical user. Since supplier revenue is linked to chemical performance, not chemical volume, suppliers increase profits by decreasing the volume of chemicals required by the customer. Thus, the role of the chemical manager is to optimize the user's chemical systems. This typically means performing certain chemical functions, such as inventory management and chemical tracking, as well as reducing chemical volumes and costs. In this way, the two industries compete for the chemical user's business. Success for the CMS industry comes at the expense of the chemical industry. As noted previously, however, individual companies can operate successfully in both industries.

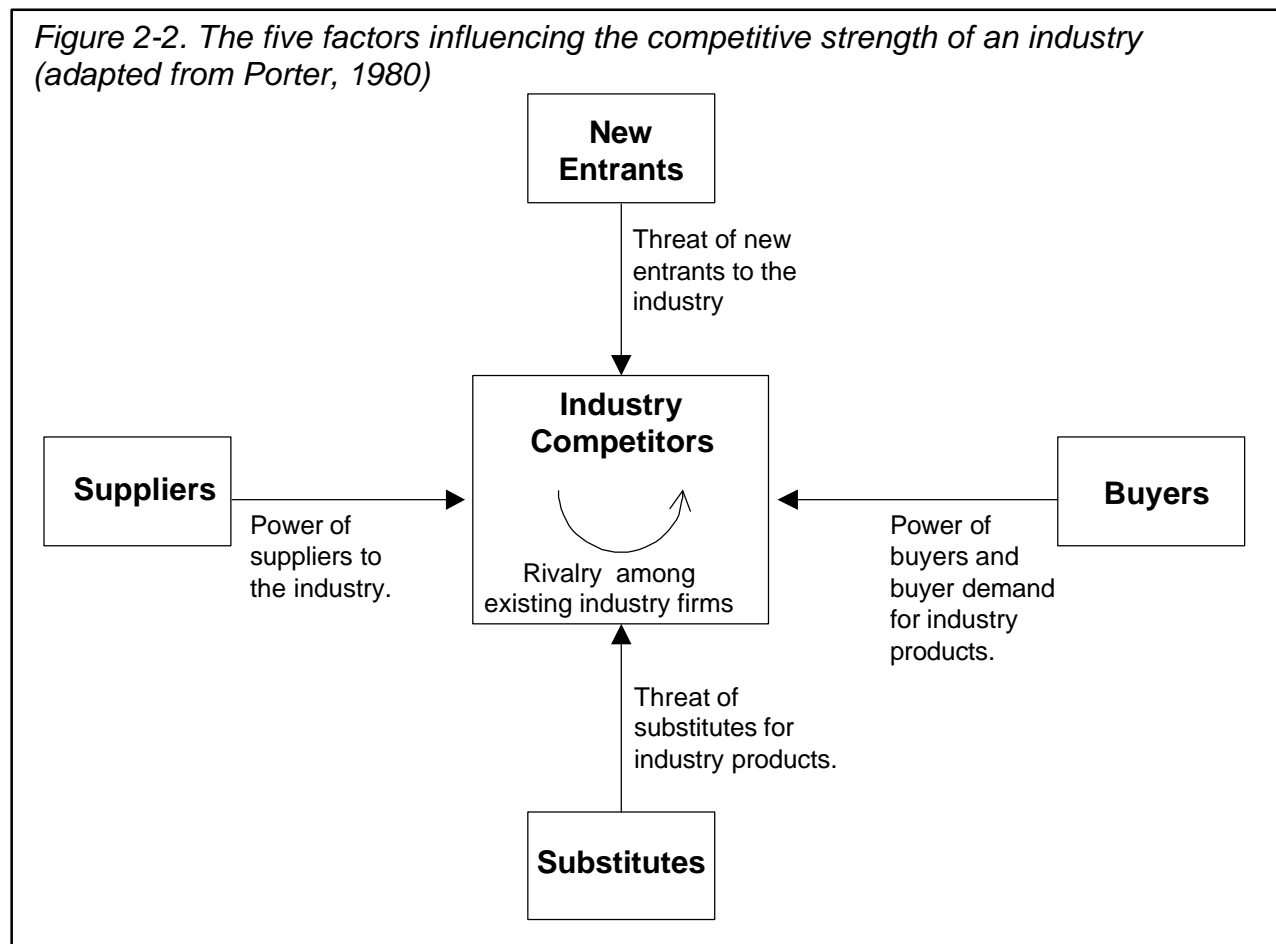
2.3. A Structural Analysis of Industry Competitiveness

The economic performance of an industry depends upon a great number of factors. However, work by Michael E. Porter, of Harvard University, has demonstrated that the most important factors can typically be grouped into five categories (Porter 1980, 1984):

- Rivalry among existing competitors
- Bargaining power of suppliers
- Bargaining power of customers
- Threat of competitor entry
- Threat of substitutes

Each of these factors will be discussed in turn, below (see Figure 2-2). Understanding these factors as they relate to both the chemical and CMS industries is important to increasing the rate of CMS adoption. The CMS industry must be able to reduce its vulnerabilities and enhance its competitive advantages.

Figure 2-2. The five factors influencing the competitive strength of an industry (adapted from Porter, 1980)



2.3.1. Intensity of Rivalry Among Existing Competitors

Firms within an industry compete with each other for business. However, the nature of this competition can vary greatly. In industries where the customer perceives little product differentiation suppliers must rely heavily on price as a competitive tool. On the other hand, where product differentiation is significant, suppliers can use quality, service, or other factors to compete for business. There is less downward pressure on price. The long-term health of an industry depends upon maintaining a moderate amount of price competition while avoiding destructive "price wars" that can rob the industry of profits needed to finance innovation and future growth.

Some of the factors that can lead to intense price competition include:

- *Numerous competitors*
- *Slow industry growth*
- *Lack of product differentiation*
- *Low switching costs for customers*

Moreover, Porter argues that there can be "good competitors" and "bad competitors" (Porter, 1985). An industry of "good competitors" tends to have greater long-term success since it continues to be innovative, yet avoids intense price competition or other destructive behaviors. Among other things, a "good competitors" has:

- *Good company credibility and reliability* - this adds to the overall reputation of the industry.
- *An understanding of the market* - will not build overcapacity or react inappropriately to market signals.
- *An understanding of the competition* - recognizes the ways to avoid intense price competition and generally cooperates with industry attempts to maintain long-term viability.

2.3.2. Bargaining Power of Suppliers

If the suppliers to an industry have strong bargaining power in the market, they can reduce industry profits and slow industry growth. Some of the factors that can increase supplier bargaining power include:

- The industry being supplied is composed of a large number of competitors.
- The supply industry is dominated by a few large firms.
- The supply industry experiences little threat from substitutes.

2.3.3. Bargaining Power of Customers

If customers have strong bargaining power in the market, it can reduce industry profits and slow industry growth. Some of the factors that can increase customer bargaining power include:

- The industry is composed of a large number of competitors.
- The customer industry is dominated by a few large firms.
- Customers purchase large volumes relative to seller sales.
- Customers perceive little product differentiation.
- Customers have low switching costs.
- The product is unimportant to the cost or quality of the customer's product.

2.3.4. Threat of Competitor Entry

New companies entering the industry bring added competition and lower returns on investment for firms already in the industry. In general, the greater the barriers to entry of new firms, the greater the competitive position of the industry. These barriers may include factors such as:

- *Economies of scale* – factors that bring significant cost advantages to high-volume suppliers.
- *Product differentiation* – the ability to create customer loyalty through a qualitative difference between one's product and a competitor's in the mind of the customer.
- *Capital requirements* – the need for large capital investments in order to produce product and compete in the industry.
- *Switching costs* - the difficulty with which a customer can switch from one competitor to another.
- *Learning or experience curve* - the expertise required to effectively produce and distribute a product.
- *Proprietary knowledge* - the extent to which the above expertise is kept proprietary.

2.3.5. Threat of Substitute Products

Substitute products are those products that can perform the same or similar function for the customer. Substitutes may be very similar to the existing product, for example substituting an aqueous cleaner for a solvent-based cleaner, or may be very different, such as eliminating the need for cleaners by using a technology that reduces product soiling.

Thus, identifying and anticipating potential substitutes requires more than monitoring new product development by existing competitors. Potential substitutes can come from

almost any industry. Any product, service, or technology that can effectively perform the same function for a customer may become a significant substitute threat.

2.4. Cultivating Market Allies

A recent book that has shed new light on industries and markets is the *Death of Competition*, by James Moore (Moore, 1996). The purpose of the book is to view markets as “ecosystems” rather than simply a collection of firms competing for customers. Robust ecosystems that can sustain long-term growth evolve a web of organisms that are mutually supportive. Weak and vulnerable ecosystems are based on only a few dominant organisms. Similarly, robust markets that can sustain long-term growth contain a web of organizations and technologies that are mutually supportive. Weak and vulnerable markets are dominated by a few organizations and technologies. The lesson for business is to focus less on direct competition and more on developing the “ecological health” of the market – including its supportive organizations and technologies.

This concept has important applications for CMS. Chemical management has many potential allies that can help support and promote the market. These allies will be discussed in Chapter 4.

2.5. Conclusions

The CMS industry and chemical industry are in competition. Chemical suppliers profit from increased chemical volume, while CMS suppliers profit from decreased chemical volume. The survival and growth of the CMS industry depends upon its ability to recognize and correct its vulnerabilities, as well as its ability to recognize and enhance its competitive strengths.

Porter’s model of competitive advantage provides a useful approach for understanding both the chemical and CMS industries. The model suggests that the rivalry among existing competitors, the bargaining power of suppliers, the bargaining power of customers, the threat of competitor entry, and the threat of substitutes are key factors in understanding industry competitive strength. These factors will be used to assess the competitive strength of the chemical industry (Chapter 3), and the CMS industry (Chapter 4) in the remainder of Part 1.

Chapter 3: The Chemical Industry

Displacing chemical sales is the primary source of current and near-future revenue for CMS programs. Thus, the primary competition for the CMS industry is the chemical industry. To best position the CMS industry to succeed in this competition, it is useful to understand the nature, competitive strengths, and potential vulnerabilities of the chemical industry.

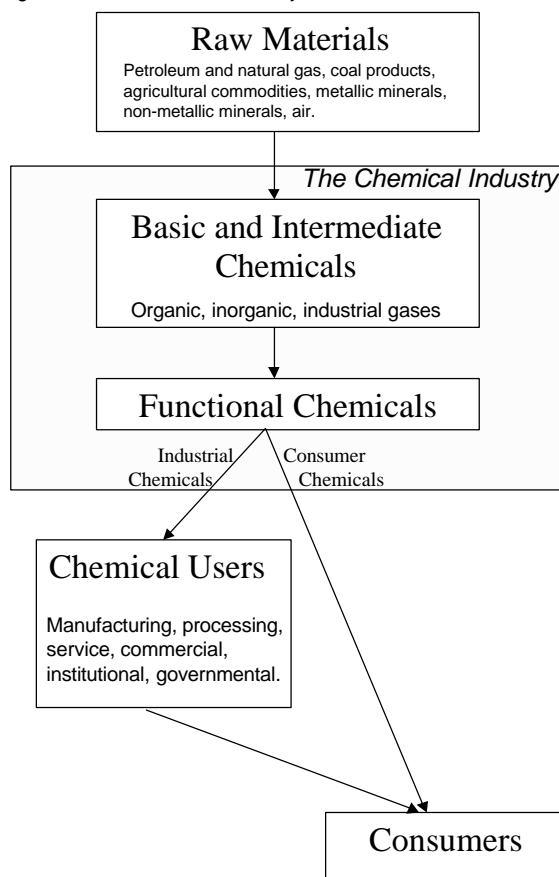
3.1. The Chemical Industry

As commonly defined, the chemical industry begins with basic feed stocks such as petroleum, natural gas, coal products, agricultural commodities, metallic and non-metallic minerals, and air (see Figure 3-1). Though a variety of chemical processes are used in the production of feedstocks, these processes are generally not considered part of the chemical industry. Thus, industries such as petroleum refining are typically not included in the chemical industry.

Feedstocks are generally used to make *basic and intermediate chemicals*. These chemicals, such as ethylene or vinyl chloride, are used within the chemical industry as building blocks to synthesize other chemicals, known as *functional chemicals*. Unlike basic and intermediate chemicals, which are used to make other chemicals, functional chemicals perform specific functions, from cleaning and coloring to protecting materials and healing people.

Most functional chemicals are sold to customers outside the chemical industry. A useful way to group functional chemicals is whether they are sold to consumers (*consumer chemicals*) or to organizations (*industrial chemicals*).¹ Industrial chemical customers include not only manufacturing and process industries, but also commercial and service companies, institutions, or governmental organizations. This distinction between *basic and intermediate chemicals*, *consumer chemicals* and *industrial chemicals* is illustrated in Table 3-1. Some chemicals fall into more than one of these chemical groups. For

Figure 3-1. The Chemical Industry.



¹ Some sources include *basic and intermediate chemicals* in the term “industrial chemicals” as well as functional chemicals intended for other industries.

example, sulfuric acid is used as a basic chemical in the synthesis of other chemicals, but is also used by certain manufacturing and processing companies outside the chemical industry. It may even be purchased by consumers in small quantities. However, most of the volume for any chemical is usually accounted for by one of the three categories.

Table 3-1. The chemical industry organized by primary chemical customer

Chemical Industry Sector	Primary Customer
<i>Basic and Intermediate Chemicals -</i>	Chemical Industry
<i>Industrial Chemicals -</i>	Manufacturing and process industry, commercial and service companies, government, institutions, etc.
<i>Consumer Chemicals -</i>	Consumers (the public)

Though there is general agreement on where the chemical industry begins, there is less agreement on where it ends. Some definitions exclude any chemicals produced for consumers (Kline & Co., 1990). Others include certain consumer chemicals, such as paints and pharmaceuticals, but exclude others, such as gasoline.

3.2. The Specialty Chemical Sector

A sector of the chemical industry known as *specialty chemicals* represents the primary potential market for CMS. *Specialty chemicals* is one of four sectors comprising industrial chemicals. These four sectors are distinguished on the basis of purchase volume and brand differentiation. Brand differentiation reflects the extent to which a chemical product from one company is viewed as similar or dissimilar to a related chemical product from another company. Using these two dimensions, four categories of functional chemicals are defined: fine, specialty, true commodities, and pseudocommodities (See Table 3-2).

True commodities are relatively undifferentiated. That is, they represent standard, widely known chemical formulations. A true commodity chemical from one supplier is expected to be essentially identical to that from another supplier. Examples include sulfuric acid and caustic soda. Because true commodities are produced in large quantities, competition among suppliers is generally on the basis of price, with significant price advantages given for volume orders.

Table 3-2. The four sectors of industrial chemicals (Kline & Company, 1990)

	Product Differentiation	
	Undifferentiated	Differentiated
Low Purchase Volume	<i>Fine Chemicals</i>	<i>Specialty Chemicals</i>
High Purchase Volume	<i>True Commodities</i>	<i>Pseudocommodities</i>

Fine chemicals are also relatively undifferentiated, but are purchased in relatively small volumes. The most common examples are many of the additives used by the food and cosmetic industries. Competition among suppliers focuses not only on price, but also on the speed and reliability of delivery.

In contrast, specialty chemicals and pseudocommodities are purchased more for their performance capabilities than for their chemical formulation. That is, the chemical user has specific chemical performance needs, but is relatively flexible about the combination of chemicals used to perform that function. This allows suppliers to differentiate between their products on the basis of chemical composition and performance. This can result in a greater amount of brand loyalty if chemical users perceive superior performance from a particular brand.

Pseudocommodities tend to be sold to a limited number of customers in relatively large volume. This situation creates greater customer leverage and puts additional pressure on price. Examples include many types of synthetic resins and fibers. Specialty chemicals, on the other hand, are purchased in smaller volumes and by a much larger number of users. This creates a very complex and diverse market where it is more difficult for the customer to maintain a high level of chemical expertise.

Specialty, true commodity, and pseudocommodity chemicals represent roughly equal shares of the overall functional chemical market. Fine chemicals represent only a small fraction of the functional chemical market, probably under 7% (Kline & Co., 1990).

Though CMS programs can include any of these four types of industrial chemicals, specialty chemicals have been the driving force behind most CMS programs. The reason has been the relatively high margins on such chemicals and the higher level of expertise needed to optimize the use of such chemicals. Examples of important specialty chemicals in existing CMS programs include paints, water treatment chemicals, and machining fluids. Thus, it is the specialty chemical sector within the chemical industry that is of particular importance to this study.

3.3. Size of the Chemical Industry

According to the U.S. Census Bureau, the value of product shipments from U.S. chemical operations (NAICS 325) totaled \$418 billion in 1997 (the most recent data available).

The worldwide specialty chemical sector has been estimated at approximately \$315 billion (Société de Chimie Industrielle, 1999). Of the over \$400 billion in U.S. chemical shipments, approximately \$91 billion is in the specialty chemical sector (see the Appendix for details).

3.4. Competitive Position of the Chemical Industry

As discussed in Chapter 2, the competitive position of an industry is commonly attributed to five key factors (Porter 1980, 1985):

- Rivalry among existing competitors
- Bargaining power of suppliers
- Bargaining power of customers
- Threat of competitor entry
- Threat of substitutes

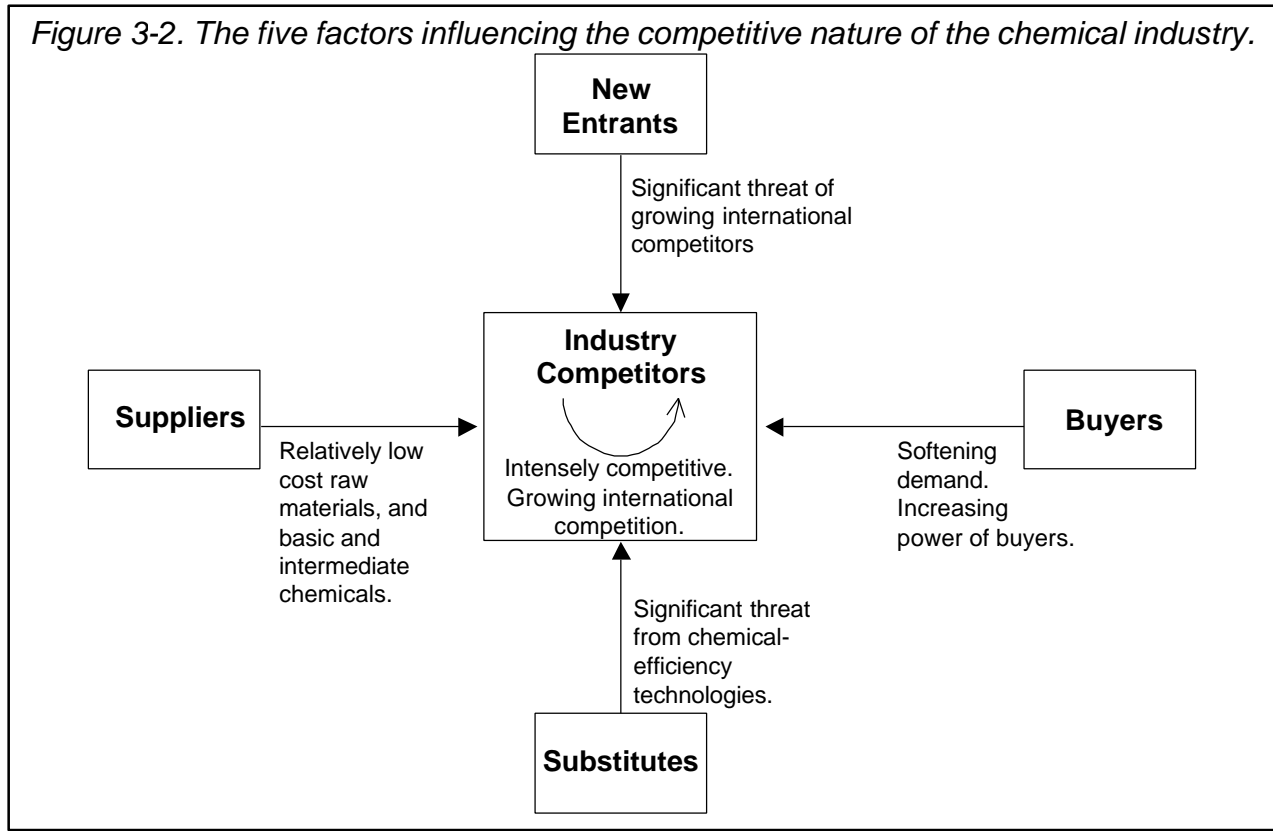
Each of these factors will be used, in turn, to assess the competitive strengths of the chemical industry as well as highlight its vulnerabilities. (see Figure 3-2).

3.4.1. Rivalry Among Existing Chemical Companies

In 1997, the U.S. had over 12,000 chemical companies employing over 800,000 people (U.S. Department of Census, 1997). Despite the large number of companies, the chemical industry is relatively concentrated, with the top 10 companies accounting for approximately 27% of all U.S. sales in 1988 (Kline & Co., 1990). However, according to Kline & Co. (1990), the chemical industry is less concentrated than other capital-intensive industries such as autos, aircraft, and petroleum refining. The largest chemical companies tend to be those with significant production in basic and intermediate chemicals. Examples include Dow, DuPont, Union Carbide, and Monsanto. Most sectors of the chemical industry are similarly dominated by a small number of very large firms. Nevertheless, most markets contain a large number of smaller competitors.

On the whole, though the chemical industry is dominated by a relatively small number of large, multi-national firms, the industry is highly competitive. In particular, international competition has increased dramatically in recent decades.

Figure 3-2. The five factors influencing the competitive nature of the chemical industry.



The specialty chemical sector supports an array of national and international chemical companies. One reason is the diversity of specialty chemical markets. Many suppliers specialize in a relatively narrow market niche. For example, the water treatment chemical market tends to be dominated by a handful of large companies, yet these companies do not generally compete with dominant firms in other niches, such as metalworking fluids.

In addition to the large national and international suppliers of specialty chemicals, many smaller companies serve regional or local markets. These companies may produce their own chemicals, or buy bulk chemicals from other producers and blend or formulate products specifically for their customers. Many of these firms compete on the basis of delivery and other services.

One result of the diversity of competition has been consolidation through mergers and acquisitions. In some cases, companies have sought other companies as a means of entering new markets. However, recent years have also seen the merger of many companies in the same market. For example, in the water treatment chemical market, one leading supplier, Dearborn, was purchased by an outside chemical supplier, W.R. Grace, forming GraceDearborn in the mid-1990's. Within a few years, Grace sold Dearborn to another leading water treatment chemical supplier, Betz Laboratories, forming BetzDearborn. In 1998, BetzDearborn was purchased by specialty chemical giant, Hercules.

This trend toward consolidation is expected to continue and will result in reduced competition in certain chemical markets. However, most chemical markets are expected to continue to be highly competitive, especially as international competition continues to grow. The continued intense competition is expected to limit industry earnings, encouraging chemical companies to seek alternative growth opportunities, such as CMS.

3.4.2. Bargaining Power of Suppliers

The supply of raw materials to the chemical industry comes from relatively competitive markets. This has tended to keep prices low while maintaining a variety of supply alternatives. The dramatic increases in petroleum and natural gas prices of the 1970's and early 1980's put extreme cost pressure on the chemical industry. However, the relatively low price of these raw materials in the 1990's helped chemical companies control their costs and pass some of these savings along to their customers. Though recent increases in petroleum prices have added some pressure on the chemical industry, the pattern over the next five to ten years is expected to demonstrate relatively stable raw material prices (Société de Chimie Industrielle, 1999).

Manufacturers of specialty chemicals use large volumes of *basic and intermediate chemicals*. Here, again, the supply situation has been favorable (Value Line, 1998) Production capacity for basic and intermediate chemicals has been increasing faster than demand. Though delayed by the Asian economic crisis, a number of new Asian production plants are expected to open in the next few years (Value Line, 1999). These factors should keep prices under control for feedstocks to the specialty chemical producers.

Overall, the supply picture for the chemical industry as a whole, and specialty chemical companies in particular, suggests that supply costs in the near term should experience relatively little upward pressure. This will offer the chemical industry some relief from the recent squeeze on margins due soft chemical demand and relatively steady chemical prices.

3.4.3. Bargaining Power of Customers

Demand for chemicals has been effected by two distinct trends. One is the overall trend in economic activity, the other is a trend toward greater chemical use efficiency.

Because chemicals are used in all sectors of the economy, from manufacturing and service industries to governmental activities, it should not be surprising that demand for chemicals is linked to cycles in economic activity. Thus, for much of the 1990's, the chemical industry experienced growth as the global economy expanded. However, the Asian economic crisis of the late 1990's, and economic uncertainty in Russia, Latin America, and elsewhere have significantly reduced demand for many chemicals.

Though Asian recovery is expected to continue, the industry will likely experience soft demand and considerable downward price pressure in the near term.

A separate trend is that of increasing chemical use efficiency. Over the period of 1992-1997 (prior to significant effects from the Asian crisis), the Federal Reserve Board's index of total domestic economic activity increased almost 25%. Over the same time period, the index of manufacturing activity increased 27%. However, the index of chemical production increased only 11% (Standard & Poors, 1998). This contrasts sharply with the industry's historic ability to grow faster than the economy. For example, from the period 1970-1988, the domestic economy grew at an annual rate of 3.2%, manufacturing grew at 3.5%, yet chemical production grew at 4.6% (Kline & Co., 1990). The evidence suggests an increased ability of the U.S. and world economies to produce a unit of output with less chemical input. Given increasing pressure to reduce the environmental and occupational hazards of chemical use, as well as the desire to control costs, this trend is likely to continue.

The overall effect has been to increase the price leverage of chemical buyers. As summarized in a recent article in *Purchasing* magazine (Reilly, 2000):

"The market for specialty and fine chemicals is undergoing many changes, but a significant run up in pricing is not one of them."

The article goes on to note that there may be a few exceptions. A few markets, such as electronics chemicals, are growing rapidly again and may see more significant price increases. Also, the increase in oil prices will eventually work its way through in the form of price increases for oil-based specialty chemicals. Overall, market forecasts suggest relatively slow growth with limited price increases.

3.4.4. Threat of Competitor Entry

Chemical production requires significant capital investment as well as significant R&D and production expertise. These two factors have posed a relatively high barrier to entry into the industry. However, it has not prevented the growth of chemical companies, particularly on an international scale. Thus, the last two decades have seen the growth of both European and Asian chemical competitors. In addition, these barriers have not prevented companies from expanding into new chemical markets, either through the development of their own production and marketing capabilities, or through acquisitions. Both of these trends are expected to continue.

Thus, although there are substantial barriers to the entrance of new chemical companies, many existing companies are expected to enter both new countries and new markets over the next decade. This trend will tend to keep the level of competition relatively high in most chemical markets.

3.4.5. Threat of Substitutes

The substitution of one chemical for another has long been a threat to individual chemical companies. However, the industry now faces a new threat – the substitution of chemicals with process-improvement technologies. The more obvious examples include chlorofluorocarbons (CFCs) and other chemicals that have been banned for environmental reasons. However, an outright ban is not necessary to produce significant substitution pressure on a chemical. Listing a chemical as a hazardous air pollutant (HAP) or as reportable on the toxic release inventory (TRI) can create significant demand not only for substitute chemicals, but also for substitute technologies. OSHA's recent concern about worker exposure to machining fluids is producing similar interest in finding acceptable substitutes, such as "dry machining." With the expansion of the TRI and the new Risk Management Planning regulations, this trend toward regulation-driven substitution is expected to continue.

3.4.6. Overall Competitive Position

Though the chemical industry is enjoying relatively low costs for its raw materials and relatively high barriers to entry, it faces serious challenges in the coming years. Overcapacity, increasing global competition, and slow global economic growth will limit sales growth and profit margins. Moreover, the movement of chemical users away from specific chemicals, and even chemicals as a whole, is likely to continue. The industry's lack of new product growth and its resistance to consolidation will likely extend the current period of under-performance.

In recent years, chemical industry stocks, on the whole, have performed quite poorly. Most sectors of the chemical industry demonstrated declining stock performance over the latter half of the 1990's, relative to market as a whole (Value Line, 1998, 1999). Various reasons have been given for this poor performance:

- Asian economic crisis
- Currency fluctuations
- Excess chemical production capacity
- Soft global demand
- Lack of supplier price leverage
- Failure to significantly reduce industry costs
- Lack of innovation to drive new product growth
- Customer movement to "supply chain management"

Most financial analysts believe that the two most important steps that should be taken by chemical companies are significant investment in new product growth and serious industry consolidation in order to reduce costs. However, analysts are generally pessimistic about the likelihood of either step occurring in the near future. The current slump in the chemical industry limits R&D investment. Several analysts attribute the slower-than-desired pace of consolidation to "management egos" -- managers who are

unwilling to step aside in a merger even when it would be in the best interest of their company (*Wall Street Transcript*, 1999). Though stock performance is expected to improve if the global economy improves, most analysts do not see the chemical industry offering many good investment opportunities in the near term.

3.5. Conclusions

The value of U.S. chemical production exceeds \$400 billion. However, the high growth rates and healthy profits enjoyed by the chemical industry through most of this century have been replaced in recent decades by intense competition, slow growth, and narrower margins. Though the chemical industry is enjoying relatively low costs for its raw materials and relatively high barriers to entry, it faces serious challenges in the coming years. Overcapacity, increasing global competition and slow global economic growth will limit sales growth and profit margins. Moreover, the movement of chemical users away from specific chemicals, and even chemicals as a whole, is likely to continue. Even in the specialty chemical sector, which has enjoyed higher profit margins due to product differentiation, these conditions are creating intense pressure for innovation.

The desire among chemical users to reduce chemical usage makes the chemical industry vulnerable, and creates an opportunity for the CMS industry to capture new markets. However, the conditions in the chemical industry also create pressure on chemical companies to seek alternative avenues for growth, such as CMS. This creates potential new competitors within the CMS industry, as we will discuss in the following chapter.

Chapter 4

The Chemical Management Industry

The term "chemical management" is used loosely by many companies claiming to provide such programs. Some of these programs are not structured in a way that promotes dramatic reductions in chemical volume and waste. For purposes of this report, we consider a CMS program to have the following characteristics:

- Supplier has a direct financial incentive to optimize chemical system performance and minimize chemical use,
- Supplier has the opportunity to perform or influence the chemical management activities needed to achieve this, and
- Supplier revenue is not positively related to chemical volume.

No official data exist on the size of the current chemical management services (CMS) market. However, based upon interviews with CMS suppliers, we estimate that it is in the range of \$500 million to \$1 billion.

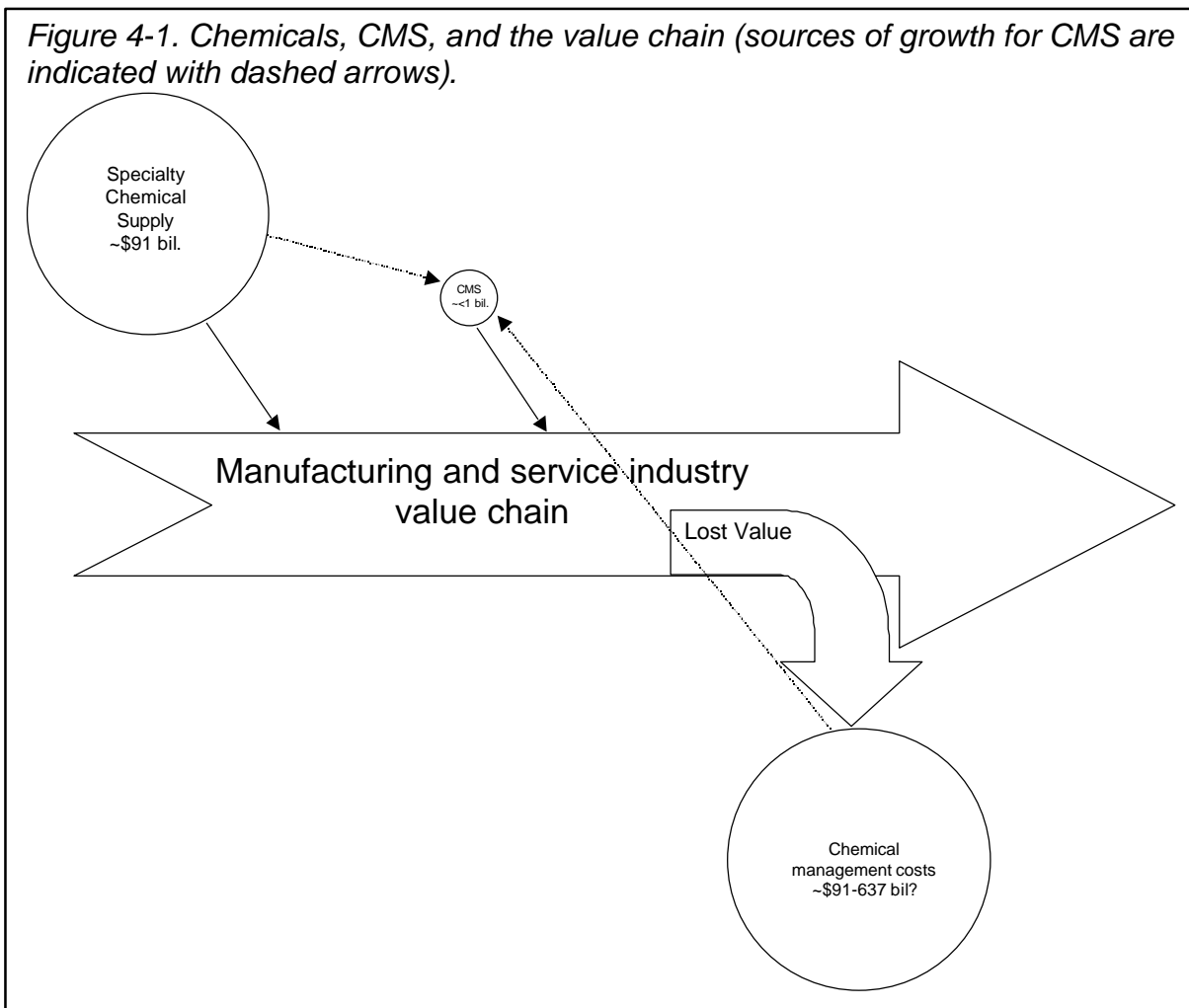
4.1. Potential Market for the Chemical Management Industry

One view of the potential market for CMS is presented in Figure 4-1. Specialty chemicals are inputs to the chemical user's value chain. Outputs are products and services. However, the use of chemicals also results in significant losses from this value chain in terms of chemical management costs such as purchasing, handling, environmental health and safety problems, treatment and disposal, liabilities, etc. Estimates for such costs range from one to seven-times the purchase costs of chemicals, or about \$91 billion to \$637 billion (Bierma and Waterstraat, 2000).

CMS, as currently practiced, has revenue growth potential from two areas: 1) replacing traditional specialty chemical purchases, and 2) reducing chemical management costs (both indicated with dashed arrows in Figure 4-1). As noted in the previous chapter, the *specialty chemical* market is about \$91 billion. However, there is probably only about \$44 billion in chemicals to which CMS could currently be applied (see Appendix for details). Based upon our interviews, we estimate that approximately one-third of this, or \$14.7 billion in chemicals, is in accounts large enough to support CMS programs, as CMS is currently structured.

Gainsharing is one method used to capture reduced chemical management costs as a revenue stream for CMS suppliers. However, interviews with suppliers indicate that current programs are able to capture very little of this savings, adding perhaps no more than about 10% to supplier revenues. Thus, we conservatively estimate this potential revenue stream as about \$1.5 billion. However, this is an area of significant future

potential. As customers better understand their true chemical management costs, and as gainsharing mechanisms improve, CMS suppliers may be able to capture a significantly greater proportion of reduced chemical management costs.



Thus, we estimate that the ultimate size of the CMS market, as CMS is currently practiced, at no more than about \$16 billion. If the size of the current CMS market is about \$0.5-1 billion, then the CMS market is currently about 3-6% saturated (see Appendix for details). This is roughly consistent with another recent estimate of the potential size of the U.S. CMS market of \$10.5-13 billion (Chemical Strategies Partnership, 2000).

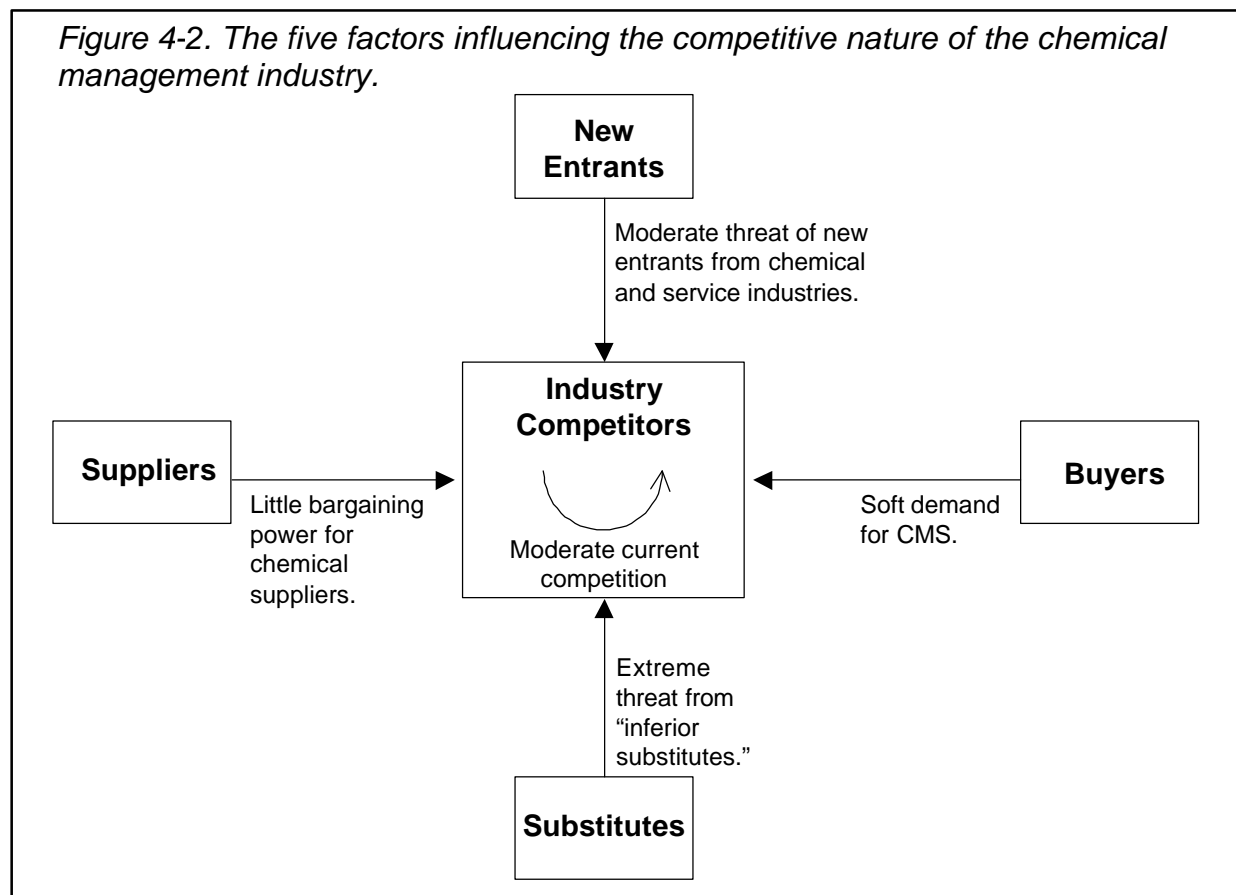
However, the international market for CMS could be more than twice this size. In addition, CMS could potentially grow much larger if it is modified to meet the needs of other users. Potentially, new versions of CMS could reach smaller specialty chemical accounts (\$29 billion), other specialty chemicals (\$47 billion), or even markets outside of specialty chemicals.

4.2. Competitive Position of the CMS Industry

As discussed in Chapter 2, the competitive position of an industry is commonly attributed to five key factors (Porter 1980, 1985):

- Rivalry among existing competitors
- Bargaining power of suppliers
- Bargaining power of customers
- Threat of competitor entry
- Threat of substitutes

Each of these factors will be used, in turn, to assess the competitive strengths of the CMS industry as well as highlight its vulnerabilities. (see Figure 4-2).



4.2.1. Rivalry Among Existing Chemical Management Companies

Currently, the CMS industry is composed of relatively few suppliers. Though there are no accurate data available, we estimate that there are probably no more than a few dozen suppliers with current CMS accounts. The number of suppliers with at least five

CMS accounts and with total CMS revenues in excess of \$25 million probably does not exceed about 20. In addition, the market appears to be dominated by relatively "good" competitors - well established, reputable firms that place an emphasis on quality and service rather than having the lowest price (see Chapter 2 for a discussion of "good competitors").

However, this does not mean the industry is not competitive. In more mature markets, such as automotive assembly plants, there is significant competition among CMS rivals for new accounts. Yet, in relatively untapped markets -- such as electronics and telecommunications, or pulp and paper -- competition is much less intense.

Companies currently in the chemical management industry are generally of four types:

1. Chemical manufacturers that have developed a CMS offering,
2. Chemical distributors that have developed a CMS offering,
3. Consulting and service companies that have expanded into CMS, and
4. Companies that were formed solely to offer CMS.

The vast majority of current CMS companies are of the first type. Many chemical manufacturers have recognized the market potential of CMS and developed CMS divisions. An advantage that these companies have over other CMS companies is that they have extensive chemical expertise. This expertise allows the company to make significant improvements in chemical use efficiency, quickly improving the profitability of a CMS account. However, chemical suppliers also face a significant challenge in offering CMS programs. Since CMS focuses on *reducing* chemical volumes, it can conflict with company infrastructure that is designed to *increase* chemical volume. For example chemical sales personnel usually do not make good chemical managers, since their skills and interests have developed around increasing, not decreasing, chemical volumes. Promotion of personnel within the supply company can still be biased towards product sales growth, even if CMS accounts are equally profitable. Upper management may be unlikely to devote proportional resources for marketing CMS programs. Even the financial community can restrict the growth of CMS when analysts continue to focus solely on product sales volume and revenues. Securing long-term growth of CMS profits within a chemical supply program will require skillful management and top-level support.

Chemical distributors not only face this internal conflict over chemical volume, but may also suffer from a lack of chemical expertise. While distributors often have significant logistical experience, they may not have the depth of chemical expertise that is possessed by the chemical manufacturer.

Consulting and service companies, as well as companies formed solely to provide CMS programs, do not have any internal conflict over chemical volume. In addition, it may be easier for these companies to convince potential customers of the service nature of CMS, since these suppliers have never marketed chemicals. However, they may suffer a significant lack of chemical expertise. In addition, they may not have marketing contacts equivalent to the chemical suppliers and distributors.

Thus, there is no clearly superior group of suppliers. Although chemical suppliers were first to market, and currently hold a commanding market share, there is no reason to believe that distributors, service and consulting firms, and newly formed enterprises, will not continue to gain new customers.

In addition to the relatively small number of CMS suppliers, several other factors limit the current rivalry in the CMS industry. First, there appears to be a relatively high degree of product differentiation in the eyes of the customer. Most customers appear to view the CMS program offered by one supplier as quite different from the CMS programs offered by other suppliers. This lack of “commoditization” of CMS enhances customer loyalty. Second, CMS creates relatively high switching costs for the customer. To be effective, suppliers must become thoroughly familiar with a customer's processes. This takes a considerable time investment for both the supplier and customer. Once established, customers must see a significant advantage in order to justify switching suppliers. These factors make it more profitable for CMS suppliers to focus on developing new CMS accounts rather than fighting over existing CMS accounts.

4.2.2. Bargaining Power of Suppliers

Chemical manufacturers are the major suppliers to the CMS industry. CMS companies typically serve in a tier 1 position at the chemical user's facility. Tier 2 chemical suppliers provide chemicals, expertise, and selected services to the tier 1 CMS supplier.

From the discussion of the chemical industry in the previous chapter, it is apparent that chemical suppliers have relatively little leverage in today's market. Excess capacity and softening world demand have kept prices low and increased the intensity of competition.

Overall, the supply conditions are favorable for the CMS industry. The depressed nature of today's chemical markets gives chemical suppliers relatively little leverage and increases their willingness to seek new supply opportunities.

4.2.3. Bargaining Power of Customers

International competition in most markets is expected to continue to grow, intensifying efforts to control costs. Most prospective CMS customers wish to reduce chemical costs and regulatory compliance problems. Though these trends support expansion of CMS markets, current conditions put considerable market leverage in the hands of the customers due to limited customer demand for CMS.

One factor limiting demand is the rapid growth of the U.S. economy. Many chemical users are focusing more on meeting production demands than controlling costs. History has demonstrated that chemical users are more likely to adopt CMS when they are facing serious economic challenges. In this respect, a downturn in the U.S. economy

could be beneficial for CMS, as companies seek more innovative ways to control costs. Continued strength in the U.S. economy, and recovery of the world economy could distract many managers from serious cost cutting efforts. One possible offsetting effect of a strengthening economy is the CMS opportunity that arises from new plant construction. In many cases, when companies build new production facilities, they are much more open to innovative programs, such as CMS, to service those plants.

Another important factor limiting overall demand is a general misunderstanding of CMS on the part of chemical users. Chemical users often greatly underestimate the importance of chemicals on their product costs and quality (Bierma and Waterstraat, 2000). This leads to underestimates of the potential value of CMS. In addition, since CMS is radically different from traditional chemical supply programs, there is often confusion among prospective customers as to the true nature of CMS. As a result, prospective customers do not believe CMS will provide benefits that are worth the risk of changing chemical supply strategies.

Overall, demand for CMS is experiencing a mixed set of trends. Customer confusion and a strong U.S. economy may distract many chemical users from considering CMS. On the other hand, the need to remain cost-competitive, the continued regulation of chemicals, and the opportunities provided by new production facilities all support the switch from traditional chemical supply to CMS. Enhancing demand for CMS is critical to accelerating its diffusion. Part 2 of this report is devoted to factors related to demand for CMS.

4.2.4. Threat of Competitor Entry

There are no capital barriers to entry for the chemical management industry. However, there are significant barriers with respect to expertise. Successful CMS programs require exceptional on-site chemical management staff. These staff must have the technical skills to recognize chemical improvement opportunities, the business skills to justify improvements, and the interpersonal skills to successfully implement them. Knowledge of how to manage a CMS program, and the personnel to manage it, are the supplier's most valuable assets. Obtaining these assets can present a major barrier to entry. Existing CMS suppliers have a significant competitive advantage over new entrants to the market.

Historically, new entrants to the chemical management industry have been chemical supply companies. This is likely to be the largest source of new competitors in the near future. However, a number of recent competitors have been chemical distributors, consulting and service firms, or new companies formed solely to provide chemical management programs.

The successful entrance of Radian International into the chemical management industry is one example of consulting and service companies that have expanded to include CMS. In fact, there are a number of service industries that could provide new CMS

competitors. Many firms, such as Radian, have provided extensive logistical, engineering, or waste management support to manufacturers. Other firms have specialized in MRO supplies, some providing on-site support such as the management of company tool cribs. These companies bring important expertise in working with customers to optimize supply programs. The challenge for these potential CMS competitors is to develop the chemical expertise needed for successful chemical management programs.

Interface LLC. is an example of a firm that was created for the CMS industry. Interface specializes in CMS for the airline industry and holds accounts with several of the nation's largest airlines. Other industry niches that are currently underserved by CMS providers may be excellent opportunities for additional CMS start-ups.

Overall, a number of new competitors are likely to enter the field not only from the chemical industry, but also from a variety of service industries. Yet, over the next several years, existing CMS suppliers should enjoy substantial competitive advantage from their expertise and reputation in the chemical management industry. However, this situation could change dramatically if the CMS industry is unable to protect itself from the wide array of firms that threaten the market with inferior substitutes.

4.2.5. Threat of Substitutes

In one sense, the CMS industry always faces the threat of companies returning to traditional chemical supply strategies. The currently soft chemical market has created intense competition in the chemical industry and relatively low chemical prices. However, the most significant threat is from traditional chemical sales programs that have been packaged as "chemical management." These inferior CMS substitutes do not offer the incentives necessary to make significant chemical use reductions. Commonly, these take the form of traditional chemical supply programs with an extra set of services such as chemical testing or special delivery programs. Many utilize supplier consolidation and volume purchases to produce significant short-term savings for the customer. Some take the form of supply integration programs, and may include extensive logistical services. However, because such programs lack one or more of the key CMS characteristics listed at the beginning of this chapter, they do not produce the long-term economic and environmental benefits of CMS.

This threat arises from the confusion among chemical users discussed above. Also, because many chemical users underestimate the impact of chemicals on product cost and quality, they are attracted by the short-term gains available from leverage buying. Additionally, because CMS is a radical departure from traditional chemical supply, they are attracted to the more traditional purchasing arrangements inherent in the inferior substitutes. Finally, the inevitable, disappointing results of these programs undermine the CMS industry as word of negative experiences with "chemical management" is spread among chemical users.

4.2.6. Overall Competitive Position

Ideally, the financial markets should be enhancing the competitive position of the CMS industry. For most CMS suppliers, CMS represents a significant growth opportunity not available in their traditional markets. The increased earnings potential should produce higher stock prices. However, financial markets currently appear to be more of a barrier than a benefit to CMS. Financial analysts who monitor chemical companies continue to focus on sales and the development of new chemical products. Our review of the financial analysis literature has found no mention of CMS or the potential of CMS as a growth opportunity for chemical companies.

Overall, the CMS industry faces a mixed competitive position relative to the traditional chemical industry. Supply conditions are quite favorable for CMS. Customer demand is being promoted by ongoing chemical regulation, the need to be cost-competitive, and construction of new production facilities. On-site chemical management expertise provides a modest barrier to entrants of other CMS competitors.

On the other hand, the strong U.S. economy and low prices for many chemicals reduces the urgency for many managers to find alternatives to traditional chemical supply. More importantly, the CMS industry faces a serious threat from inferior "chemical management" programs. There are essentially no entry barriers to companies wishing to offer such programs. The lack of standard terminology or contract provisions in the industry allows inferior "chemical management" programs to proliferate. This threat must be overcome if CMS is to significantly increase its rate of adoption among chemical users.

4.3. Cultivating Market Allies

As discussed in Chapter 2, James Moore has proposed that companies view themselves as operating within an ecosystem, rather than simply an industry. This business ecosystem contains not only similar companies, but a host of other organizations and technologies that are beneficial to the ecosystem. Companies in an industry should seek to improve the health of the overall ecosystem in order to promote long-term growth.

This concept has important implications for CMS. Chemical management has many potential allies that can help support and promote the market. Table 4-1 lists some of these potential allies, organized into three groups.

The first group, Special Interest Allies, have core interests that would benefit from CMS expansion. The USEPA, equivalent state agencies, and environmental interest groups are important examples. These organizations can support the CMS market directly and indirectly. Direct support can come from offering benefits to companies that adopt CMS programs. For example, CMS can be written into consent agreements in much the

same way that pollution prevention programs are currently (this approach could also involve attorneys general). Indirect support could come both from funding of CMS research and by providing public recognition for the environmental benefits of CMS and the companies that use it. Promoting CMS through conferences, publications and award programs can help disseminate CMS information as well as add credibility. OSHA and related organizations can potentially play a similar role, focusing on the health and safety benefits of CMS.

Professional associations for purchasing, EH&S, maintenance, and other professionals are interested in keeping their membership up-to-date with innovations in the field. This opens many opportunities for articles in newsletters and magazines as well as conference presentations. University faculty seeking research and publication opportunities can similarly benefit from collaboration on case studies and other CMS research.

Surprisingly, organized labor could also become an important ally. Though the critical issue of job security must be resolved, CMS offers workers the opportunity for significantly greater control over health and safety conditions in the workplace. Active support from at least one major union could help reduce worker resistance to CMS in many plants (see section 7.4.2. for further discussion of CMS and unions).

Economic Interest Allies include companies that could benefit from CMS. Most important are suppliers of technologies that can improve production process and reduce chemical usage. Suppliers of membrane filtration systems, centrifuges, and other chemical recovery equipment stand to increase sales through CMS accounts. Suppliers of metalworking, cleaning, and other chemical-using equipment could benefit from significantly greater customer satisfaction, since their equipment will operate better when chemicals are better managed. The advantage of an alliance between equipment suppliers and CMS suppliers is that both the equipment and the chemicals will work better if they are designed to work together. BetzDearborn, a CMS supplier, recently formed a partnership with USFilter to market their products to be used together for water and wastewater treatment (Towers, 2000). While this alliance would benefit BetzDearborn even in a traditional chemical sales approach, BetzDearborn sees the primary benefit from companies wanting to outsource treatment and chemical management responsibilities. Another group of possible Economic Interest Allies are energy service companies (ENSCOs). ENSCOs provide energy management services

Table 4-1. Potential CMS Allies

Special Interest Allies

- EPA
- Attorneys General
- OSHA
- Environmental interest groups
- Professional associations
- Universities
- Unions

Economic Interest Allies

- Technology suppliers
- ENSCOs

3rd Party Facilitators

- WRMC
- Chemical Strategies Partnership
- Manufacturing Extension Services
- Other business-oriented organizations

in much the same way that CMS suppliers provide chemical management services. Together, ENSCOs and CMS suppliers may offer greenhouse gas reduction programs.

Third-party facilitators are "neutral" organizations that could help companies through the CMS adoption process. This could include organizations such as WMRC and CSP that have experience in manufacturing assistance. Other potential allies include the many local manufacturing assistance organizations, some of which are funded through the National Institute of Standards and Technology (NIST). Initial efforts to evaluate and implement CMS can be difficult - even overwhelming. General Motors, Ford, and other companies with a long history of CMS success found that implementing CMS at their various plants became considerably easier as they gained experience. Third-party facilitators could capitalize on this experience and help other companies that are exploring CMS for the first time. Of particular importance is assistance at the early stages of the adoption process (such as the Awareness and Analysis stages discussed in Chapter 6).

There is a natural synergy between CMS and environmental management systems (EMS) such as ISO 14001. EMS programs require a systematic approach to identifying and solving environmental problems, similar to the approach used in CMS programs. One of the most difficult aspect of EMS development is identifying the environmental impacts of manufacturing operations, yet this is one of the strengths of CMS. Thus, CMS can capitalize not only on its ability to assist in EMS development, but can also cultivate as market allies those organizations that promote EMS programs – such as environmental assistance and regulatory agencies.

4.4. Conclusions

From the above discussion, two activities appear to be particularly important to the future competitive strength of the CMS industry. First, the industry must effectively combat the flood of inferior substitutes currently entering the market. Second, the industry must reach out to the wealth of untapped allies that can help support and promote CMS adoption.

The CMS industry faces a serious threat from inferior “chemical management” substitutes, such as integrated supply, leverage buy, and similar programs. The industry must find a way to clearly differentiate CMS from inferior substitutes in the mind of the customer. Many options are available, from advertising, to technology certification programs to industry standards. However, the first step must be to establish a common definition and terminology to be used by all suppliers in the CMS industry.

A wide array of potential allies can help support and promote CMS adoption. Ranging from EPA to manufacturing assistance organizations to technology suppliers, these allies can provide awareness, education, credibility, and continuous improvement for the CMS industry. However, each ally must be cultivated individually. This will take time and effort, but could provide valuable leverage for expanding CMS markets.

PART 2

ENHANCING DEMAND FOR CMS

Chapter 5

Useful Lessons from Marketing

"I grossly underestimated the resistance to change in our organization. I knew it was there, but I didn't know it was this large."

A Plant CMS Champion

5.1. Introduction to Part 2: The Importance of Understanding Demand

Increasing customer demand for CMS is essential to the growth of the CMS industry. Experience has shown that demand for CMS has grown slowly. This is not unusual for products or services that differ dramatically from what the customer is used to. Understanding the factors governing demand for CMS, and the best methods to influence those factors, are essential to significantly increasing the CMS market.

In this chapter, basic principles from the field of marketing are used to provide insights about demand for CMS. Of particular importance are principles from a theory known as Diffusion of Innovations, best characterized by the writings of Everett Rogers (Rogers, 1995). One of these principles, understanding the stages in adoption of an innovation, is used in Chapter 6 to explore the adoption process for CMS. Another important principle, understanding the characteristics of key stakeholders in the adoption decision, is used in Chapter 7 to better understand the stakeholders in the CMS adoption decision.

5.2. Innovations Diffuse Over Time

5.2.1. Stages in the Individual Decision to Adopt

Research into the adoption of innovations has shown that individuals pass through a series of stages prior to, and following, adoption. Diffusion of Innovations theory uses six stages (see Figure 5-1). From (0) a state of ignorance, an individual (1) receives knowledge of an innovation. A period of (2) persuasion then follows during which the individual recognizes a potential need for the innovation and seeks information to reduce uncertainty about the innovation. Finally, (3) a decision is made either to adopt or reject the innovation and (4) that decision is implemented (adoption). This may be followed by (5) a confirmation stage in which the decision may be affirmed or reversed.

In reality, this process may not always be linear. In particular, it is likely that an iterative process between stages 1 and 2 must occur before a decision is made to adopt the innovation. Initial knowledge may lead to recognition that the innovation may meet a need. This in turn leads to the acquisition of additional knowledge and perhaps the recognition of yet greater needs that may be met.

In Chapter 6, we expand this simple model of adoption to better understand the adoption process for CMS. An understanding of the stages in the CMS adoption process can identify "weak links" that cause adoption efforts to fail.

5.2.2. Diffusion through a Population

Figure 5-2 displays the characteristic s-shaped curve of cumulative adoption of an innovation over time. Adoption begins slowly, followed by a more rapid adoption rate for the majority of adopters, and then a slowing adoption rate as the innovation approaches 100% adoption. This pattern is not only applicable to the adoption of many new ideas, but to most commercial products as well.

The slope of the s-shaped curve indicates the rate at which innovations diffuse through a population. Rapidly diffusing innovations, such as clothing fashions, may approach 100% adoption within months, and will have a very steep diffusion curve. Others, particularly "preventive" innovations, such as seat belt use, dietary changes, smoking cessation, etc., may require decades to approach 100% diffusion, and are characterized by very flat diffusion curves. It is already clear from the history of CMS that it currently has a rather flat diffusion curve, with diffusion rates measured in years rather than months.

There is no guarantee that an innovation will ultimately progress to 100% adoption. Many innovations, as well as many new commercial products, "die out" after adoption by only a minority of the population. The goal of this report is to accelerate the rate of CMS adoption (increase the slope of the curve) and to promote 100% adoption where feasible.

5.3. Characteristics of the Innovation

The rate at which an innovation diffuses depends on a number of characteristics of the innovation itself. Some of these characteristics may be changeable, thereby accelerating adoption. It may not be possible to change other characteristics, but steps can be taken to minimize the negative impact of such characteristics. Rogers identifies five characteristics of the innovation commonly associated with the rate of adoption: 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability, and 5) observability.

Figure 5-1. Stages in the adoption process (adapted from Rogers, 1995)

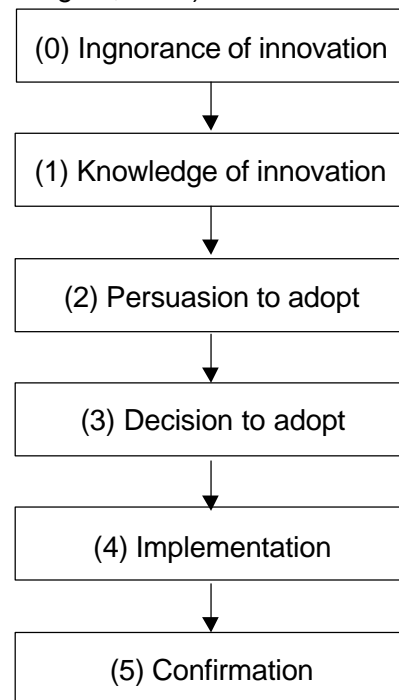
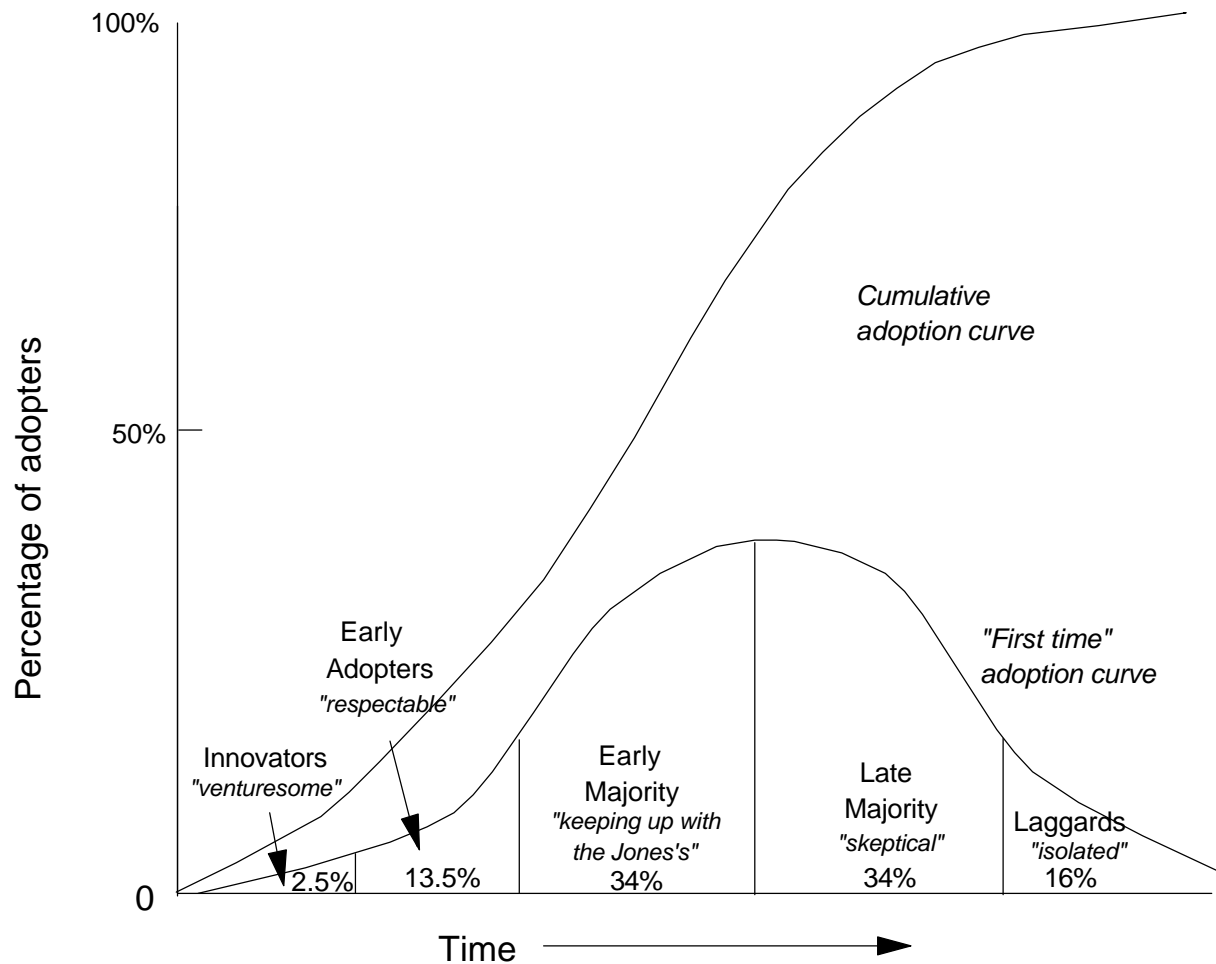


Figure 5-2. Pattern of Cumulative and "First Time" Adoption Over Time. (adapted from Rogers, 1995)



However, before briefly discussing each of these characteristics, it is important to recognize that any innovation has both a "hardware" and "software" component. The hardware component is composed of the physical attributes of the innovation. The software component is the informational or intellectual attributes. CMS is largely software. While a CMS program may include tanks, totes, barrels, etc., its primary value comes from the knowledge and expertise needed to make significant improvements in operating performance.

5.3.1. Relative Advantage (Consequences)

Relative advantage is the extent to which the potential adopter perceives the particular innovation as capable of satisfying a need better than current or alternative technologies. History has clearly demonstrated, however, that just because an innovation offers a relative advantage over an existing technology, customers will not

necessarily adopt the innovation. One reason for this is that the innovation may address a need that is not particularly important for the prospective customer. In addition, there may be many factors working against adoption (as we will discuss later in this chapter). In most cases, the relative advantage must be very large before a prospective customer will seriously consider switching. Or, as one researcher has put it, "To overcome the installed base effect (existing technology), the relative advantages for adopting the new superior technology have to be overwhelming..." (Woodside, 1996)

Thus, it is critical to understand the potential customer's needs that can be met with CMS and to convert these into perceived advantages. Types of needs, and the extent to which a potential adopter might recognize each need, can vary significantly. However, one need appears to be universal - the need to reduce costs.

5.3.1.1. Cost Reduction

Easily the most significant benefit of CMS is cost reduction. These savings extend well beyond the cost of chemicals, and include chemical management costs as well as savings resulting from improvements in production and product quality. General Motors estimates that savings generated by their CMS program have more than covered the entire cost of the program (Mishra, 1998).

There is a general consensus among CMS suppliers that when prospective customers fully understand the cost savings possible with CMS, adoption of the program occurs much more rapidly. However, it is often extremely difficult for managers to recognize the total cost of chemicals at their plant and the ways in which CMS could reduce those costs. The importance of cost reduction, and the difficulty in demonstrating the link with CMS is evident from a number of comments during interviews with CMS suppliers:

"Cost reduction is very important. There are people that are looking at it simply from the point that "I have heard that this reduces cost - I've got a goal of reducing costs 15% or 20% so I want to take a look at this."

"Not to oversimplify, but if I had to say why a company would decide not adopt chemical management, it would come down to one simple word - cost. They don't understand it."

"Identify the costs. The most important thing that needs to happen is they need to identify all their costs related to chemicals. Where the customer misses it is if you were to look at the plant, chemical costs are no more than 1% of total cost. Number one is steel, or whatever raw material. Number two is labor. Then facilities, maintenance, tooling and MRO, insurance. At the bottom is toilet paper, janitorial, and chemicals. But chemicals touch raw materials, scrap, labor, facilities, maintenance, tooling. All these other costs they don't recognize."

"Every month production gets a report from accounting that is an inch thick. I said 'How do you know what your chemical cost is?' Some hydraulic oil might be here, then tooling cost would be stuck in the middle. It's all just scattered. There is no way they know their costs."

"Why don't plants adopt this? Well, it boils down to that they just don't see the value, because of segregated budgets."

"They do not understand all the value. Even if they see it in writing, they may still not understand because they do not understand production. They do not know how to do total value analysis. That is a problem. That is why it is important to get the plant manager involved, since he understands the whole operation."

"The angle to look at CMS is that it is the next phase of cost reduction. They've got CNC and the automated equipment - only have three people running 77 machines. Now how do you save money? Chemicals. Before CMS, chemicals were just looked at as a cost of doing business. As long as they were constant, it's OK. Many plants still don't have a concept of total cost."

5.3.1.2. Other Benefits

Though cost savings are important to every prospective customer, there are many other potential benefits of CMS that can increase its perceived advantages. Examples include the need to: maintain or improve competitive position, enhance the company image, reduce liability, improve employee productivity and morale, maintain product quality, maintain production schedules, and reduce the regulatory burden. Many benefits are specific to certain groups in a company. In Chapter 7, we discuss the key CMS stakeholders in a typical company. At that point, we will further discuss benefits of particular concern to each stakeholder.

5.3.2. Compatibility

If an innovation is not compatible with the values, beliefs, attitudes, or practices of the potential adopter, it can significantly slow the rate of adoption. It is often the most significant source of resistance to the innovation. Innovations that conflict with the organizational culture or the practices of management and employees are unlikely to be adopted except in the face of overwhelming need. An understanding of organizational values, beliefs, attitudes, and practices is important if one is to accelerate the adoption process.

Changing the organizational culture is usually not feasible. However, all innovations have multiple attributes. Some of these attributes are likely to be compatible with organizational culture, while others may conflict. It is often possible to emphasize or enhance those attributes that are compatible with organizational culture while

minimizing the conflicting attributes. Several compatibility problems for CMS are discussed below.

5.3.2.1. Jobs

The most important perceived incompatibility for CMS is jobs. CMS can be perceived as incompatible with the existing system of job responsibilities. Many individuals, from middle management to shop floor workers, often believe that CMS will make them obsolete. Of course, in reality, the change of responsibilities often results in job *enhancement* instead of job *replacement*. Yet, the perception of job loss is an important obstacle for the CMS industry to overcome. This is emphasized in comments from CMS suppliers:

"The first thing they think is 'They are going to take my job.' It's not just the union. When you walk in the plant everybody sees you as a threat to their job."

"Another large hurdle is that, when CMS comes in, certain people's responsibilities are greatly reduced. Some of these people are now presenting a huge wall - for obvious interests. Maybe there is a perceived threat that really they should not be concerned about, because their other responsibilities really consume enough of their time. Chemical management might have felt like a lot of their job but it really wasn't. Now they can do those other things more effectively. That's our biggest barrier to acceptance."

5.3.2.2. Process Stability ("Control")

For many people in a plant, process stability is critical. Often, considerable time and expense have been devoted to creating process stability - or at least the appearance of process stability. Any change to the inputs or decisions involved in the process can be perceived as a threat. Again, consider the experiences of CMS suppliers.

"I'll tell you why CMS is being adopted so slowly. It's scary - 'I'm going to lose control of my plant. I'm going to lose control of my process. We worked for 30 years to get these processes down pat and now someone is going to come in and change it? No way.' The perception of loss of control. But so many companies don't really have control. They just think they do. What do they mean 'I don't have control?' They know exactly how many drums they have in inventory. But that has nothing to do with it."

"Some guy's job is on the line if you screw up. He won't allow you the opportunity. Even if there is only a 5% chance of a screw up, it is too much."

"When somebody says 'Hey, listen, a company is going to come in and they are going to control all your chemicals for you,'" they automatically put up this wall.

It's natural. I think a lot of it is communication. There are too many traditional views out there and it is too easy to stay in traditional ways."

"There is concern about losing control. They are concerned about running out of product. They used to keep an eye on the product. Now with CMS...you think you are losing control. As your last drum is getting low, they have to wonder if the chemical manager is on the ball. They use to have one drum behind it, or two. Now there isn't one. In this plant they would have a drum that was 90% full but is tapped for the process, and there would be a full drum behind it. They knew it was there, even though it might take 6 months to use that first drum. That was their comfort level. But they needed that comfort level because their inventory and purchasing system was so loose. We bring a greater level of inventory control. We know what is in the plant and what we can get. We can keep inventory low."

"We explain that for a period of time we are not going to change anything until they get a comfort level with our guys and know what they are doing. We are not coming in here with a bunch of young kids trying to recreate something that has taken them 20 years to get. When we do make a change, we will try to change a small area, a single machine, or a group of machines, rather than a whole department. We will do a little crawling before we walk and before we run."

"Production often says 'If it ain't broke don't fix it. Yes, I'm concerned with cost, no, I really don't care about the environment, but I'm most concerned with production and quality.'" Particularly today, where we have such a robust economy, the hardest part of their job is getting product out the door because demand is so strong. To deal with this, we use guarantees. We'll pay for lost throughput, rework, whatever. Actually we have written that into some of our contracts."

5.3.2.3. Existing Chemical Use

Many plants are reluctant to change the chemicals they use, and so, resist CMS. In part, this is due to a misperception that CMS requires a change in chemicals. This is clearly a barrier seen by many suppliers:

"We have seen one big resistance in the market as 'Well we like this chemical management concept, but we've got some special products here that we don't want to change,' or 'We've got some suppliers here that we would like to keep.' They tell us 'We don't want to hire a chemical manager because you are just going to provide all those products yourself.'" We have to explain that we will provide product regardless of source. We are here to be your chemical manager, not your supplier of every single product."

"Number one problem is establishing credibility. The assumption is that if some chemical is going to get changed out its obviously going to be our product that comes in."

"Sometimes, even though they say 'it ain't broke', in reality it is. They tell us they have to change tooling because the tool is dull. They don't understand that the tool is dull because they were using the wrong coolant. So when we show them that with this change you are going to be able to get another 100 runs through here without changing your bit, then all of a sudden you are talking their language."

5.3.2.4. Outsourcing

Some companies have established outsourcing policies. They seek to focus on core business and outsource non-core activities when possible. CMS can be quite compatible with such policies. However, other companies have either not seriously considered outsourcing, or are consciously avoiding it. Here, CMS may hit a barrier. As one supplier put it:

"There is good news and bad news about outsourcing. The bad news is that there are so many horror stories. The good news is that there is so much pressure on how executives are being compensated - EVA, sales per employee, eliminate 10 people this year by attrition. 'How are we going to keep these processes running? We are going to do it by outsourcing to a chemical management company, which isn't going to increase our costs, but decrease our costs'."

5.3.3. Complexity

In general, the more complex the innovation, the more slowly it is likely to diffuse. This is because there is a greater risk, and possibly a greater cost, associated with the innovation. All other things equal, the more simple the innovation, the more quickly it will be adopted.

In one respect, CMS is quite simple - pay the supplier for chemical performance, not chemical volume. However, in practice, it is quite complex. It involves personnel from almost every area of a plant. It significantly changes job responsibilities. It creates data gathering and problem-solving processes where none existed before. It is based on a relationship between plant and chemical supplier unlike any the plant has previously experienced.

A possible counter to this complexity is that CMS can simplify other complex issues in the plant. In most plants, chemical management is chaotic. From chemical purchasing, to inventory, to proper usage, to environmental health and safety regulations, chemicals are the source of very complicated and frustrating problems in a plant. Responsibilities

are divided among a variety of different operating units that have little incentive to cooperate. Few individuals have the expertise to optimize chemical management. Chemical technology and regulatory requirements change rapidly.

CMS can greatly simplify these problems for the plant. A central chemical manager with a chemical management team composed of representatives from throughout the plant can coordinate previously chaotic chemical systems. The expertise and resources of the supplier can be used to stay up-to-date on technology and regulatory changes. Thus, although CMS can be complex to establish, it greatly simplifies chemical management in the plant overall.

5.3.4. Observability

The more easily a potential adopter can observe the innovation and its results, the more uncertainty will be reduced, and the more likely the innovation will be adopted. This is a serious handicap for CMS. Since CMS is almost entirely "software" (expertise, ideas, "best practices," relationships, etc.) it is *very* difficult to observe. Moreover, because companies find that CMS provides them with a substantial competitive advantage, they are sometimes hesitant to share this information with other companies, particularly competitors.

CMS will diffuse more rapidly only if observability can be increased. This can be accomplished in at least three ways. First, more CMS programs should be documented and disseminated through periodicals, conference presentations and similar channels, to key decision-makers in other plants. Second, CMS demonstration sites can be created in major market areas. These would feature companies with successful CMS programs that are willing to open their doors to other companies. Visiting companies could see not only the new technologies employed through CMS, but talk with plant personnel about CMS and how it works. The ADOP2T program created by WMRC for the electroplating industry could be a successful model. Third, CMS "User Groups" can be established. Composed of plants with existing CMS programs, User Group meetings could provide an opportunity for CMS users to discuss problems and learn from each other. But, just as important, prospective CMS customers could attend in order to better "observe" how CMS actually works. The Chicago area is an excellent place to try a User Group. It has one of the highest concentrations of CMS programs of any metropolitan area. Several plants with CMS programs have expressed an interest in participating in a User Group.

5.3.5. Trialability

An important aspect of an innovation is the extent to which a potential adopter can "try it out" without significant risk. A trial reduces uncertainty at a small cost. A classic example of an attempt to increase trialability is the automobile "test drive." Driving a car before it is purchased helps the consumer reduce uncertainty with only a small

investment of time. All other things equal, innovations that can be tried on a small or experimental basis, without significant cost or risk, are likely to be adopted more quickly.

Trialability is a serious challenge to CMS. Implementing a CMS program, even a pilot program, involves a significant investment of time and resources for both the supplier and prospective customer. Though there will probably never be a way to "test drive" CMS before purchasing it, there may be many opportunities to reduce customer risk during pilot programs. This is an area that requires significant innovation on the part of CMS suppliers, and a willingness to share innovations with other suppliers.

5.4. Characteristics of the Adopter

Not surprisingly, diffusion of innovation research has found that the speed with which an individual adopts an innovation is influenced by a number of characteristics of the prospective adopter. While it is not possible to change the characteristics of the adopter, marketing strategies can be adapted to be consistent with those characteristics. For marketing CMS, this knowledge can be used not only to target the right audience, but also to choose the marketing message, message source, and channel, to match the characteristics of the adopter.

One of the most important characteristics is how early in the diffusion process the individual decides to adopt - that is, the individual's "innovativeness." Five categories of "innovativeness" are commonly used in the diffusion and marketing fields. These categories of "first-time" adopters are illustrated in the lower portion of Figure 5-2.

Innovators are generally characterized as "venturesome". They tend to have both the interest and resources to take considerable risk. Some innovations may be attractive to *innovators* largely because they are novel and risky. *Early adopters* are more a part of the mainstream. Though they are very future-oriented and open to change, they are more risk-averse, and therefore more respected by the majority of the population. Their interest is often in gaining and maintaining a competitive advantage. The *early majority* are well informed but generally consider new technologies too risky until proven by others. However, the *early majority* wish to avoid being "left behind" in the move to a new idea. It is the adoption of an innovation by the early majority that often coincides with a dramatic increase in its rate of diffusion throughout a population. The *late majority* are skeptical of change. They may wait until change is a necessity and clearly supported by social norms. Rogers notes, "[t]hey can be persuaded of the utility of new ideas, but the pressure of peers is necessary to motivate adoption" (Rogers, 1995). *Laggards* tend to be socially isolated and have limited communication networks. They tend to be rigidly focused on the past and are more interested in maintaining past practices than preparing for the future.

While the messages used in marketing CMS should address the important needs and concerns of the target audience (see Chapter 7), the tone of the message should vary by the target audience's "innovativeness." Table 5-1 provides a summary. In addition,

the source of the message for each target audience should generally be an opinion leader (see section 5.5.2. below) from the adopter category that is one step ahead. For example, to reach the *early majority*, use an opinion leader from the *early adopters*.

Table 5-1: Tone of marketing message by "innovativeness" of target audience.

<u>Approximate Market Saturation</u>	<u>Adopter Category ("innovativeness")</u>	<u>Tone of Marketing Message</u>
<2.5%	Innovators	"Cutting edge"
2.5% - 16%	Early Adopters	"Competitive advantage"
16% - 50%	Early Majority	"Don't get left behind"
> 50%	Late Majority and Laggards	"Everybody's doing it"

5.5. Social Context and Communication

It should not be surprising that innovation diffusion research has found that adoption of an innovation is highly influenced by the social context in which it is introduced. Some of the most important social factors are discussed below.

5.5.1. Communication Networks

Communication of information is an important factor influencing the diffusion of an innovation. Important not only is the content of the information, but also the channel through which it is communicated and the source from which it comes.

Diffusion of Innovations theory notes the importance of communication content addressing adopter questions such as: "What is the innovation?", "How does it work?", "Why does it work?", "What are the innovation's consequences", and "What will its advantages and disadvantages be in my situation?" However, other information, particularly with regard to perceived need for the innovation, may play an important role in developing the sense of personal need, which must precede the adoption of most innovations.

The channel and source of communication can also be important in influencing the rate of innovation adoption. Two general categories of communication channels, mass media and interpersonal, are really two ends of a spectrum from "one-to-many" to "one-on-one" communication. National media represents the extreme of "one-to-many" communication. It is characterized by one-directional flow of information and the source is often someone quite different, in many attributes, from the receiver. A personal conversation represents the other, "one-to-one," extreme. It typically involves rapid two-way communication between two individuals who are very similar and likely know and trust one another. Many other forms of communication, such as articles in trade journals, or presentations at conferences, represent points between these two extremes.

Diffusion of Innovations research has found that mass media, and other "one-to-many" channels are relatively important in the early stages of the adoption process (creating awareness). Interpersonal channels are more important in the later stages (becoming convinced of the need for the innovation and the value of the innovation in meeting that need).

5.5.2. Opinion Leaders

It has long been recognized that in making any decision, information from certain individuals is much more influential than information from others. The same is true for the innovation adoption process. These influential communication sources are known as *opinion leaders*. In general, opinion leaders tend to be perceived as similar to the potential adopter, but slightly more competent, knowledgeable, or experienced. Opinion leaders may not formally hold any special status in the social system, but nevertheless are accorded a higher informal status by other social system members. In general, each adopter category creates opinion leaders for the subsequent adopter category.

Opinion leadership can be very useful in attempts to increase the observability of CMS. Case studies or demonstration sites should ideally feature opinion leaders in a given industry or trade association.

5.5.3. Social Norms and Consequences

Many times, resistance to an innovation is due to its negative social consequences. This appears to be true with CMS as well. Below, we consider negative consequences for social status, power, and company culture.

5.5.3.1. Social Status and Power

Informal authority in an organization can be as important as formal authority. Each organization has its own social norms and its own means of attaining social status and power. Both suppliers and plant personnel noted the problems that result when CMS conflicts with the existing social norms:

"There is an ego issue. You talk about the different supporting groups to manufacturing - there are big egos! They believe they already have it under control. They don't need our help." (chemical supplier)

"I did not expect or forecast the level of resistance at this company. It's primarily at the managerial staff level - the middle management level within the plants. It was a power base struggle. The culture here was not going to give up its defined power. (a plant CMS manager)

"Each division had individuals who were their own experts and they have been for decades. So there is a built-in reluctance to give that up. It's an insecurity factor." (a plant maintenance manager)

"They were worried that management was going to replace them in their entirety. They would lose their appointment. Secondary to that, if they weren't going to lose their appointment, they were going to lose their status in the hierarchy of the company." (a plant CMS manager)

5.5.3.2. Company Culture

Top management in a company creates a culture that defines the "rules for success" within the company. Unfortunately there are some company cultures that create significant barriers to successful implementation of CMS. These include cultures that promote short-term cost control over long-term return on investment, reward individual performance over plant-wide performance, encourage competition among its employees instead of cooperation, and view employees as a cost to be eliminated rather than an asset to be maximized.

Consider the following comments, first from company personnel and then from a CMS supplier:

*"Resistance comes from our operating managers. They are insecure, not about what CMS was going to do for them, but what **our company** was going to do **to** them." (a plant chemical technical manager)*

"In reality, management judges all of us by our budget control. They will forget about the 'global good' when it comes down to the fact that one department has a monthly variance, even though it was out of their control." (a plant CMS manager)

"We've always had a 'spend it or lose it' mentality at the end of the budget period. It discourages real savings." (a plant purchasing manager)

"In some cases companies take a closer look at CSM and realized it will require people working together. All of a sudden they say, 'We can't get these departments to work together, we can't get a team together, purchasing doesn't want to lose their little fiefdom.' So they go back to looking at leverage buys as a way of doing business rather than CMS. They didn't know all that was involved in CMS, then when they went and talked to five suppliers, they found out. That one person who thought he was going to be the champion drops it like a hot potato." (a CMS supplier)

5.6. Other Marketing Concepts

5.6.1. Product positioning

"Product positioning" is the process of understanding to which products the new product is perceived as being similar, and then demonstrating to the customer how the new product is superior in meeting their needs. For example, diet soft drinks may compete on calories, taste, image, and price. A new product may compete on one or more of these attributes, such as a "generic" brand competing on price. CMS diffusion could benefit greatly from "product positioning". It would be valuable to know with what CMS is competing and on what cluster of needs. A CMS innovation can then be positioned to compete effectively. We return to this topic in Chapter 7.

5.6.2. Market Segmentation

Market segmentation is a concept that is extremely helpful to individual suppliers as they seek to increase market share. However, it can also be useful to an entire industry as it attempts to expand. In brief, market segmentation is the grouping of prospective customers in ways that effective marketing programs can be efficiently applied to each segment. While it is most effective to develop a unique marketing program targeted specifically to the needs of each customer, such an approach is not efficient. Thus, segments are developed that are large enough to be efficient, yet small enough to result in effective marketing programs.

An important contribution to market segmentation in business-to-business marketing was made by John Berrigan and Carl Finkbeiner in their book *Segmentation Marketing* (Berrigan and Finkbeiner, 1992). They demonstrate that business markets are best segmented according to the needs of three levels of stakeholders: strategic, operational, and functional. Strategic stakeholders are senior-level managers responsible for determining the strategic directions for the company. Operational stakeholders include COOs, plant managers, and others charged with overseeing the day-to-day operations of the company. Functional stakeholders operate in the functional divisions of a company, such as purchasing, maintenance, and manufacturing.

The needs of these three groups, while inter-related, are often quite distinct. A successful marketing strategy must address the needs of each of the three groups to be most effective. We will utilize this concept from Berrigan and Finkbeiner in Chapter 7.

Though an in-depth segmentation strategy is beyond the scope of this project, such a study may be worthwhile for the CMS industry. Accurately defining market segments can significantly improve marketing effectiveness and expand the CMS market. As an example of what can be done, consider a study by the energy utility industry. As the energy utilities recognized the need to expand into the energy services industry, they wished to develop effective marketing programs. As a result of their research, nine key segments were identified. (see Table 5-2). Using these segments, along with existing market information and common characteristics of firms in each segment, the utility

industry was able to identify some segments that were most likely to adopt new energy services. Specific service combinations and associated marketing programs could then be designed for each of these segments.

In fact, the segmentation work performed for the energy services market may be of benefit to the CMS industry since many of the issues are the same. Energy can be a costly input to the manufacturing process, yet it is outside the core business of the customer. Decisions that affect energy consumption are decentralized, poorly coordinated, and often overlooked. Effective management of energy costs means moving beyond price-driven energy purchases to value-driven energy services.

Table 5-2. Needs-based segments of the business energy market (source: Berrigan and Finkbeiner, 1992).

Segment Name	Segment Description
PROACTIVES	Actively managed centralized price competitors who adopt new technologies, supervise energy use and see supportive utility relationships.
BESEIGED	Day-to-day managers with low energy costs, who are driven largely by near-term cash concerns.
SURVIVORS	Investors in new technologies, who strive to improve cash flow by competing on price and learning equipment.
INNOVATORS	Risk-taking leaders in quality, who develop new products and services, embrace new technologies, and require clean and continuous power.
UTILITARIANS	Multilocation businesses, who manage for the long-term, prefer to lease equipment, and seek to provide new and superior services.
DEPENDENTS	Energy managers, who require uninterrupted power, want customized services, and need flexibility in billing.
CONSERVATIVES	Service-oriented, centralized cost controllers, who seek clean power, rate stability, and supportive utility relationships.
STATUS QUOS	Confident managers of mature product lines, who have low-percentage energy costs.
SELF-RELIANT	Quality-oriented, day-to-day line managers, whose businesses do not depend heavily on energy supply or services.

5.7. Conclusions

The field of marketing, and Diffusion of Innovations theory in particular, provides a number of useful lessons for marketing CMS. The most important lessons include:

- An understanding of the stages in the CMS adoption process can identify "weak links" that cause adoption efforts to fail (see Chapter 6).

- The relative advantage of an innovation must be overwhelming in order to overcome barriers to adoption, yet this cannot happen if the prospective customer does not perceive the advantage. This is particularly true for cost reductions, since many companies greatly underestimate their total cost of chemical ownership.
- CMS is misperceived as incompatible with existing job responsibilities, process control, and control over chemical usage. Marketing efforts must target these misperceptions.
- CMS, being largely a "software" innovation, is inherently difficult to observe. Demonstration sites, User Groups, and other marketing efforts are needed to improve observability.
- Prospective CMS customers have little opportunity to experience a "low-risk" trial of CMS before committing to implementation. Creative alternatives are needed in this area.
- Marketing efforts require careful consideration of the message, message source, and channel of communication in reaching CMS customers (see Chapter 7).

Chapter 6

CMS Adoption in Plants

"That one person who thought he was going to be the champion drops it like a hot potato."

A CMS Supplier

In this chapter, we will explore the adoption of CMS by plants, the sources of resistance, and methods for overcoming that resistance. Though our primary focus is on adoption at the plant level, we recognize the importance of adoption at the corporate level as well. In the case of multi-plant companies, both plant and corporate “buy-in” are essential to successful adoption of CMS. Many of our findings in this chapter, as well as in Chapter 7, apply to CMS adoption at both the plant and corporate levels.

6.1. Companies as Adopters

Chapter 5 presented the essential elements of Diffusion of Innovation theory as applied individuals. However, when dealing with an organization more than one individual is typically involved in the decision process to adopt an innovation. Each of the individuals involved in the decision process must arrive at the decision to adopt – for any one of the individuals can stop the adoption process or can compromise the success of the innovation once adopted. This increases the complexity of the adoption process.

6.1.1. *Anyone can initiate CMS and anyone can kill it.*

Based upon our interviews with CMS users, companies considering CMS, and CMS suppliers, we believe most of the key stakeholders in a plant can be arranged into four distinct groups:

- Management
- Purchasing
- EH&S (environment, health and safety)
- Chemical Users (manufacturing, maintenance, engineering, unions, etc.)

Understanding and reaching the individuals in each of these groups is critical to the successful adoption of CMS, as indicated in comments from CMS suppliers:

"Who you sell CMS to, at what level in a company, is key to the success of CMS as we understand it."

"Plant personnel are divided into production and support personnel - purchasing group, environmental group, maintenance group, engineering. They are diverse. All supposedly working toward the same goal, but they have their own budgets,

their own ideas, their own plans. You have a lot of different groups going different ways trying to accomplish the same thing."

Each group makes their respective adoption decision based primarily on how CMS impacts their group, rather than how it affects the plant or company as a whole. Chapter 7 focuses specifically on the dynamics of these groups and how to reach them with relevant CMS information. However, it is clear that each of these groups is important. We found that anyone can initiate the CMS adoption process and anyone can become a CMS champion. We also found that anyone can kill the CMS adoption process. Our interviews suggest that significant resistance from any stakeholder group can either stop the adoption process or lead to failure of the CMS program if adopted, yet we did not find a clear pattern of support or opposition from any stakeholder group. Consider the reflections below from both CMS suppliers and CMS users.

Management

"You have conflicting forces. You all have to work together for the benefit of everybody and overcome 'what's in it for me?' Every company has the same problem. Nobody ever looks at what's best for the plant, what's best for the company - except the plant manager. That is why the plant manager always gets involved in these discussions. He usually decides what is best for the plant. Then he needs to change other people's objectives."

"Somebody in the organization has to sell the plant manager and then he sells the rest of the organization; the plant manager, production manager, or somebody who has enough influence over the whole plant. The plant manager is responsible for all budgets we're talking about. It has to be the total cost budget."

"A team will then be organized. Then a plant manager turns the process over to the team. The plant manager usually wants the team to direct the process and to keep him informed."

"I think it is introduced at the middle management level - or at least it has been traditionally. But it needs to get to the plant manager or higher level."

"What led us down this path was our VP who had talked to someone, coming back to our plant and saying 'I want one of these (CMS)' - expecting it to lay a golden egg. Well it is not going to lay a golden egg for the first year."

"I would say it was across the board - upper management saw it as a positive thing, but middle management, engineering, workers on the line - they didn't want it."

"What kills it is the manager saying, 'I don't see the value there.' Environmental staff or who ever is excited about what we can do, just doesn't have the horsepower to get it through."

Purchasing

"The champion has to be an individual with multi-department clout. Every other department has to work with purchasing."

"Purchasing is always a problem."

"Purchasing has to be convinced to be willing to play along."

"Purchasing is a big stumbling block..."

EH&S (environment, health and safety)

"Our experience is that environmental is a strong, strong, strong supporter."

"My experience is the environmental group initiates it."

"The environmental group killed it at this plant. They didn't want the risk of someone else managing the chemicals."

Chemical Users (manufacturing, maintenance, engineering, unions, etc.)

"Production middle management typically stops it - either by lack of support or dominant undermining - the culture 'we've been there already.' It's all production in a plant. If production doesn't like something they can make it awfully tough. If they believe in it, they make it easy."

"Where CMS is sold is key. You cannot go just to the maintenance manager and try to sell CMS because he takes the idea and then he has to sell it around."

"Maintenance waffles at first, but usually become a strong supporter. Because they get so much service from us."

"I feel that the starting point is really close to the manufacturing process. How it gets started is probably a type of reaction to a process being out of control. Budgets being not complied to. It's kind of a reaction."

"Production managers support it if they see the value for them."

6.1.2. Is adoption top-down or bottom-up?

An important aspect of promoting CMS is understanding whether it is best to introduce it at the top (company or plant management) and force it down through the organization, or introduce it at the bottom and let it percolate up through the organization. What

emerged from our interviews is that top-level commitment significantly enhances the successful adoption of CMS at the plant level. However, top-down mandates often lead to unsuccessful CMS programs because they breed resistance at the plant level. It is clear that CMS must be sold to both the corporate and plant personnel. Several comments from interviewees emphasize these points:

"The issue is commitment. You look at the accounts that we have closed, they had top down commitment."

"We talk to various people in the plant. When you are trying to bring it to them, it's hard because you can bring it to one of those groups, but then you've got to sell it to all the other groups. You've got a better shot if you can sell somebody up high. They can help drive it through."

"The prospects that drag on forever are the ones that did not have the commitment up front. You have to convince them this is the right thing to do. You have to go to all those different groups. If you are lucky and you have a champion in that plant who can do that for you, but you still have to get up pretty high for someone to say 'yes!'"

"You have to sell the individual plant. It can be influenced by corporate, but plants make their own decisions."

"Where there is CMS success, more often than not you find that CMS is being implemented on a plant-by-plant basis. Even if it is a multi-plant corporation, it is one that has individual plant autonomy. The plant manager decides to implement chemical management. The plant has independence in purchasing and how they want to do it."

"At the corporate level they might understand some of this but have a hard time communicating it into the plant. A lot of time they don't get the respect from the plant people. Whether they are onsite or offsite. The onsite people get a little more respect, because they get some face time with the factory people. But the outside corporate people, they are viewed as 'uh oh, here comes chemical management.' It's the policy or philosophy de jour. In today, gone tomorrow."

"Nothing that is mandated from the top-down ever works. It has to come from the floor up. You tend to buy into it if it is a good thing. It's not going to replace all your jobs, in fact it may help retain your jobs. It can save the company. That's important, those people have to know the exact state of the company. If you are in bad shape, they need to know."

Another point was clearly evident in our analysis of the interviews, there is an adoption process that can be segmented into stages.

6.2. The Adoption Process

6.2.1 The Stages

In Chapter 5 we discussed the common stages that individuals experience in adopting an innovation. Because companies adopt CMS only with the consent of many individuals, each of these individuals must progress through the stages. Moreover, we believe that there is not just one decision to be made, but a series of decisions that are required to implement a successful CMS program. The result is a very complex adoption process. However, based upon our interviews, we have developed a somewhat simplified, yet useful model of CMS adoption. While we recognize that every company is different, we propose a basic model that has six stages: Awareness, Analysis, Supplier Selection, Pilot Program, Full Implementation, and Confirmation (see Figure 6-1). Each stage begins with a specific event and ends with group consensus and a decision to proceed to the next stage. An inability to reach consensus will often stop the CMS adoption process. Each of these stages is discussed in detail below.

6.2.2. Perceived Benefits and Risks

In simple terms, the decision to move from stage to stage in the adoption process results from a comparison of the anticipated benefits gained from CMS and the perceived risks. For a given stakeholder the benefits and risks may change as they move from stage to stage in the adoption process, as some problems are resolved and new ones emerge.

Figure 6-1. Stages in the CMS adoption process.

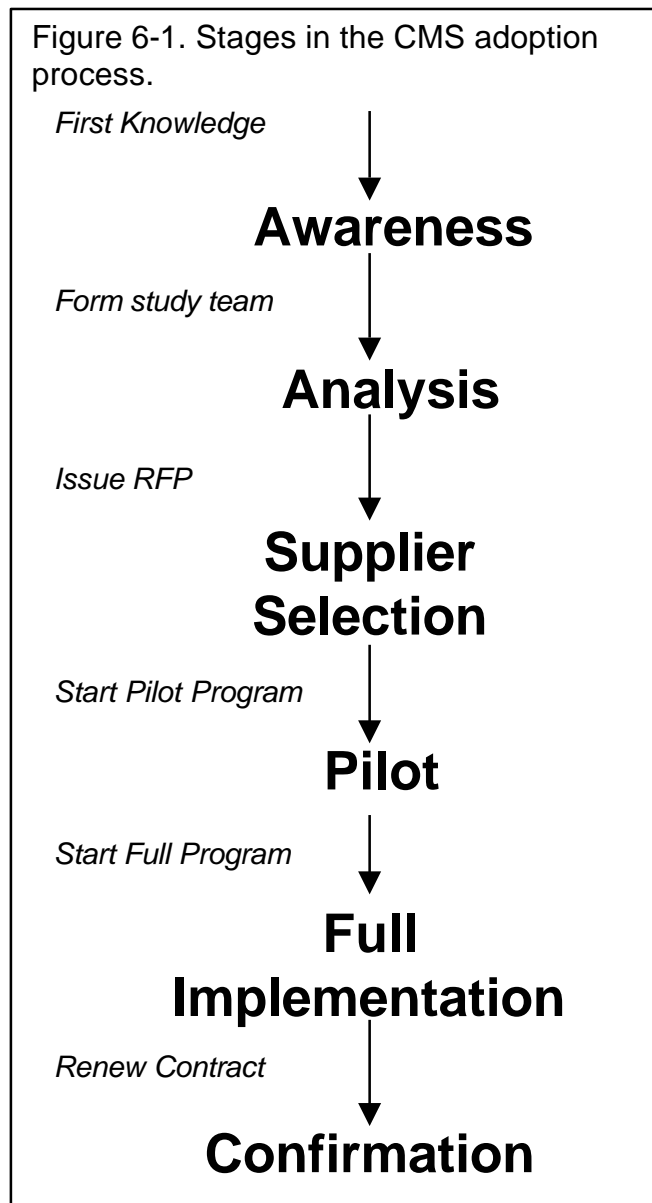


Figure 6-2. Stakeholder accepts and then embraces CMS.

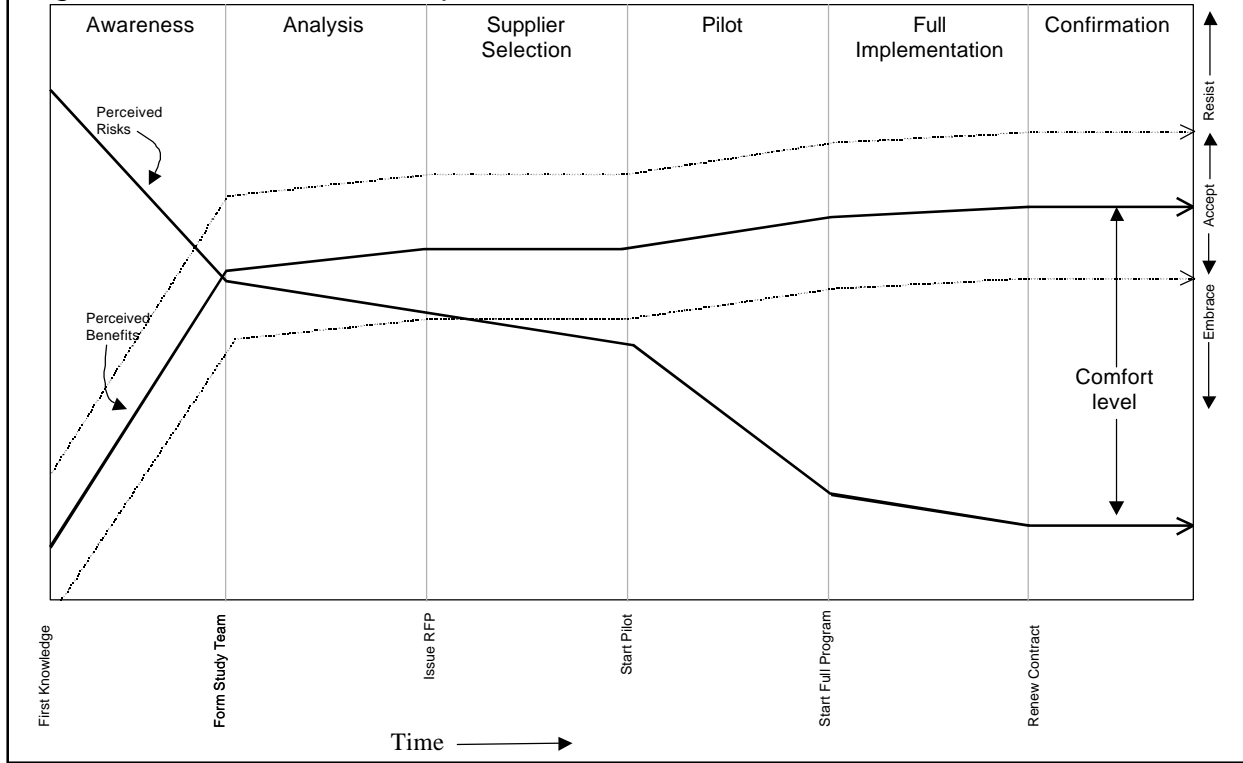
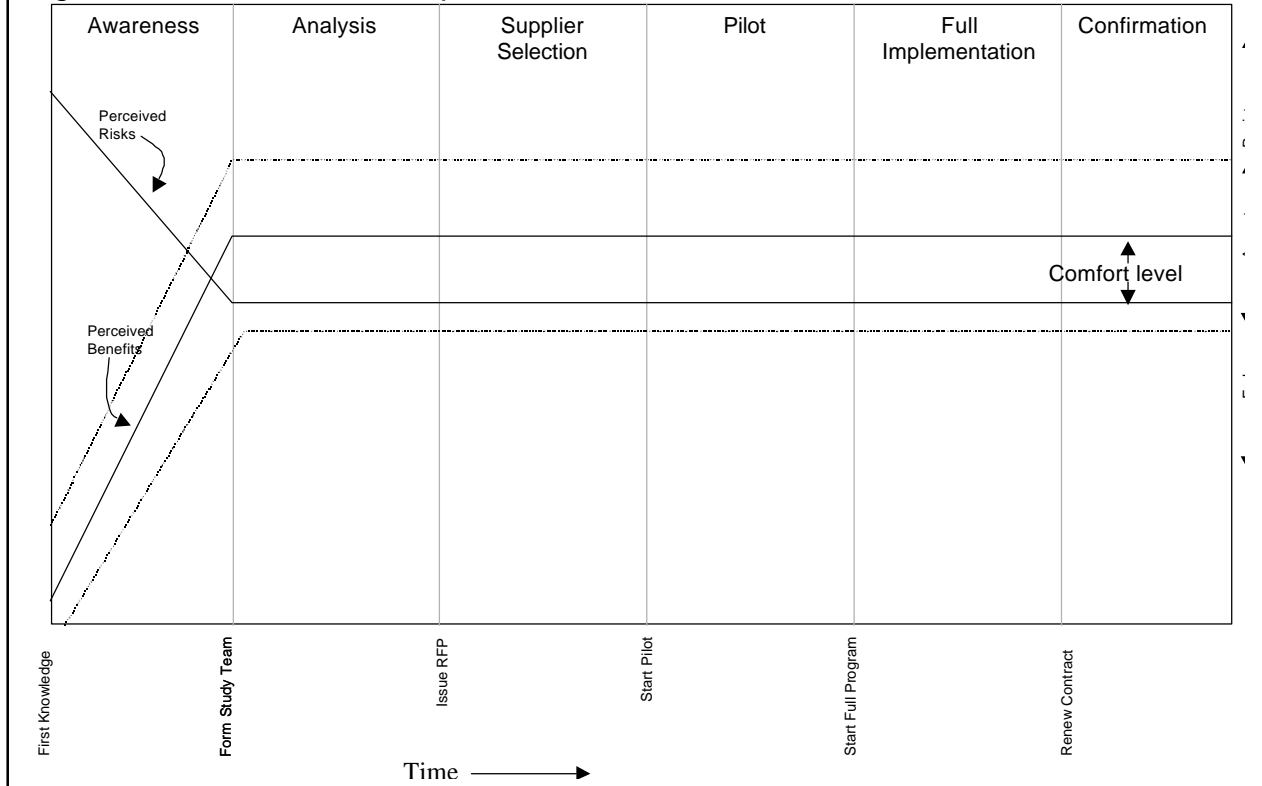


Figure 6-3. Stakeholder accepts CMS.



For example, Figure 6-2 illustrates a possible pattern of benefits and risks for a stakeholder. Initially, the stakeholder is very skeptical - perceived risks are high and perceived benefits are low (indicated by the solid lines). However, by the end of the Awareness stage, benefits and risks are perceived as about equal and the stakeholder agrees to move to the next stage of adoption.

We believe that when risks are only marginally higher or lower than benefits (as indicated by the dashed lines), a stakeholder will decide to continue to the next stage. If risks are significantly higher than benefits, the stakeholder will resist further action. If risks are significantly lower than benefits, the stakeholder will "embrace" CMS - that is, he or she will become a proactive supporter.

In the example of Figure 6-2, perceived benefits continue to rise slowly through the initial stages of adoption and perceived risks drop significantly. Part way through the Supplier Selection process, the superior benefits of CMS become clear and the stakeholder becomes a proactive supporter. By the time of contract renewal, benefits are high and risks are low. The stakeholder has developed a high degree of comfort with the CMS program. In contrast, Figure 6-3 illustrates a case in which initial resistance of the stakeholder is overcome, but perceived risks continue to exceed perceived benefits. The stakeholder accepts CMS but does not actively support it. The comfort level with the program at the time of contract renewal is minimal.

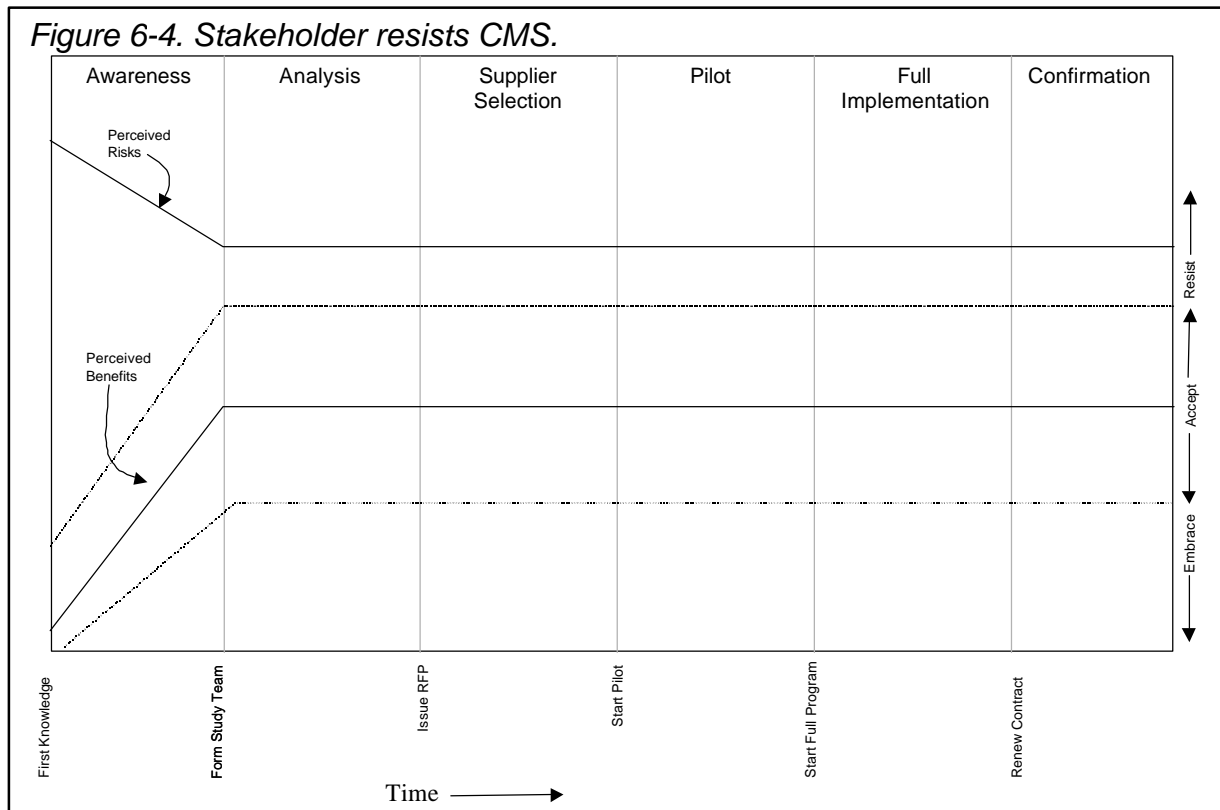
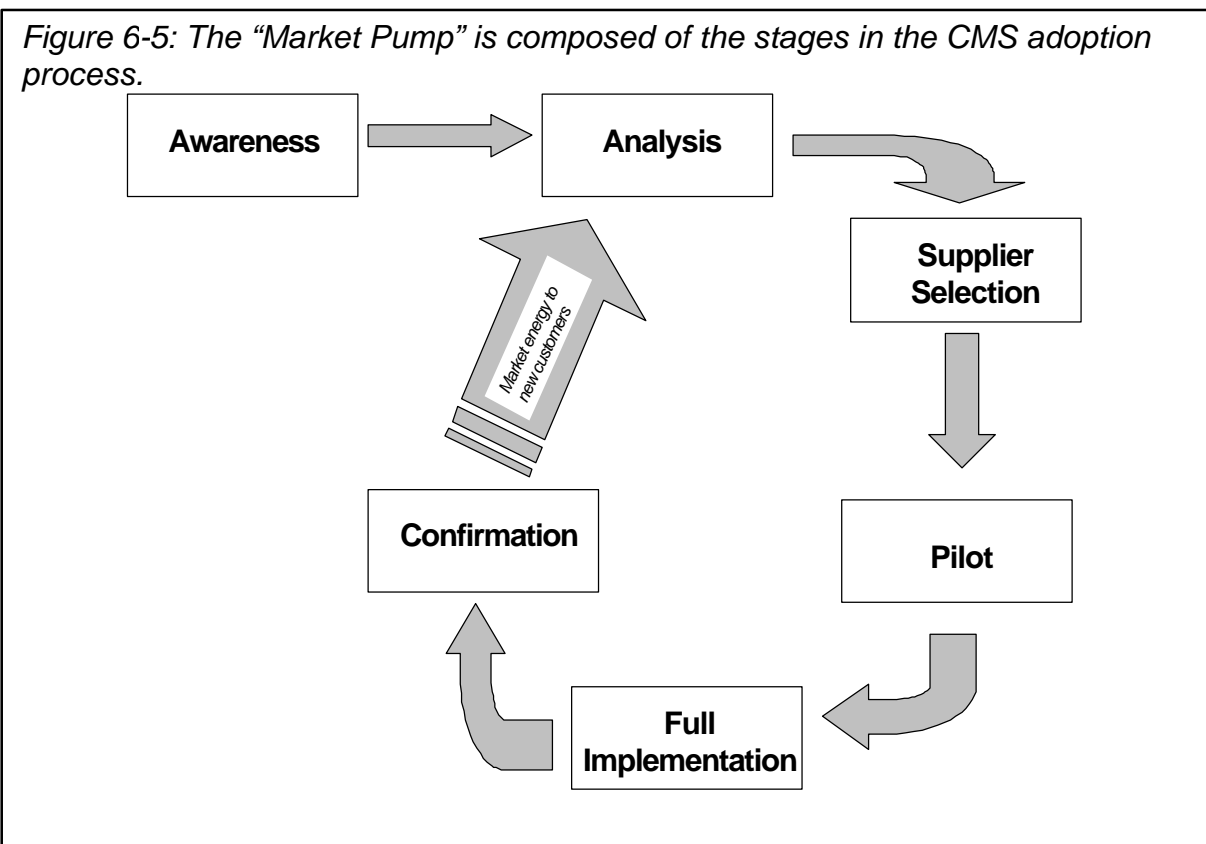


Figure 6-4 illustrates a case in which stakeholder resistance is not overcome. The stakeholder continues to resist CMS adoption throughout the process. The most likely outcome under such circumstances is that the process is aborted and CMS is never adopted.

Obviously, any number of adoption patterns are possible. For example, stakeholders could vacillate from resistance to acceptance to embracing and back to resistance as they move through the stages of adoption. The value of this diagramming approach is to focus the attention on the factors governing perceived risks and benefits of each stakeholder group at each stage in the process. These factors will be discussed further below as well as in Chapter 7.

6.2.3. Stages and the “Market Pump”

As mentioned in Chapter 5, a useful way to envision the growth of the CMS market is through the actions of a “market pump.” Plants that have successful CMS programs share this experience with others, “pumping” energy into the market and expanding demand for CMS. The stages in the adoption process can be organized to illustrate their role in the market pump (see Figure 6-5). Success in the Implementation and Confirmation stages is shared with other plants. Commonly these other plants are in the Analysis stage, but sharing can also be useful to plants in the Awareness stage.



The value of viewing the market pump as a series of stages is that it can help identify key points in the process where marketing strategies can have the greatest effect on expanding the CMS market. This point is made in Chapter 1, as Figure 6-5 is adapted to illustrate where the Top 10 Activities act to strengthen the market pump.

6.3. Stages in Adoption

6.3.1. Awareness

The Awareness stage begins with "first knowledge" of CMS and ends with the decision to form a study team. This is often the longest stage (other than Confirmation).

6.3.1.1. First knowledge

Prior to Awareness, there is little or no knowledge of CMS within the company. Awareness begins when someone learns of CMS and begins to actively think about its potential applicability in the company. There are many companies that can significantly benefit from CMS (chemical accounts approaching \$1 million or more), but we believe that a large proportion of these companies have no knowledge of CMS and therefore have not reached the stage of Awareness. Though there are no accurate data, our interviews suggest that this proportion could be as much as 25% or more of the eligible companies.

Another large proportion of companies (perhaps 25-50%) have entered the stage of Awareness, but have not progressed beyond very basic (often incorrect) "first knowledge" of CMS with only one or two employees. This "first knowledge" of CMS can be acquired from many different sources. The most common appear to be:

- Supplier marketing initiatives.
- Communication with peers at plants that use CMS.
- Hiring someone who possesses CMS experience from a plant that uses CMS.
- Reading about CMS in a trade magazine.
- Exposure to CMS at a trade conference.

The first two, supplier marketing initiatives and personal networking, probably account for the vast majority "first knowledge" sources.

The source of "first knowledge" is critical. When first introduced to CMS, the individual must decide whether to expend the time and effort to learn more about CMS, or to focus these limited resources on other pressing issues. As discussed in the previous chapter, CMS is complex, often incompatible with a company's current practices and culture, and the benefits may be hard to recognize. We believe that the vast majority of "first knowledge" experiences result in an initial decision *not* to

pursue CMS further. We found that plant personnel often indicate a misunderstanding of CMS when explaining why they were not interested:

"Well it's kind of like letting the fox guard the chicken coup. The manufacturer of the product is the one managing the product for me. From where we are, as far as my environmental person and me, we take the position that we are not interested in having someone else manage our chemicals and put us in a situation where we could be legally liable. There is too much money involved for chemicals to be mismanaged."

"What I understand CMS to be is a price per gallon plus a management fee that is not to exceed like 14% of the total expenditure. There were supposed to be reductions in costs each year, but the supplier won't tie in actual numbers."

"We already pull samples and send them out to a lab to get them checked. We'd do this no matter if they are managing it or we are managing it, just to make sure everything is on the up and up. We want it checked to see that we are getting what we are supposed to be getting. Why should I pay them to do that? I'm not getting something here."

"Our present chemical process is fairly stable right now. We have put a lot of time and effort into it. We are doing it again today, going over some steps - what are we looking for, what are we going to be doing, how are we going to attack this? Now when we go out for bids, what are we really looking for? We want to get apples to apples. Make sure we are not getting substitutions. It is so easy to substitute material and say, 'OK I cut some costs off this.' They 'buy the business' so to speak."

It is unclear why "first knowledge" of CMS is so often incorrect. Undoubtedly, CMS can initially be threatening, so personal perceptions may be distorted to help justify the decision not to pursue it. However, it may also be that personnel are not getting clear and consistent information regarding CMS, even from suppliers. As mentioned in Chapter 4, many suppliers offer so called "chemical management" programs that are missing one or more critical components of CMS. These programs are inferior to CMS since they do not promote long-term financial and operating benefits for the chemical user. Moreover, CMS is an inherently difficult concept to explain. We will discuss this problem in more detail below.

6.3.1.2. The internal "sales" process.

Once someone in the company learns about CMS and believes it may offer some benefits, this "early champion" faces the challenge of explaining the concept and convincing others of its potential benefits. Since many individuals in a plant have the capability to stop a CMS initiative, this internal "sales" process is complex. We believe this is a critical barrier to the adoption of CMS. Even though a chemical supplier may be allowed to make an initial CMS presentation during the Awareness

stage, **most of the critical marketing is done by the plants' "early champions" not the CMS supplier.** Typically, the "early champions" are poorly prepared for the marketing job and have limited resources in terms of CMS information and supporting data.

To internally market CMS, the "early champion" must be able to:

1. Clearly explain CMS and how it differs from traditional chemical supply,
2. Demonstrate benefits relevant to the target audience with supporting data, and
3. Allay fears or concerns about possible negative consequences.

This requires good marketing materials that are specifically targeted to the different stakeholder groups in the company - management, purchasing, EH&S, and chemical users (manufacturing, maintenance, engineering, unions, etc.). These materials must include data-based case studies that are relevant not only to the specific industry involved but also target each of the stakeholder groups.

Unfortunately, "early champions" often have little or no marketing material. In most of the cases we encountered, companies in early stages of Awareness had no informational materials on CMS. They relied primarily on "word-of-mouth" marketing. Those who did have materials had only general and anecdotal information on CMS. We did not find any materials that were targeted to specific stakeholder groups. Given this, it is not surprising that suppliers routinely noted that successful CMS champions possessed either clout or a strong personality required to push CMS through the organization. Without good marketing materials, the "internal sell" can be extremely difficult for the "early champions."

6.3.2. Analysis

The Awareness stage ends as a team is formed to formally study CMS. Though internal marketing continues, the emphasis shifts to a more systematic collection of information about CMS and its potential application in the plant . We estimate that only a small proportion of prospective companies (perhaps 10%-20%) has currently reached this Analysis phase.

A CMS study team is usually composed of representatives from purchasing, EH&S, and chemical users (manufacturing, maintenance, engineering, unions, etc.) in the plant Management often gives the team its charge, but may or may not have representation on the team. In companies that are doing a top down implementation, there is usually a corporate representative on the study team.

The goal of the study team is typically to determine if CMS makes sense for the plant. To make this determination, the team gathers available information, requests conceptual presentations from suppliers, visits other plants with CMS programs, and

discusses the advantages and disadvantages of CMS - with team members as well as their colleagues in the plant.

The Analysis stage involves learning the features and benefits of CMS and matching these with the particular needs and operations in the plant. It is during this time period that the most significant sources of resistance must be overcome. Good quality CMS educational materials are critical in this stage. However, they must provide enough detail to explain exactly how CMS works. They must be specific to the needs of each stakeholder and each stakeholder's group. Case studies and field visits are useful sources of information that help reduce uncertainty and clarify benefits.

6.3.3. Supplier Selection

The Supplier Selection stage begins with development of a request for proposal (RFP). In some cases, one or more suppliers may already be deeply involved in the process and may even participate with writing the RFP. RFPs are then distributed to potential suppliers. Interested suppliers typically tour the facility to observe and study chemical usage. Suppliers then develop RFP responses and make presentations to the study team summarizing their proposal and responding to questions. Ideally, this is an opportunity to raise and resolve issues of concern, for both the plant and the supplier. The Supplier Selection stage ends with the selection of a supplier.

A number of problems can de-rail or kill the CMS adoption process during the Supplier Selection stage. First, in the development of the RFP it is tempting for the purchasing group to promote standard "leveraged buy" arrangements. This is simply due to the fact that the Purchase group is usually very familiar with this concept and it is consistent with their departmental responsibility to reduce purchasing costs. If the study team does not have access to someone with experience in writing a CMS RFP, it may have significant difficulty convincing the Purchasing group to focus on total costs – not just purchase costs.

Second, it may be difficult for the study team to identify promising suppliers. There is no single source of information identifying CMS suppliers with expertise that matches the plant's needs. If a plant can only identify one or two promising suppliers, they may interpret this as a sign that they are out on the "bleeding edge" of this innovation. Cautious managers will choose to delay the adoption process rather than push forward and wait for the market to further develop.

Third, CMS proposals can be difficult to accurately quantify and evaluate, as opposed to standard chemical purchasing quotes. Suppliers may differ in their ideas for process improvements or the services that they can offer, much less be able to financially quantify their potential benefits. Some suppliers may provide hardware, such as pumps, totes, and meters. Others may provide engineering and chemical management expertise that is difficult to monetize. Not only can the evaluation effort be intimidating for the study team, but the bids may vary greatly and be difficult to compare. This can

give the study team the impression that CMS is a poorly defined concept. Again, cautious managers will back down.

These problems highlight the need for an unbiased third party to function in the important role of a facilitator. WMRC, CSP, and similar organizations could help companies through the supplier selection process, though they should clearly remain out of the evaluation process. Once properly trained, third-party staff could facilitate the development of CMS RFPs, identify prospective suppliers, and coordinate the proposal review process.

6.3.4. Pilot

The purpose of a CMS pilot program is to provide the plant personnel with “first hand” experience with CMS to minimize risk. For stakeholders who have not yet embraced CMS, the CMS pilot program is an opportunity to verify the potential benefits and decrease the perceived risks. It is also an important opportunity for the supplier to develop a thorough understanding of the chemical systems, and political issues, within the plant.

Most suppliers offer some sort of CMS pilot program. Many call this a “ramp-up” period where production processes and chemical systems are studied and supplier staff are trained. The CMS pilot program can last a period of several months to a year. In our research we were unable to determine how effective “ramp-up” periods are in fulfilling the goal of a pilot program – gaining experience with minimal risk. In some cases, plants enter multi-year contracts at the start of the CMS program, thus providing little opportunity to evaluate potential risk. Process changes are rarely made during the “ramp-up” period because supplier staff are still in the process of studying the plant operations. Some plants are disappointed that progress cannot be made faster.

There appears to be considerable opportunity for improvement of CMS pilot programs. It will require some creativity on the part of suppliers to develop strategies to offer a CMS “test drive” without the financial commitments inherent in many current “ramp-up” strategies. Though this will entail additional risks for the suppliers, it could significantly reduce the perceived risks and increase the perceived benefits for the plant study teams. Knowing that such “test-drives” are available could even reduce the study team’s perceived risks in the Awareness and Analysis stages.

6.3.5. Implement

Following a successful CMS pilot program, the study team and supplier are ready to enter into a long-term agreement. Ideally, the pilot has highlighted important issues that must be resolved by the plant and the supplier to insure a successful CMS program. These issues should be addressed in the long-term contract.

However, the CMS pilot program may identify problems of sufficient magnitude that a CMS program is not possible. In one pilot program we studied, both the plant and supplier had made significant mistakes in structuring and implementing the program. The short-term nature of the program allowed the supplier to terminate an unprofitable relationship. It also allowed the plant to learn from its mistakes and restructure the program with an entirely different chemical footprint and chemical supplier.

6.3.6. Confirmation

The Confirmation stage begins after the first CMS contract has been implemented and run its course. Now the plant has the opportunity to renew the contract, rebid the contract, or return to a non-CMS chemical supply program. Ideally, the program has been successful and the plant is pleased with both CMS and the CMS supplier.

The value of the Confirmation stage from a marketing perspective is to get information about the program out to prospective customers in the market, completing the cycle of the "market pump" (Figure 6-5). We have already mentioned many possible ways to do this, from trade articles and presentations, to demonstration sites and User Groups. However, the important point is that a successful CMS program is an extremely valuable marketing resource. Plant and corporate personnel who support the program can be outstanding "sales" representatives for CMS. The CMS industry cannot afford to allow such resources to be under-utilized.

6.4. Conclusions

There are at least four key stakeholder groups involved in the CMS adoption decision for most companies: management, purchasing, EH&S, and chemical users. Significant resistance from any of these groups can stop the adoption process. Each group is primarily interested in their own priorities, not the overall benefits for the company.

The adoption process typically proceeds through a series of six stages: Awareness, Analysis, Supplier Selection, Pilot, Implementation, and Confirmation. Stakeholders weigh the perceived benefits against the perceived risk at each stage before deciding to continue to the next stage. Among the most important lessons to be learned from examining each of the stages in the adoption process are:

- The "first knowledge" that most stakeholders have with CMS is negative and often incorrect. A more comprehensive effort is needed to "pre-sell" stakeholders using consistent terminology and definitions.
- Company CMS champions need marketing materials to help make the "internal sell" to other company stakeholders. These materials must be readily available and address the specific needs and concerns of the stakeholder group.

- The total cost of chemical ownership must be demonstrated to stakeholders, particularly management. Relevant case studies as well as simple estimation procedures are needed.
- Low-risk pilot programs can reduce stakeholder uncertainty and increase CMS adoption. This will require significant creative effort on the part of CMS suppliers.
- CMS successes can be shared with prospective customers through User Groups, demonstration sites, and related marketing efforts.

Chapter 7

Targeting Key Stakeholders

"We decided that we couldn't remain narrowly focused. We had to go after all these decision-makers..."

an advertising executive

"CMS needs to be a no-brainer. They need to think 'We are idiots if we don't do this'."

a CMS supplier

The key stakeholder groups most commonly involved in the decision to adopt CMS are management, purchasing, environmental health and safety (EHS), and the chemical users (manufacturing, maintenance, engineering, unions, etc.). In this chapter, we examine each of these stakeholder groups in turn. For each stakeholder group, we first examine their priority needs and concerns; second, we explore the potential ways in which CMS can relate to their priorities; and third, we discuss means of reaching the stakeholders with marketing messages about CMS.

Before looking at each stakeholder group individually, it is useful to note their relationship to each other in terms of basic interests (Berrigan and Finkbeiner, 1992). Figure 7-1 illustrates that corporate management must set the company's overall direction and assure that the various plants are working to move the company in that direction. Berrigan and Finkbeiner call this *strategic* interests. Plant management, on the other hand, has *operational* interests since it is responsible for the daily performance of individual plants. *Functional* departments, such as purchasing, EHS, production, etc., have interests that relate directly to their specific functional objectives.

We use these three levels of interests to explore the concerns of each stakeholder group. We identify factors that can be an aid in adoption of CMS as well as those that can be a barrier. A summary is presented in Table 7-1.

Figure 7-1: The relationship between key stakeholder groups.

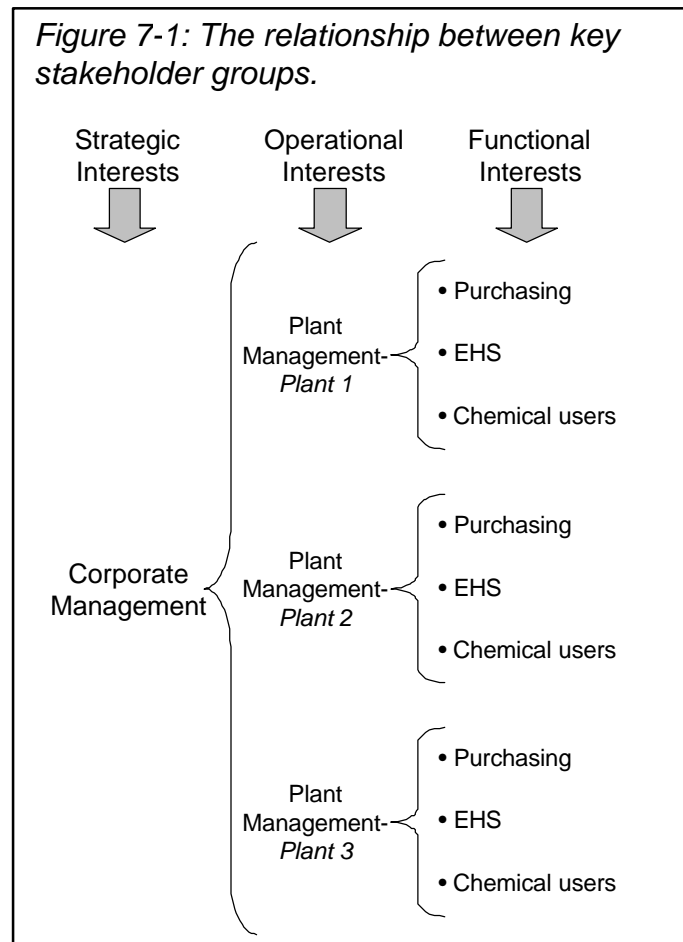


Table 7-1: Priority aids and barriers to CMS for each of the key stakeholder groups.

<u>Interests</u>	<u>Stakeholder</u>	<u>Aids to CMS</u>	<u>Barriers to CMS</u>
Strategic	Corporate management	Concern for total performance.	Difficult access.
Operational	Plant management	Concerned about total performance.	Difficult access, failure to understand total chemical costs.
Functional	Purchasing	Leverage purchasing resources, compatible with "total value buy."	Job loss, not compatible with price orientation.
	EHS	Leverage EHS resources Improve EHS information and performance.	Perceived loss of control over chemical risks.
	Chemical users		
	Production	Improved process reliability, reduced downtime, improved quality.	Perceived loss of control over process.
	Maintenance	Leverage maintenance resources.	Job loss, perceived loss of control over equipment.
	Engineering	Leverage engineering resources.	Job loss, status loss.
	Unions	Health and safety control.	Job loss.

7.1. Corporate Management

7.1.1. Corporate management concerns

Corporate management is concerned primarily with the strategic needs of the company. They must set the direction for the company's future and determine the best course to follow to get there. They also create the internal culture of the organization through the organization structure, budgeting, decision-making, and reward policies.

Table 7-2. Top concerns of global CEOs (source Kearney, 1997)

1. Relationships with customers
2. Cost competitiveness
3. Effective use of information technology
4. Managing change
5. Shareholder value
6. Revenue growth
7. Industry restructuring
8. Globalization
9. Value-added relationships with suppliers

Three studies provide some useful insights into the needs and concerns of top management. The first is a 1997 survey of CEOs in the world's largest companies (sales in excess of \$1 billion) to identify their most pressing concerns (Kearney, 1997). The 463 companies represented a wide array of industries, from consumer products and healthcare to automotive and utilities. The top nine concerns are presented in Table 7-2.

The second study, conducted in January, 2000, assembled 46 global corporate CEOs and industry researchers to identify the primary industry issues for the start of the new millennium (Kearney, 2000). Some of their top priorities are summarized in Table 7-3.

Table 7-3. Global corporate priorities for the new century (source: Kearny, 2000).

1. Optimism Overcomes Global Gloom

Taking advantage of growth opportunities is a top priority. Emerging markets and global economic recovery offer unprecedented opportunities for global growth.

2. Need for Risk Management Remains Strong

Companies must hedge against U.S. stock market upsets and backlash against economic globalization.

3. Coming to Terms with the Internet

Make the most of Internet possibilities, from access to markets and customers previously beyond their reach, to marketing new products and bundling new service offerings.

4. Coping with the New Economy

The new economy has reduced long-range planning cycles in some business sectors to as little as six months. New competitors will focus on credibility, networking and relationship building, rather than revenue or profit levels.

5. Restructuring Requires New Thinking

As new forms of business organization emerge, traditional corporations must learn to manage business alliances in which they exercise only partial financial and legal influence. As the need to restructure intensifies, CEOs should continue to focus on their companies' core competencies.

6. The Importance of Straight Talk

Corporations must maintain their relationships with investors and customers.

Consumer networks will examine all aspects of corporate performance in a search for violations of labor and environmental standards.

7. Maintaining Human Resource Potential

Tight labor markets means finding the means to reduce employee turnover and to leverage the most value from each employee.

8. Corporate Citizenship in a Struggling World

Corporate leaders can play an important role in ensuring that communities offer a sound education to all. Corporations cannot turn their backs on society's newest class of have-nots.

The third study was a collaboration between the Center for Advanced Purchasing Studies, the National Association of Purchasing Management, and A.T. Kearney, Inc. It was conducted to identify why corporate CEOs have not been more active in pursuing

value-added supply relationships, even though 70-80% of the cost of most manufactured items is driven by suppliers (Center for Advance Purchasing Studies, 1998). CEOs cited eight reasons most consistently. These reasons are summarized in Table 7-4.

Table 7-4. Barriers to forming effective supplier partnerships, North American CEOs. (Center for Advanced Purchasing Studies, 1998)

<u>Barrier</u>	<u>Percentage of Respondents</u>
1. Too many competing initiatives	56%
2. Comfortable relationships with existing suppliers	48%
3. Lack of cross-business cooperation	40%
4. Doubt that opportunities exist	36%
5. Lack of cross-functional cooperation	32%
6. Lack of adequate data to support analysis	32%
7. Inadequate monitoring and control systems	32%
8. Inadequate experience at managing major improvement program	28%

Together, these studies suggest that CEO priorities still include many of the traditional concerns, such as cost control, growth, shareholder value. However, they also reflect more recent business trends, such as relationships with customers, globalization, managing change, corporate citizenship, and coping with new technology and the new economy.

Importantly, priorities also include creating greater value-added relationships with suppliers. From Table 7-4, it is apparent that none of the barriers to such relationships reflect a dissatisfaction with current suppliers or supplier partnerships. Instead, they reflect the distractions of other company priorities (#1), contentment with the status quo (#2 and #4) or inadequacies of the company (#3, and #5-8).

7.1.2. CMS and the corporate manager

Corporate management support for CMS is critical. Yet reaching corporate management is difficult. Consider the comments from some CMS suppliers:

The hard part is not selling them (corporate managers), the hard part is getting to them.

From an upper management standpoint, we really haven't had a lot of resistance at all - once you reach them. It's getting up to bat that is the hardest problem, not hitting the ball.

At the corporate level they might understand some of this but have a hard time communicating it into the plant.

If corporate management can be reached, the issues listed in Tables 7-2, 7-3, and 7-4 present both a challenge and opportunity for marketing CMS. In particular, Table 7-4 suggests that CMS marketing efforts must demonstrate the magnitude of the current chemical management need and that CMS can bring significant strategic benefits to the company (#1, #2, and #4). Second, many of the beneficial aspects of CMS overcome inadequacy of current chemical management systems within the company (#3, and #5-8).

The primary issues of importance to corporate management are consistent with a number of strategies that could connect CMS with the strategic needs of the corporation addressed in Tables 7-2, 7-3, and 7-4.

- CMS is a value-added supply relationship that fits the new, global economy, unlike traditional “dollar-per-barrel” supply programs. CMS is based on “Pay for performance, not chemicals.” (Table 7-2, #9; Table 7-3, #4 and #5).
- CMS, when evaluated from the perspective of the total cost of chemicals, can make a major contribution to the cost competitiveness of a company’s product (Table 7-2, #2 and #5; Table 7-4, #1 and #4).
- CMS can support rapid growth, yet is versatile enough to respond to sudden economic changes and industry restructuring (Table 7-2, #4 and #7; Table 7-3, #1 and #2).
- CMS promotes employee health and safety as well as environmental protection worldwide (images of the World Trade Organization and World Bank protests are still fresh in the minds of CEOs) (Table 7-2, #8; Table 7-3, #8).
- CMS can free up available manpower and resources from chemical management duties, allowing company personnel and resources to be applied to core business activities (Table 7-3, #7).
- CMS can facilitate the cross-unit integration of employees required to make value-added supply programs work (Table 7-4, #3 and #5).
- CMS can provide the monitoring and control systems needed to make value-added supply programs work (Table 7-4, #6-8).

7.1.3. Reaching corporate management

Management is the stakeholder group that is most difficult to reach with marketing information. It is a challenge that CMS shares with many products and services that are sold business-to-business, or "BtoB." For insights on reaching management, we devote most of this section to lessons learned from award winning BtoB marketing managers. While specific strategies differ, ranging from golf tournament sponsorship to covering the walls of airports with their company's logo, an effective marketing channel is one that has a high concentration of product exposure to the people you seek to reach. The challenge for CMS is finding such channels for corporate managers of high-volume, chemical-using company's.

The most common channel used to reach corporate managers is the print media - typically top business publications. Irene Hindman is an advertising executive recently named by *BtoB* magazine as one of the best and brightest business-to-business marketers (BtoB, 2000a). Her strategy for marketing office products has many similarities with CMS:

"We did a lot of research about how the decision to purchase office products was made," Ms. Hindman says. "We found that the decision-making process was astonishing, with everyone from the receptionist to the CEO involved. It's not the person who actually makes the purchase. Everyone has a voice in it."

But the common factor, it turned out, was that these decision-makers read. A lot. "We found they were readers of The Wall Street Journal, Business Week, The New York Times, all the major consumer business publications," she says. "We decided that we couldn't remain narrowly focused. We had to go after all these decision-makers in the business publications they regularly saw."

Caroline Riby, another business-to-business advertising executive recognized by *BtoB* used the following strategy for computer hardware:

Her choices in media were full-page ads in The Wall Street Journal and Business Week, plus high-profile sponsorship of Saturday business-oriented programming on cable, with both media aimed at building brand awareness.

The hardest part of any campaign, she says, is "realizing what motivates your customer and knowing how to get them when they're in the best mood and in the best place for receiving that message."

Of course, the market for office products and computer hardware is much broader than for

Table 7-5. Promising business publications to reach senior management.

- *Business Week*
- *Fortune*
- *The New York Times*
- *The Wall Street Journal*
- *IndustryWeek*
- *The Economist (global editions)*

CMS. However, these approaches to use written media probably reflect the best strategy for reaching corporate management with information on CMS (see Table 7-5 for examples of publications to reach corporate management). We know of two CMS suppliers who have advertised in *Fortune* magazine. Though both report some response from the ads, both were also disappointed that the response was not greater.

Some publications may provide a better opportunity for reaching the manufacturing sector. For example, *Business Week's* Industrial Management Edition goes to the 250,000 industrial management *Business Week* subscribers and is published 21 times per year. Another promising magazine is *IndustryWeek*. The advantage of *IndustryWeek* is its focus on manufacturing. The magazine has recently revamped its print and Internet formats to better reach manufacturing executives (BtoB, 2000b).

Many top advertising executives are also recognizing the growing power of the Internet to reach their audience. This is most commonly done by advertising on web sites frequented by their target audience. Among the most popular for reaching top management are financial and stock market sites, though some companies have gone after sports, news, and other sites that reflect the interests of the managers they want to reach. Lisa Geers, another business-to-business marketer recognized by *BtoB*, suggests the following strategy for Internet advertising:

Strategies that have been successful for print are now being applied to Internet marketing, Ms. Geers says.

"When I first started examining the Internet, I looked at it much like print," she says. "If the content is of value to the visitor, they will develop an affinity for the site, and in turn, that site becomes a valuable tool for getting our clients' marketing communications message to the market."

Ms. Geers developed a model for analyzing Web sites similar to what [her company] uses for print. "I scan through them right on the Internet and evaluate them in terms of content, audience profiles, traffic patterns and page views, which give us a profile of how visitors are using the site."

BtoB magazine recently reported that most trade magazine web sites are generating revenue and that many are turning a profit. Most of the revenue is generated by advertising (BtoB, 2000c)

Of course, advertising is just one (quite expensive) means of using media. News can be even more effective - and it's free! As discussed in section 4.3., the CMS industry has many potential market allies. This includes special interest organizations, such as EPA, OSHA, and environmental activist groups. CMS presents an opportunity for these groups to further their environmental goals. There is ample opportunity to earn public recognition from such groups for the environmental, health, and safety improvements resulting from CMS programs. News of awards or similar recognition can attract significant interest from the target audience.

However, print, electronic and broadcast media are not the only means of reaching an audience. Conferences, workshops, or other events and locations that result in a concentration of top management can provide excellent opportunities for marketing. One of the most significant challenges facing the CMS industry is identifying such opportunities and designing effective marketing strategies to take advantage of them.

7.2. Plant Management

7.2.1. Plant management concerns

Plant managers hold the difficult position of being sandwiched between corporate goals and directives on the one hand, and the demands and realities of plant operations on the other. As with corporate management, plant management is interested in the “big picture” rather than individual day-to-day concerns. However, plant management is more concerned about operational issues than strategic issues. In addition, because the purpose of any plant is to manufacture product, the interests of plant management overlap significantly with those of the manufacturing unit (see Section 7.4.1.). However, unlike a manufacturing supervisor, the plant manager is responsible for the overall performance of the plant. This requires integrating and optimizing the various operations in the plant.

In addition, most plant managers hold significant responsibility for:

- Planning processes,
- Organizational structure,
- Purchasing rules,
- Cost-control mechanisms, and
- Management style.

Among the important characteristics of a management style are reward systems, problem-solving procedures, and individual as well as team responsibilities.

7.2.2. CMS and the plant manager

Many of the CMS suppliers we interviewed emphasized the importance of plant management support and the overlapping needs with corporate management and manufacturing. They also expressed the same concern about getting access to plant management as they did with corporate management. This is reflected in many of the following comments:

"Plant managers recognize our value. There's nothing like a union shop where they refuse to work because their chemicals are not adequate - dermatitis, other problems. They will walk! Then they have to call the maintenance department to deal

with it, and that could be 3 or 4 hours before they get to the machine that is holding up the entire line. These are things that plant managers worry about. If we can keep them happy and keep them producing parts, we're worth every nickel they're spending."

"Money - that's what speaks to management. Risk minimization and cost savings."

"There are many risks involved for the manufacturer. There is the waste hauling, health and safety in the workplace, and compatibility issues - is there product failure because of compatibility issues of chemicals. An endless list of potential risks that we can help with."

"What plant managers want is performance - total cost. CMS may even be more costly, but he is looking for a total profitability for the plant - other cost reductions, increasing output, less downtime."

"If you can relieve some of their people burden so that they can reallocate people, they jump on. 'You mean I don't have to have this guy taking inventory each day? Good, now I've got a half a day, what am I going to do with him. I'm going to put him on the inspection line or I'm going to put him over here. He can reposition that person to where he has problems."

Below are a number of plant manager concerns that CMS can address. It should be noted that these are benefits that cannot be provided by chemical sales programs or integrated supply programs.

- CMS, when evaluated from the perspective of the total cost of chemicals, can make a major contribution to cost competitiveness.
- CMS can improve process reliability, reduce downtime, and enhance productivity as well as product quality.
- CMS can facilitate environmental health and safety compliance as well as reduce employee concerns about EHS threats.
- CMS can free up available manpower and resources, allowing company personnel to focus on core business activities.
- CMS can facilitate the cross-unit integration of employees required to make chemical management work.
- CMS can provide the monitoring and control systems needed to make chemical management work.

7.2.3. Reaching plant management

In some cases, plant managers can be even more difficult to access than corporate managers. Prudent use of media may be one of the best approaches. There are few periodicals or web sites designed specifically for plant managers. Instead, we believe that media channels appropriate for corporate management and for manufacturing (see Section 7.4.1. below) are most likely to be read by plant managers. The most promising are listed in Table 7-6. The IndustryWeek web site also provides a current listing of major manufacturing conferences such as the Best Practices from America's Best Plants Series and International Manufacturing Technology Expo.

Table 7-6. Promising channels for reaching plant management

Print media

- *Business Week's Industrial Management Edition*
- *IndustryWeek*

Web sites

- Manufacturing.net
- Businessweek.com
- Industryweek.com

Conferences

- See Industryweek.com

Plant managers rely on networking as a source of new ideas and technologies. Networking information sources include plant meetings, company-wide meetings and industry meetings. Trusted supplier representatives may also provide valued information, as well as peers in other industries that are encountered at conferences, golf outings, or community events.

7.3. Purchasing

7.3.1. Purchasing concerns

The role of a purchasing department can vary greatly from company to company. Some purchasing departments play a central role in cost control, quality improvement, and process innovation. Others have a relatively minor role, with efforts limited largely to negotiating prices and checking on supplier services.

The purchasing function typically has both a corporate and plant presence (Fearon, 1988). At the corporate level, purchasing typically reports to the executive vice president or operations vice president. At the plant level, purchasing has reporting responsibilities to plant management as well as to corporate purchasing.

Table 7-7. Issues of importance to purchasing/supply executives (in descending order). (source: Center for Advanced Purchasing, 1998)

1. Electronic commerce
2. Strategic cost management
3. Strategic sourcing
4. Supply chain partner selection and contribution
5. Tactical purchasing
6. Purchasing strategy development
7. Demand-pull purchasing
8. Relationship management
9. Performance measurement
10. Process uncoupling
11. Global supplier development
12. Third party purchasing
13. Virtual supply chain
14. Source development
15. Competitive bidding and negotiation
16. Strategic supplier alliances
17. Negotiation strategy
18. Complexity management

The role of the purchasing professional in the U.S. has seen significant change in the last 20 years. To compete with foreign manufacturers, many U.S. companies adopted strategies to cut costs, improve product quality, reduce inventory, and develop closer relationships with suppliers. In response, many purchasing departments have begun to focus purchasing decisions on just-in-time delivery, total cost of ownership, and value-added relationships with suppliers.

A 1998 study of 160 North American purchasing/supply executives identified 18 categories of primary concerns. These categories are summarized in Table 7-7.

7.3.2. CMS and purchasing

CMS clearly addresses a number of critical purchasing issues listed in Table 7-7. These include strategic sourcing (#3), and supply chain partner selection and contribution (#4). Given an understanding of the total cost of chemical ownership, CMS can also make significant improvements in strategic cost management (#2). However, CMS has the potential to make valuable contributions to several other purchasing priorities as well.

Electronic commerce (#1) and demand-pull purchasing (#7) focus on integrating suppliers into the production process; consumer orders trigger corresponding supply and production activities. This should happen seamlessly through electronic networking technologies such as intranet, extranet, and internet interfaces. Many CMS suppliers are well positioned to offer such systems.

However, electronic commerce, viewed in more limited terms, represents a serious threat as an "inferior substitute" for CMS. Many purchasing professionals view e-commerce as the ultimate weapon in price-based buying. The ability to instantly compare many supplier prices puts significant market power in the hands of purchasers and commoditizes specialty chemicals. Many chemical suppliers have begun offering e-commerce Internet sites for their chemicals. However, these efforts pale in comparison to a recent move by a consortium of major chemical manufacturers, including BASF, BP Amoco, Dow, and DuPont (Westfall, 2000). This group is forming a new corporation to serve as the "premier on-line marketplace for the chemical industry worldwide". Any chemical company can list their chemicals on the site. Although such sites could be used by CMS suppliers to drive down their own chemical costs by seeking the lowest priced chemicals, the more likely scenario will be to encourage purchasing professionals to pursue price-based buying over value-based buying.

Tactical purchasing (#5) reflects the use of cross-functional teams, as well as automating or outsourcing basic supply activities such as ordering, quoting, expediting, etc. CMS can make contributions to both these efforts. Performance measurement (#9) reflects improved metrics for monitoring value from supply relationships as well as product performance. Many of the other purchasing priorities also rely upon improved metrics. Again, CMS has can make significant contributions to improve performance metrics.

The CMS suppliers we interviewed had a lot to say about purchasing. Their comments reflect the positive and negative aspects of marketing CMS to purchasing:

“Purchasing is a big stumbling block when we trying to sell this thing on a daily basis.”

“Purchasing resistance is pretty cut and dried - it’s a fear of loosing their job. That’s the big thing. But today so many purchasing people are wearing so many hats that a lot of them are relieved to get chemicals off their desk. You’d think there would be more resentment there, but there actually isn’t.”

“Purchasing people come on board pretty much on the financial side. A lot of time the purchasing people could save the plant a lot of money, but they don’t have the opportunity because they are not on the factory floor and they are just buying what is being requisitioned - as opposed to sourcing. A lot of times they are frustrated by what is going on at the factory level. So at a lot of plants purchasing has been one of our biggest allies, in the beginning and through the life of the contract.”

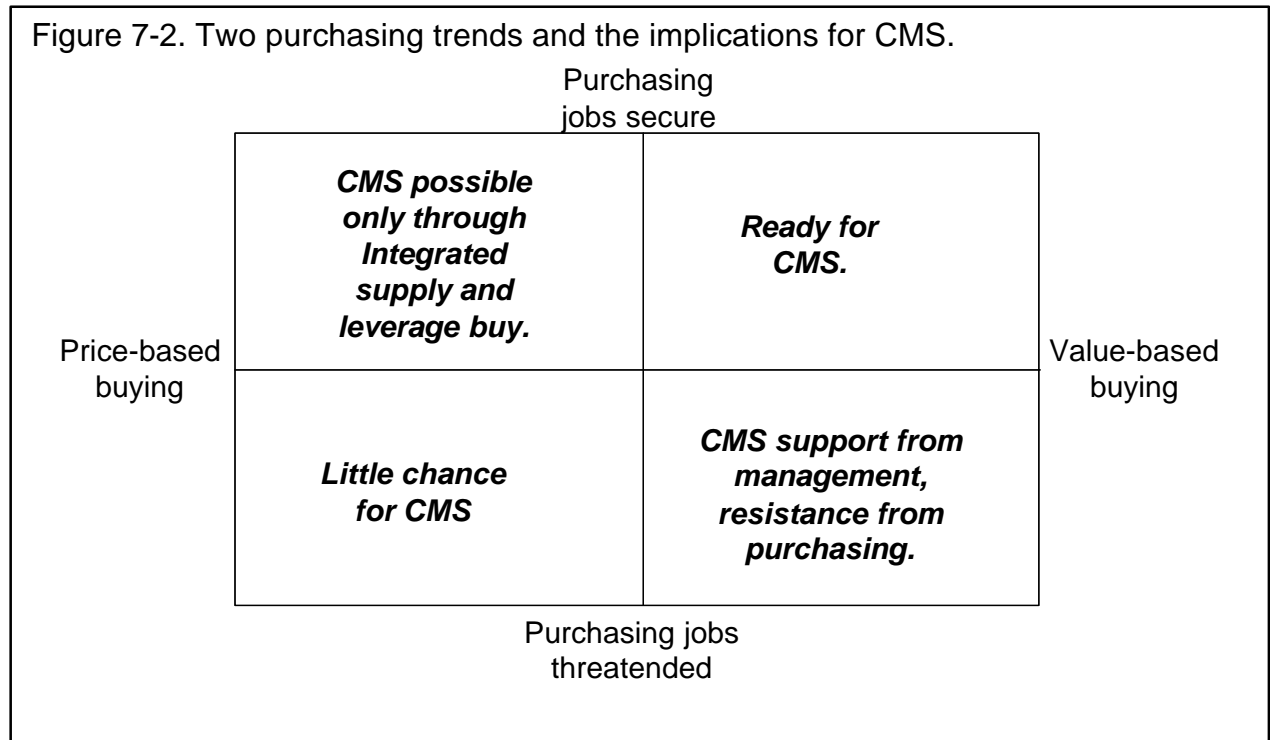
“CMS has a major, major impact on purchasing - it impacts the way they do things and on the way their performance is measured. Ultimately, purchasing is involved in everything. Purchasing has to be convinced to be willing to play along. The plant manager, environmental manager, production manager, cannot let out a contract without purchasing approving it. Purchasing is critical, but they are the ones furthest remove from the day to day operation of the plant.”

“Purchasing for the most part only looks at the purchase price of the chemical. That is their only part of the equation because that is the only way they are evaluated - purchase price. The engineers are evaluated on usage and performance. In other words, if the usage goes down the buyers don't get any credit.”

“In some companies the purchase of chemicals and the purchase of tooling is accomplished through different buyers. You might have a chemical buyer and a tooling buyer, so even within the department of purchasing you have subgroups. Each of which may have a different agenda. We can't just sell the chemical buyer, we have to sell the purchasing manager.”

Together, these issues identify two trends in purchasing that are of particular importance to CMS. One is the emerging split between companies that are pursuing price-based buying strategies and companies adopting value-based buying strategies. The second is a split between companies that are in the process of downsizing purchasing departments by outsourcing purchasing functions, from companies that have already downsized purchasing and are now seeking to refocus personnel on core business practices. In the first case, purchasing jobs are threatened, while in the second, purchasing jobs are relatively secure. These two trends, and the implications for CMS are presented in Figure 7-2.

In organizations pursuing both price-based buying and purchasing downsizing, there is little chance of adopting CMS. Management does not see the need and purchasing perceives it as a threat to their jobs. For organizations using price-based buying where purchasing jobs are secure, there is the possibility of initially marketing CMS through its integrated supply and leverage buying capabilities. Since purchasing personnel are looking for opportunities to outsource purchasing activities, the chemical management capabilities of CMS may then become important.



In organizations that want to implement a value-based buying program, but are still seeking to downsize the purchasing department, CMS may be resisted by purchasing but supported by management. A champion for the CMS program will have to come from outside of the purchasing department, possibly from the ranks of plant or corporate management. The challenge will be developing a working relationship with purchasing. For organizations seeking value-based buying where purchasing jobs are secure, purchasing may be ready to champion CMS, because it offers significant benefits for the purchasing department and the organization. This represents an ideal environment for marketing CMS.

7.3.3. Reaching Purchasing Personnel

Purchasing personnel, probably more than any other business professional, is under a constant marketing barrage from sales people. This can make purchasing professionals resistant to marketing and sales pressure. Crafting marketing messages that address

key purchasing concerns will be essential to overcome resistance and alter purchasing behavior.

Some of the most popular journals targeted to the purchasing professional are listed in Table 7-8. In addition, the web offers excellent opportunities to market CMS. The National Association of Purchasing Management (NAPM) offers an excellent web site with extensive information on procurement, supplier sourcing, supply chain management, outsourcing and links to related purchasing information sites.

PurchasingCenter.com offers a number of user services such as current business news and trends as well as a comprehensive conference calendar that chronologically lists purchasing conferences and workshops for a wide range of industries. One of the features of this calendar is that it provides web links for all the events and organizations listed, allowing the suppliers to narrow their marketing focus to specific regions and industries.

Unfortunately, the purchasing literature is in great need of timely and accurate articles on chemical management. The literature has given relatively little coverage to CMS; but when it has, it has been misleading. For example, in a March 11, 1999 *Purchasing* magazine article that includes BetzDearborn's CMS programs, the author discusses "getting overall purchasing leverage" from the program, but there was no discussion about unique financial mechanisms or the process improvements that such mechanisms produce (Genna, 1999). In a 1997 article, the author notes that CMS programs provide "product consolidation, inventory management, and waste disposal" services, but never mention the far greater benefits from process improvement (Lewis, 1997). A 1996 article in *Industrial Distribution* defines "complete chemical management services" as "purchasing, accounts payable, materials handling, and inventory management, along with other value-added services like testing, disposal and information support in the form of MSDS management and environmental reporting." While the list of services is impressive, it misses the point - CMS customers do not buy a laundry list of services, they buy continuously improving chemical performance. There is a need for more thorough, well-researched, accurate articles on CMS, including CMS case studies from a purchasing perspective.

Table 7-8. Promising channels for reaching purchasing personnel.

Print media

- *Purchasing* magazine
- *Purchasing Today*
- *The Journal of Supply Chain Management*
- *Modern Purchasing* (Canadian)
- *Modern Materials Management*
- *Material Handling Management*

Web sites

- napm.org
- purchasingcenter.com

Conferences

- See purchasingcenter.com

7.4. Environment, Health and Safety (EHS)

7.4.1. EHS concerns

The management of environmental health and safety (EHS) issues can be organized in a variety of ways. Some companies maintain individual departments for each of these three functions, others consolidate the functions in to one department and often one job description. The consolidation efforts are primarily due to the significant overlap between the three areas not only in terms of the expertise of environmental, health, and safety professionals, but also in the nature and root causes of the problems they face. Many EHS problems arise from the production processes, the materials (including chemicals) selected for the production process, and the lack of adequate control and efficiency of use of these materials in the production process.

EHS management is frequently divided between plant and corporate staff. The degree to which EHS control is centralized at the corporate level can vary considerably. In some cases, plants retain highly qualified EHS professionals with a wide latitude of decision-making authority. In other cases, policies are set at the corporate level and plant EHS functions are carried out by maintenance or other staff on a part-time basis. Many companies use a strategy somewhere between these two extremes.

Table 7-9. Selected priorities for the new EHS manager (Larson, 2000)

1. Improvements in resource utilization (energy, investment, raw materials and staff time);
2. Risk and liability reductions;
3. Streamlined management of environmental data and information;
4. Waste minimization;
5. Full-cost accounting for EHS improvement
6. Performance based contracts
7. Minimize process downtime through improved health and safety procedures
8. Identifying, quantifying and reducing greenhouse emissions in the coming decade.

The EHS function in many companies has been changing over the last decade and will continue to change in the future. The change is driven by a recognition in these companies that EHS management must extend beyond regulatory compliance to pursue value-added solutions. A recent issue of *Environmental Protection* magazine featured the value-added trend and the issues that are important for this new type of EHS manager (Larson, 2000). The article summarizes the characteristics of the split between old and new EH&S programs as follows:

A corporate culture that once considered environmental functions as nonproductive liabilities is witnessing a new generation of environmental managers. They are thinking beyond compliance and remediation activities and redefining their company's environmental policies to achieve business objectives. This new breed of environmental manager is focused on environmental, health and safety (EHS) programs that positively impact their companies' profits, competitive positions, public images and shareholder values.

This new view of the EHS function results in a new set of priorities. Of priorities discussed in the article, those of greatest importance to CMS are listed in Table 7-9.

7.4.2. CMS and EHS

CMS suppliers we interviewed had a number of observations concerning EHS and CMS:

"I can't think of too many instances where the environmental people vetoed the program. Their needs to have to be met, and CMS meets those needs. You have to look at which departments are significantly affected by the way we are currently doing things. Environmental is one."

"Our experience is that environmental is a strong, strong, strong supporter."

"My experience is the environmental group initiates it."

"The environmental group killed it at this plant. They didn't want the risk of someone else managing the chemicals."

"Most of the environmental people come on board because they are just swamped. They are so overwhelmed. And the biggest thing is that information they are getting for their reporting is completely wrong. It's all based on purchases. Nobody inventories chemicals. It comes in as an item and gets expensed out immediately. So you may buy 10 drums every other month, and that is what your usage shows, when in fact you are at 5 drums a month. You are reporting 10 drums every other month, instead of a flat 5 drums. What I tell the environmental people is that we are going to give you the accurate environmental reporting you never got. You take it a step further, what do they do for all their spray cans? They bought 10 cases. How are they going to report that to the EPA? Ten cases? What we do is convert it to a number that makes sense, pounds, gallons, whatever. So the environmental people, once they see that, they wave their magic wand and half their prayers we have answered. So the environmental people support this."

"We aren't taking their job, unlike purchasing, so there really isn't a threat there. They have got in us a glorified worker bee - tracking all that information for them and giving it to them in a timely fashion. Then when they get hit with a production chemical that needs to be removed from the plant, they don't have to go fight the people on the factory floor, they tell us to get it out of the plant and then it is our job to make it happen. So the environmental people usually jump on real fast."

"Environmental concerns have decreased in the last 5 years. The muscle for the environmental group to get CMS through just doesn't seem to be there anymore."

CMS can generate significant benefits for the traditional, compliance-oriented, EHS manager, as well as the new, value-oriented EHS manager. Considering the comments of CMS suppliers, above, and the EHS priorities listed in Table 7-9, there are a number of key points that can help in CMS marketing. In particular, CMS:

- Improves compliance assurance and the monitoring of regulatory developments.
- Provides accurate and timely data needed for regulatory reporting.
- Frees-up EHS personnel to work on more value-added activities.
- Improves resource utilization (Table 7-9, #1).
- Reduces chemical risks and liabilities (Table 7-9, #2).
- Streamlines EHS data management (Table 7-9, #3).
- Minimizes chemical waste and reduces scrap waste (Table 7-9, #4).
- Provides much of the data needed for full-cost accounting of EHS problems and improvements (Table 7-9, #5).
- Employs performance-based contracts (Table 7-9, #6).
- Minimizes process downtime through improved chemical management (Table 7-9, #7).

The need to identify, quantify, and control greenhouse gases is not a primary focus of current CMS programs, but energy efficiency and other means of reducing greenhouse gases may present a significant future competitive opportunity for marketing CMS. This may require the development of strategic partnerships with energy service companies or others organizations with energy efficiency expertise.

7.4.3. Reaching EHS Personnel

Some of the most popular journals targeted to the EHS professional are listed in Table 7-10. On the web, the EHS Network (ehsn.com) web site is designed to be a one stop site for EH&S professionals, offering an excellent search engine with 200 top web sites for EH&S professionals. These web sites can be used to target advertising to EH&S professionals. In addition the national Association of Environmental Professionals (naep.org) has an excellent web site that lists a variety of EH&S professional publications, both public and proprietary, that provide avenues to target EH&S professionals. Finally, the EH&S Products online magazine (ehs-online.com/) offers a professional events calendar that provide events, dates and associated web sites that can be used to target EH&S professionals at selected industry events and locations.

Table 7-10. Promising channels for reaching EHS personnel.

Print media

- *Pollution Engineering*
- *Environmental Protection*
- *EM*
- *Occupational Hazards*
- *Occupational Health & Safety*

Web sites

- ehsn.com
- naep.org
- ehs-online.com

Conferences

- See ehs-online.com

7.5. Chemical Users

7.5.1. Manufacturing

Manufacturing has responsibility for producing quality products on time and within budget. To accomplish this, manufacturing supervisors strive for reliable production processes, elimination of production interruptions, and the opportunity to reduce costs without threatening production. *Change* carries the risk of product quality problems, production delays, and cost over-runs. Since CMS represents a significant change for many companies, it can encounter substantial resistance from manufacturing. As one of our interviewees put it:

The production side doesn't want to change because they don't want to mess everything up. "Somebody else is going to be making decisions that may impact production?" So their reason is if it ain't broke don't fix it. "Yes, I'm concerned with cost, no, I really don't care about the environment. I'm most concerned with production and quality." Particularly today, where we have such a robust economy, in production the hardest part of their job is getting product out the door because demand is so strong.

Given the concerns of manufacturing personnel, some of the most important marketing messages about CMS appear to be:

- CMS increases manufacturing control, since manufacturing retains decision-making authority, but CMS provides better information and chemical control.
- CMS increases the reliability of production operations.
- CMS decreases production costs.
- CMS can improve product quality while providing better production control.

Some of the most popular journals targeted to the manufacturing personnel are listed in Table 7-11. Many of the channels for reaching manufacturing personnel overlap significantly with those used to reach plant management. However, for the manufacturing personnel, Manufacturing.Net is particularly useful.

This web site offers five separate manufacturing “communities” including automation and control, design, manufacturing processes, plant operations and supply chain. Each “community” has its own news

Table 7-11. Promising channels for reaching manufacturing personnel.

Print media

- *Business Week's Industrial Management Edition*
- *IndustryWeek*

Web sites

- Manufacturing.net
- Businessweek.com
- Industryweek.com

Conferences

- See Industryweek.com

section, an events calendar, related associations, web site sponsors listing and links for additional information on specific manufacturing topics. It is a well-organized, comprehensive site that is easy to use and offers an excellent opportunity for accessing individuals in different areas of the manufacturing sector.

7.5.2. Maintenance

The plant maintenance function has experienced an enormous evolution in the past two decades. It is moving from what was largely a machine repair department, to a high-tech, proactive machine reliability strategy. This has required significant changes in the basic skills of maintenance staff, the problems they encounter, and the way they interact with others in the plant. This change has not always come easily, including changes in the way maintenance relates to their suppliers. Consider the following comment of one of our interviewees:

“Our biggest obstacles are the users, the maintenance people. They are concerned that they loose control. Plus, they have a good thing going. The supplier is taking care of them - ball tickets, golf outings, whatever. They are going to lose that. I’d say about 25% of the decision-makers in the plant have a perks concern. In every plant, one out of 4 people has their hands in something. Not a pay-off situation, but lunch, ball tickets, golf hats, doughnuts, fishing trips. You don’t see it as much, but for some reason maintenance - there is a lot in that area.”

From our study of maintenance personnel, a review of the maintenance trade literature, and agendas from recent maintenance conferences, we have selected some of the key issues for plant maintenance professionals (see Table 7-12). Note the many similarities between the issues of maintenance and the issues of EHS - such as integration into overall business goals, and moving from an "after-the-fact" department, to a proactive contributor of

Table 7-12. Selected key issues of the plant maintenance profession.

- Shifting the paradigm that maintenance is a repair function, to maintenance as a reliability function.
- Shifting the paradigm that maintenance is a liability, to maintenance as a value-added product asset.
- Integrating maintenance into business objectives.
- Justifying preventive maintenance (PM) and reliability-based maintenance (RBM) programs.
- Using total productive maintenance (TPM), preventive maintenance (PM), predictive maintenance (PdM) overall equipment effectiveness (OEE), reliability-centered maintenance (RCM), and root cause failure analysis (RCFA).
- Process optimization through maintenance.
- Upgrading technology skills such as infrared thermography and vibration analysis.
- Information systems, including computerized maintenance management systems (CMMS), and enterprise asset management (EAM) systems.
- Time management through proactive maintenance.
- Working with organized labor.

business value. Just as with EHS, the goal is to improve processes, not just respond to process problems. Joel Levitt, in his book *Managing Factory Maintenance*, argues that the future of maintenance lies in working "endlessly to reduce and, where possible, eliminate the need for maintenance" (Levitt, 1996).

From the above discussion, it should be clear that the priorities of maintenance are consistent with CMS. Some of the most important marketing messages about CMS appear to be:

- CMS promotes reliability-oriented maintenance.
- CMS is a proactive maintenance program consistent with PM, PdM, TPM, and similar maintenance programs (see Table 7-12).
- CMS provides better information and chemical control, allowing maintenance to be integrated into enterprise asset management (EAM) and similar computer-based systems.
- CMS frees-up maintenance personnel to focus on more value-added activities.
- CMS has been a productive partner in advanced maintenance programs (see for example, the GM Electro-motive Division case history in Bierma and Waterstraat, 2000)

Some of the most popular journals targeted to the maintenance personnel are listed in Table 7-13. Reliability Center (reliability.com) offers an excellent web site with a comprehensive list of links to an array of maintenance-related sites, including links to trade magazines, trade associations, testing laboratories, consultants, and vendors. Plant Services (plantservices.com) hosts a comprehensive industry calendar of events as well as an online version of *Plant Services* magazine, targeting plant engineering and maintenance services. They offer free subscriptions to qualified individuals. It also offers online educational resources and an online topic discussion forum. Finally, The Plant Maintenance Resource Center (plantmaintenance.com) is a good web resource for maintenance professionals. It includes links to maintenance consultants, CMMS and

Table 7-13. Promising channels for reaching maintenance personnel.

Print media

- *Maintenance Technology*
- *Maintenance Journal*
- *Facilities Engineering Journal*
- *IMPO (Industrial Maintenance & Plant Operations)*
- *Reliability Magazine*
- *Lubes 'n Greases*

Web sites

- mt-online.com (Maintenance Technology Magazine Online)
- manufacturing.net
- reliability.com
- plantservices.com
- plantmaintenance.com
- industryweek.com

Conferences

- See reliability.com

maintenance software, CMMS vendors, maintenance conferences and conference papers, articles on maintenance, and many other valuable resources.

7.5.3. Engineering

In many plants, engineering is responsible for the design of production equipment and processes, including selection of the proper chemicals for each piece of equipment. Design responsibilities can range from piping to painting to machine maintenance.

A recent article on plant engineering management summarized the plight of the profession this way (Campbell, 2000)

What's the toughest part about the facilities business? When everything works, no one notices. Maintenance is ahead of schedule, pumps are pumping, lights are burning, and wheels are turning. From that perspective, everything is great. It takes a lot of effort to reach this point. The rest of the plant takes our efforts for granted.

Given this, it should not be surprising that engineering's concerns mirror those of the other key departments in the plant. In fact, engineering responsibilities largely overlap those of other departments we have previously discussed including manufacturing, maintenance, and EHS. Plants with a strong engineering program may have engineering personnel heavily involved in the day-to-day operation of these programs. Other plants may have limited engineering staff, and rely upon the other functional departments to provide most of the management. Our list of selected concerns was developed from our interviews with plant engineering personnel, literature reviews, and conference agendas. (see Table 7-14).

CMS can help meet the needs of engineering in much the same what it can help meet the needs of manufacturing, EH&S, and maintenance. As one CMS supplier explained:

Table 7-14. Selected key issues of the plant engineering profession.

- Integrating engineering into business objectives
- Re-casting engineering as a value-added program.
- Promoting total system reliability.
- Developing and improving plant information management systems (PIMS) and enterprise resource planning (ERP) systems.
- Avoiding outsourcing of engineering functions.

Table 7-15. Promising channels for reaching engineering personnel.

Print media

- *Manufacturing Engineering*
- *Plant Engineering*
- *Facilities Engineering*
- *IMPO (Industrial Maintenance & Plant Operations)*
- *Reliability Magazine*

Web sites

- sme.org (society of manufacturing engineers)
- fit.edu/AcadRes/engmgt/society.html (engineering and technology resource site)
- manufacturing.net
- reliability.com
- plantservices.com
- industryweek.com

Conferences

- See all above web sites

On the engineering side, the biggest problem in our experience is that the engineers are worried that someone else is making decisions in the plant and they are not. What we try to do is make it their decision. We don't want the credit. If we are on a cost-per-unit basis, the credit to us is lowering consumption. But what we tell the engineers is, look, sign our change order and when it works you are going to be a hero. We try to get them on the team and make them look good.

Some of the most popular journals targeted to the engineering personnel are listed in Table 7-15. Many engineers will also read journals targeted to the specific operations of their plant. For example, an engineer working in a plant that does painting might also read *Products Finishing* or *Metal Finishing* magazines. The World Wide Web Virtual Library Project sponsored by CERN provides an excellent Engineering and Technology Management resource site (www.fit.edu/AcadRes/engmgt/society.html). The links at this site will provide access to specific engineering sites that have events publications, calendars, articles, seminar lists, forums and associated member activities. A similar site for Manufacturing Engineering (www.uwstout.edu/mevl/) is available as well. This site includes an extensive list of vendors as well.

7.5.4. Unions

Unions are concerned with jobs. It is natural, therefore, to assume that unions will oppose, rather than support, CMS; since it is perceived as a job outsourcing program. As one interviewee put it:

We have had some really tough adversarial situations. Unions can be especially tough.

However, this is not always the case with CMS. In plants where job loss was not an issue, unions have become proponents of CMS programs. CMS offers union workers two benefits that union personnel value, personal safety and control. In all five of the plants we studied for our previous research, the CMS supplier had developed good working relations with union workers. Supplier personnel readily admitted that their job would become impossible without the cooperation and support of the union workers, and went out of their way to educate and listen to union workers. This created a trust that benefited everyone.

One plant, in particular, clearly emerged as a model for union support and cooperation, General Motors' Electro-motive Division plant in LaGrange, Illinois. Not only were there good relations between supplier and union personnel, but the union was one of the most vocal supporters of CMS program in the plant. This support was summarized by the UAW representative on the plant's chemical management team:

"We didn't used to have much control over the chemicals that were brought in here. Someone would decide they wanted a certain chemical and that was it. Now things are different. UAW Safety is the first signature you have to get on our '10-step approval process.' We can make sure we are not bringing more hazards in the

workplace. There always is a better product--one that can do the job without the risks. Let's face facts, its ignorance that caused most of our problems. The more we know the fewer problems we have. That's been a real plus in this program."

For the production line workers, CMS provides access to chemical decision-making and greater assurance of safety. For the union management, it is a chance to demonstrate value to its membership. Though unions have not been actively pursued as CMS champions, this may offer a promising option. As one interviewee commented:

"We need to reach the union at an expert level. For example IAM represents a lot of our customers, and they have a program where they are trying to convince their locals of the value of self-directed workgroups. They got behind it based on the success of one of their locals. They are willing to do some things like that if they think that, long-term, it will protect the job security of their members. Unions can make this fail real easy. They can make us look bad real quick. But they can also be strong supporters."

7.6. Financial Management

A number of CMS suppliers have identified financial managers (CFO, controller, accounting, etc.) as both a potential barrier and potential ally. As one CMS supplier summarized it:

"They aren't in the decision to go with chemical management, but they can be a stumbling block if their concerns aren't addressed."

Financial personnel are usually involved in putting into practice the unique financial arrangements of a CMS program. Since chemicals are no longer purchased by individual departments, a new method of allocating CMS program costs across the departments must be developed. This has been a significant problem in several plants. At one plant, during final CMS program contract negotiations, the financial representative said that implementing CMS was not possible because he did not know how to integrate it into the plant's accounting process. Only the intervention of a politically powerful purchasing manager allowed the program able to go forward. At another plant, the accounting process allocated program costs to each department based on estimated chemicals use. However, initial program efforts benefited only a few departments. Objections from departments that were allocated CMS program costs, yet received few benefits, threatened to kill the program during its first year of operation.

It is clear that involving plant financial personnel early in the process can help avoid many of these problems. The comments of two suppliers summarize this point:

"Whether it's the controller or the CFO or the accountant - any time we have had this person on board from the beginning it's been a much smoother transition."

"What is lacking in almost any company we go into, it seems that the financial people get left out. If they can get on the committee and give it their blessing, it's best."

However, financial management can also become a champion for CMS. The rationale is that, as with corporate and plant management, financial managers see the "big picture" in terms of overall benefits to the plant. Small increases in cost in one area are not a problem if they are offset by large savings elsewhere. Thus, financial managers can recognize and evaluate the overall benefits of CMS to the plant and help distribute costs and benefits so as to minimize resistance from business units that may see increased costs. One supplier explains:

"I think they can become an ally, because they are one of the few people who see the total cost. When you start talking about reduction of purchase orders and purchases req's, reduction of inventory carrying costs or inventory movement in your plant, they understand that. They understand the cost of inventory, the cost of money. They are the ones that are always pushing for it, as opposed to pushing against it."

Table 7-16. Promising channels for reaching financial managers (in addition to those for reaching corporate managers).

Print media

- CFO
- Business Finance

Web sites

- cfonet.com
- businessfinancemag.com
- accounting.software-directory.com

Conferences

- See all above web sites

Most of the journals and web sites of interest are the same as those of interest to corporate management (see section 7.1.3.). However, there are some journals and websites that provide information and resources specifically for financial managers (see Table 7-16).

7.7. Conclusions

Adoption of CMS requires acceptance by management, purchasing, EHS, and a variety of chemical users. This means that CMS must be sold to each of these stakeholder groups on their own terms. It is necessary to understand the conditions in which each stakeholder group works, their priority needs and concerns, how CMS can address those priorities, and through what marketing channels they can be reached.

Marketing materials must be developed that can be used by a company's early CMS "champions" to market CMS internally. These must be readily available (such as through the World Wide Web), and, most importantly, targeted to each stakeholder group.

In addition, a comprehensive marketing program for CMS is needed, addressing each of the stakeholder groups. The goal is not only to increase the number of CMS champions, but also to favorably dispose all stakeholders to CMS thereby easing the process of "internal marketing."

At a minimum, this should involve:

- advertising in print media
- advertising on the World Wide Web
- exhibiting at trade shows and conferences
- presenting case studies at trade shows and conferences
- publishing case studies in print media and World Wide Web
- creating news events with market allies

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Appendix

Estimating the Potential CMS Market

As discussed in Part 1 of this report, the primary source of revenue in CMS accounts is the displacement of a customer's specialty chemical purchase expenses. CMS customers are generally unwilling to pay significantly more than past chemical expenditures, even though they usually get significantly greater value in a CMS program. Based upon our interviews with CMS suppliers, we estimate that payments for reducing a customer's chemical management costs (costs other than chemical purchase expenses) probably contribute no more than about 10% additional revenue to the supplier. This is often accomplished through "gainsharing" opportunities in the CMS contract.

We examine the size of the potential CMS market in six steps:

- 1) The current U.S. specialty chemical market.
- 2) The proportion of the U.S. specialty market most amenable to CMS.
- 3) The proportion of the market in large-volume accounts.
- 4) Additional revenue from other chemical management savings.
- 5) The international market
- 6) Other growth opportunities

For our estimate of the size of the current U.S. market for specialty chemicals, we use an estimate by SRI Consultants as reported in *Purchasing* magazine in 1999 (see Table A-1). The data indicate a market of over \$90 billion.

However, not all specialty chemicals are readily amenable to CMS as currently practiced. Based upon interviews with suppliers, and our own understanding of CMS, we eliminated a number of specialty chemicals from our estimate of the potential CMS market (right-hand column in Table A-1). This includes elimination of the top three specialty chemicals - bulk medicinal chemicals, pesticides, and specialty polymers. While there is nothing that specifically prohibits the application of CMS to these chemicals, or the other chemicals we excluded from our estimate, a number of factors present barriers. For example, the primary customer for pesticides, farmers, are very different from the typical CMS customer and will probably require a very different kind of CMS program. For many other chemicals (such as medicinals and polymers) the primary customers are either chemical companies or other firms for which chemistry is very close to their core business. Such companies are much less likely to "outsource" chemical management responsibilities.

There is no clear guide to which specialty chemicals will prove amenable to CMS in the coming years. We have chosen to eliminate only those chemicals for which there is reason to believe that current CMS programs would not work. However, the Chemical Strategies Partnership recently completed a market estimate taking the opposite

approach – including only those chemicals for which there is reason to believe that current CMS programs would be successful (Chemical Strategies Partnership, 2000). Their estimate of \$10.5-13 billion agrees reasonably well with our final estimate of about \$14.7 billion for the size of the current chemical market that could be reached by CMS.

Table A-1: U.S. specialty chemical market in 1999 and estimated potential CMS market. (source of specialty chemical market data: SRI Consulting as quoted in Reilly, 1999).

U.S. specialty chemicals (millions of dollars)		
Market segment	Market size in 1999	Amenable to CMS
Bulk medicinal chemicals	11,573	
Pesticides	7,973	
Specialty polymers	6,392	
Industrial cleaners	6,037	6,037
Specialty surfactants	4,626	4,626
Printing inks	4,368	4,368
Food additives	4,319	
Flavors and fragrances	3,896	
Catalysts	3,888	
Specialty ceramics	3,604	
Electronics chemicals	3,366	3,366
Paper chemicals	2,975	2,975
Water-soluble chemicals	2,756	2,756
Auto aftermarket chemicals	2,609	
Oil field chemicals	2,342	2,342
Cosmetics chemicals	2,314	
Plastics additives	2,311	2,311
Water management chemicals	2,199	2,199
Lube oil additives	1,964	1,964
Imaging chemicals	1,856	1,856
Textile chemicals	1,652	1,652
Adhesives and sealants	1,486	1,486
Specialty coatings	1,168	1,168
Biocides	1,124	1,124
Membrane materials	1,075	1,075
Rubber processing chemicals	826	826
Antioxidants	705	705
Synthetic lubricants	677	677
Flame retardants	584	
Corrosion inhibitors	363	363
Mining chemicals	129	129
Total	91,157	44,005

The right-hand column of Table A-1 indicates a potential specialty chemical market of about \$44 billion. However, CMS as currently practiced is applicable primarily for large chemical accounts (greater than about \$1 million). This is because there are substantial economies of scale in the time and effort required to produce significant process efficiency improvements. Based on interviews with suppliers, we estimate that

approximately one-third of specialty chemicals are sold to accounts that exceed \$1 million. This reduces the potential CMS market to about \$14.7 billion. Assuming an additional 10% revenue from gainsharing, this produces an overall estimate of about \$16 billion. Given a current CMS market of about \$0.5 - \$1 billion, current market saturation is only about 3% - 6% - leaving substantial room for growth in the U.S. market.

However, there are many other growth opportunities for CMS. Most important is the international market. Many CMS suppliers currently have foreign CMS accounts, many with the overseas plants of U.S. companies. The worldwide specialty chemical market has been estimated at \$315 billion (Société de Chimie Industrielle, 1999), or about 3.5 times the size of the U.S. market. Applying this simple ratio to the estimated potential U.S. market for CMS produces an estimated potential worldwide CMS market of about \$56 billion. Clearly, the international market potential for CMS is large.

In addition, there are two other potential growth areas for CMS. First, \$29.3 billion in U.S. specialty chemicals were eliminated from our estimates because they were sold to smaller accounts. If CMS can be adapted to become profitable in smaller chemical accounts, some of this market can be tapped. Significant progress in this direction is being made by CMS suppliers for metalworking fluids. Second, over half the specialty chemicals were eliminated from our estimates because of difficulties in applying CMS (medicinals, pesticides, etc.). If CMS can be adapted to these chemicals, substantial new markets would be opened.