

Transition to Chemical Management Services

Opportunities, barriers & drawbacks in a European context

Pranshu Singhal

Supervisors

Oksana Mont

Zinaida Fadeeva

Thesis for the fulfilment of the
Master of Science in Environmental Management and Policy
Lund, Sweden, October 2003

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Published in 2003 by IIIIEE, Lund University, P.O. Box 196, S-221 00 LUND, Sweden,
Tel: +46 – 46 222 02 00, Fax: +46 – 46 222 02 10, e-mail: iiiiee@iiiiee.lu.se.
Printed by KFS AB, Lund.

ISSN 1401-9191

Acknowledgements

I would hereby like to sincerely thank the following people for their valuable input and assistance during the execution of this thesis:

- STINT Foundation for funding my studies and the thesis at IIIIEE.
- Officials from Ashland, ABB, BASF, Castrol, DowCorning, Fuji, Henkel, PPG, Quaker, Rockwood, Shell and STMicroelectronics for sharing their experience on chemical management services with me.
- Dr. Thomas Jakl from Ministry of Environment-Austria, Jennie Oldham from Green Alliance, Dr. Hans Out and Dr. Henrich Van Megen from FECC, Mr. Paul Hodges from International E-chem, Mr. Thomas Votta and Ms. Freda Feng from Tellus Institute and Mr. Greger Lundqvist from Swedish Plastics and Chemical Association for their valuable insights.
- Researchers, professors, officials from industry associations and policy institutions who assisted me in various surveys.
- My supervisors Oksana Mont and Zinaida Fadeeva who constantly guided and advised me during the course of this work.

I would also like to express my deepest gratitude to all the professors specially Thomas Lindhqvist and Lars Hansson, research and the administrative staff for creating this brilliant atmosphere of learning.

Finally, I would like to thank Niina for her continued moral support and all my colleagues of batch 8 for this great and memorable year at IIIIEE.

Abstract

Chemical Management Services (CMS), an application of Product Service Systems (PSS) in the chemical sector, attempts to optimise chemical consumption patterns. CMS works by changing the fundamental relationship between chemical suppliers and chemical customers and providing incentives to both to reduce the quantity of chemicals used. CMS is gaining increasing popularity as a tool for cost savings and reducing the chemical load on the environment. CMS has a high penetration in the USA, especially in the automobile and semiconductor industry, but the extent to which it is being used in Europe is still not well established.

This thesis culls the benefits that the companies in Europe realise/may realise through the transition to CMS. The barriers faced by the companies as well as the drawbacks they realised after providing or adopting CMS in European countries have also been analysed. The thesis builds upon the experience of 12 companies that supply/buy chemical services and discussions with stakeholders in Europe. Frameworks have been developed, analysed and proposed for use by the companies that desire to implement CMS. The frameworks help to identify the opportunities, barriers and drawbacks related to CMS. The key opportunities related to CMS include competitiveness, enhanced supplier-customer relationships and better management of EHS issues. Existing supplier-customer relationships, which generally lack trust, and hesitation of customers to share process knowledge with suppliers form significant barriers to CMS. No major drawbacks of CMS were identified in this study.

Executive Summary

Optimisation of the patterns of production and consumption is essential to sustainable development. Product-service systems (PSS) provide a new approach for optimising both the production and consumption patterns and facilitate the move towards sustainability. The PSS concept is based on the assumption that customers actually need the function provided by the product rather than the product itself. In a product service system the value of utilisation is recognised i.e. the consumer pays for the utilisation of the product.

Chemicals are used in most of the processes in some or the other way and provide various functions directly or indirectly. The chemical industry has been facing critical concerns owing to the impacts of chemicals on human health and environment. Chemical Management Services (CMS), an application of PSS in the chemical sector, can provide solutions to various environment, health and safety problems by altering the relationship between the suppliers and the customers and realigning the incentives of the suppliers and the customers in a way that they work together towards reducing chemical consumption and achieving better chemical use efficiency.

The core of CMS is the paradigm shift in the focus from selling chemicals as products to selling chemical services that decouples profit from the volume of the chemicals sold. The compensation of the supplier in CMS is based on the service provided rather than the products delivered. CMS brings in the expertise of the supplier for the management of the chemicals. The foundation of CMS is the financial model which provides incentives to both the service provider and the customer.

This research work is built upon the experience of 12 large-scale companies in Europe, which have transited to CMS. CMS has helped all these providers and customers in gaining a competitive edge. CMS providers have gained a competitive edge due to a unique position in the market whereas the customers of CMS have become competitive due to better process efficiency and cost savings. All these companies have also identified enhancing of supplier-customer relationships as an important outcome of providing/adopting CMS. Enhanced relationship has helped suppliers to maintain their customer base, and have longer contracts and has assisted customers to better understand the capabilities of their suppliers and lay trust on them.

CMS assists in assuring the stakeholders as companies have better environment performance, face reduced risk at the site and reduce their costs. Many suppliers started providing CMS to meet the customer demand for outsourcing non-core activities like chemical management, whereas other suppliers initiated CMS as they perceived a future market demand for it. CMS has also helped its customers in generating data on chemicals required for legislative purposes and environmental management systems. None of the contacted companies has commented on the identification of total chemical costs as a significant outcome of CMS, though it forms the basis for financial contracts.

CMS has acted as tool for suppliers to take product stewardship and for customers to reduce their environmental impacts and maintain safer working conditions at the site. CMS has also promoted regulatory compliance as the supplier is much competent in managing the chemicals.

The existing relationship between the suppliers and the customers wherein the customers do not lay full trust on the suppliers and maintain secrecy about processes has posed as a significant barrier for suppliers to provide insights on process improvements. Moreover, the purchase department of the customers does not generally work in close cooperation with the

quality, maintenance, production, and waste management departments and is, thus, not aware of the real costs related to chemicals. This leads to a situation wherein the purchase department just focuses on the price offered by the suppliers rather than the value added services provided by them. Another important barrier for the CMS providers in Europe is the diversity in legislations, cultures and politics which makes it difficult for suppliers to provide CMS.

There are no significant drawbacks faced by the companies who have transited to CMS. One of the potential drawbacks that may come up and has been anticipated by the chemical users, who plan to transit to CMS is that their chemical providers could become their future competitors. Loss of control over their processes and gradual depletion of the process knowledge is yet another potential drawback for the customers of CMS. Evidence suggests that companies who have outsourced their activities have faced resistance from the workers who agitate as outsourcing poses a risk to their jobs. This agitation by the workers may also take place in the case of CMS. Diminishing of alternative suppliers is another extreme consequence of CMS but none of the customers that have adopted CMS have reported it.

Frameworks have been developed and proposed for the companies to identify the opportunities, barriers and drawbacks of CMS during the course of this work.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION	1
1.1 PROBLEMATISATION.....	1
1.2 RESEARCH OBJECTIVES.....	3
1.3 RESEARCH METHODOLOGY.....	3
1.4 SCOPE	6
1.5 RESEARCH CONTRIBUTION.....	6
2. EUROPEAN CHEMICAL INDUSTRY AND CHEMICAL MANAGEMENT SERVICES	7
2.1 OVERVIEW OF THE EUROPEAN CHEMICAL INDUSTRY	7
2.2 CHEMICAL MANAGEMENT SERVICES.....	8
2.2.1 <i>Need for CMS</i>	8
2.3 TYPES OF CMS CONTRACTS.....	12
2.4 CMS IN EUROPE	13
3. DEVELOPMENT OF A FRAMEWORK FOR ANALYSING OPPORTUNITIES FOR COMPANIES TO PROVIDE/ADOPT CMS	15
3.1 COMPETITIVENESS.....	15
3.2 SUPPLIER-CUSTOMER RELATIONSHIPS	16
3.3 STAKEHOLDER ASSURANCE	16
3.4 MARKET DEMAND FOR OUTSOURCING	17
3.5 VOLUNTARY STANDARDS	17
3.6 REAL CHEMICAL MANAGEMENT COSTS	17
3.7 EHS ISSUES.....	18
3.7.1 <i>Product Stewardship for Suppliers</i>	18
3.7.2 <i>Safe Working Environment & Reduced Risk for Customers</i>	19
3.8 LEGISLATIVE COMPLIANCE.....	19
3.8.1 <i>New EU Chemicals Policy (REACH)</i>	19
4. DEVELOPMENT OF A FRAMEWORK FOR ANALYSING BARRIERS AND DRAWBACKS OF CMS.....	23
4.1 BARRIERS.....	23
4.1.1 <i>Adverse Supplier-Customer Relationships</i>	23
4.1.2 <i>Lack of Communication</i>	23
4.1.3 <i>Lack of Knowledge on Real Costs</i>	23
4.1.4 <i>Secrecy about Processes</i>	23
4.2 DRAWBACKS	24
4.2.1 <i>Competing with Customers</i>	24
4.2.2 <i>Loss of Control & Depletion of Knowledge</i>	24
4.2.3 <i>Resistance from Workers and Lowered Morale</i>	24
4.2.4 <i>Single Sourcing</i>	24
5. CMS APPLICATION IN EUROPE	26
5.1 CASES ON CMS SUPPLIERS IN EUROPE.....	26
5.1.1 <i>Ashland Speciality Chemical Company</i>	26
5.1.2 <i>BASF Coatings AG</i>	27
5.1.3 <i>Castrol</i>	29
5.1.4 <i>Henkel Technologies</i>	30
5.1.5 <i>Quaker Chemical Corporation</i>	33
5.2 CASES ON CMS CUSTOMERS IN EUROPE.....	34
5.2.1 <i>ABB</i>	34

5.2.2	<i>STMicroelectronics</i>	35
5.3	STAKEHOLDER VIEWS ON CMS IN EUROPE	36
5.3.1	<i>European Association of Chemical Distributors (FECC)</i>	36
5.3.2	<i>Green Alliance, UK</i>	37
5.3.3	<i>International E-chem, UK</i>	37
5.3.4	<i>Ministry of Environment, Austria</i>	38
5.3.5	<i>Swedish Plastics and Chemical Association</i>	39
5.4	CONTRAST IN USA AND EUROPE REGARDING CMS.....	41
6.	ANALYSIS	42
6.1	OPPORTUNITIES	42
6.1.1	<i>Competitiveness</i>	42
6.1.2	<i>Supplier-Customer Relationship</i>	44
6.1.3	<i>Stakeholder Assurance</i>	45
6.1.4	<i>Market Demand for Outsourcing</i>	46
6.1.5	<i>Voluntary Standards</i>	46
6.1.6	<i>Real Chemical Management Costs</i>	47
6.1.7	<i>EHS Issues</i>	48
6.1.8	<i>Legislative Compliance</i>	49
6.2	BARRIERS.....	52
6.2.1	<i>Adverse Supplier-Customer Relationships</i>	52
6.2.2	<i>Lack of Communication & Knowledge on Real Costs</i>	52
6.2.3	<i>Secrecy about Processes</i>	52
6.3	DRAWBACKS.....	53
6.3.1	<i>Competing with Customers</i>	53
6.3.2	<i>Loss of Control and Depletion of Knowledge</i>	53
6.3.3	<i>Resistance from Workers and their Lowered Morale</i>	53
6.3.4	<i>Single Sourcing</i>	54
6.4	ADDITIONAL BARRIERS AND DRAWBACKS	54
7.	CONCLUSIONS AND RECOMMENDATIONS	56
	BIBLIOGRAPHY	58
	ABBREVIATIONS	62
	APPENDIX I: QUESTIONNAIRE FOR CHEMICAL MANAGEMENT SERVICE (CMS) CUSTOMERS	63
	APPENDIX II: QUESTIONNAIRE FOR CHEMICAL MANAGEMENT SERVICE (CMS) PROVIDERS	68
	APPENDIX III: LIST OF THE CONTACTED COMPANIES PROVIDING/ADOPTING CMS IN EUROPE	73
	APPENDIX IV: LIST OF INTERVIEWEES	74
	APPENDIX V: STAKEHOLDERS IN THE EUROPEAN CHEMICAL INDUSTRY	75
	APPENDIX VI: ADDITIONAL CASES ON CMS IN EUROPE	77

List of Figures

Figure 1-1: Pathways of chemicals to environment (Royal Commission on Environmental Pollution, 2003)	2
Figure 2-1: European Union is the second largest chemicals producing area in the world (CEFIC, 2002c).....	7
Figure 2-2: Chemical consumption of various sectors in Europe (CEFIC, 2002c).....	8
Figure 2-3: Difference in traditional relationship and CMS model (Chemical Strategies Partnership, 2000).....	9
Figure 2-4: Cost visibility of chemical management (Reiskin et al., 2000)	10
Figure 2-5: Total cost of chemicals in automobile sector (Haas TCM, 2003)	11
Figure 3-1: Framework for analysing reasons for companies to transit to CMS.....	22
Figure 4-1: Framework for analysing barriers and drawbacks related to CMS.....	25
Figure 5-1: Henkel’s service capabilities across the customer’s value chain (Rothwell, 2003b).....	31
Figure 6-1: Good relationship between suppliers and customers fosters competitiveness	45
Figure 6-2: Meeting market demands helps companies to gain competitive edge and enhance relationships	46
Figure 6-3: Following voluntary standards helps in gaining competitiveness, complying with legislations, assuring stakeholders and meeting EHS requirements.....	47
Figure 6-4: Better management of EHS issues helps gaining competitive advantage, meeting legislative requirements and assuring stakeholders.....	49
Figure 6-5: Complying with regulations provides assurance to the stakeholders.....	50
Figure 6-6: Framework to evaluate benefits of CMS.....	51

List of Tables

Table 1-1: Companies contacted regarding CMS.....	5
Table 1-2: Interview guidelines	6
Table 2-1: Shift from the traditional approach of doing business to a CMS approach (Votta, 2003)	9
Table 2-2: Benefits of Chemical Management Services realised by GM	12
Table 2-3: Case study depicting benefits of selling services	12
Table 2-4: Guidelines for designing financial model of CMS	12
Table 3-1: Difference between the present legislation and REACH (European Commission, 2003)	20
Table 5-1: Contrasts in CMS between USA and Europe.....	41
Table 6-1: CMS offers a competitive advantage to suppliers.....	43
Table 6-2: CMS offers a competitive advantage to customers.....	44
Table 6-3: CMS and Supplier/Customer Relationships.....	44
Table 6-4: CMS provides assurance to stakeholders	45
Table 6-5: CMS helps in meeting the market demand for outsourcing.....	46
Table 6-6: CMS assists in meeting requirements of voluntary standards	47
Table 6-7: CMS has helped in managing EHS issues	48
Table 6-8: CMS assists in legislative compliance.....	49
Table 6-9: Adverse supplier/customer relationships are a barrier to CMS.....	52
Table 6-10: Lack of communication & knowledge on real costs are barriers to CMS	52
Table 6-11: Maintaining secrecy about the processes is a barrier to CMS.....	53
Table 6-12: Competition with customers as a drawback to CMS	53
Table 6-13: Lack of control and depletion of knowledge as a barrier rather than drawback to CMS	53
Table 6-14: Resistance from the workers and their lowered morale as a drawback to CMS.....	54
Table 6-15: Other barriers and drawbacks faced by the companies	55

1. Introduction

This chapter discusses the problems in the chemical industry, specifies the research objectives of this study, methodology followed for carrying the research, the scope of the thesis and, states the relevance of this work.

1.1 Problematisation

The aim of sustainable development is to change and optimise the patterns of production and consumption. During the last few decades, the focus of various groups has been on production patterns to solve the environmental concerns but now it is becoming increasingly clear that environmental gains made on the production side are being offset by the increases in consumption. The tie between the profits and sales of goods drives the businesses to produce and sell more which is one of the factors leading to increase in consumption. This research work concentrates on solving some of the environmental problems related to the chemical industry by decoupling the tie between the profits and the volume of chemicals sold.

The chemical industry is very diverse in nature and includes basic chemicals; speciality chemicals derived from basic chemicals; products derived of life sciences; and consumer products. Most of the products from one chemical company are used by other chemical companies or other industries like electronics, metal, automobile etc. The chemical industry produces, uses, and releases thousands of chemicals every year. Chemicals are used in most of the processes in some or the other way and provide various functions directly or indirectly.

The chemical industry has been facing critical concerns owing to the impacts of chemicals on human health and environment. One of the important reasons for these concerns is the continuous increase in the consumption of chemicals. There are countless incidents of significant environmental impacts caused due to the effluent and emission discharges and poor management of chemical wastes. The most disastrous chemical accidents include those at Flixborough-UK in 1974, Seveso-Italy in 1976, Bhopal-India in 1974 and Toulouse-France in 2001. All this has resulted in creating public resentment and problems for the chemical industry.

The image of the European chemical industry had worsened in the year 2002 compared to the year 2000 in accordance with a conducted by the European Chemical Industry Association (CEFIC). The chemical industry stands at the seventh place in overall favourability among eight surveyed industries, ranking only above the nuclear power industry according to results of CEFIC's survey. The rating of the industry also remains low on the issue of social responsibility. The public in Europe believes that the industry should be subjected to stricter legislative control (CEFIC, 2002b).

According to the CEFIC Pan European Survey of 2000 “the public remains critical about the environmental and health risks of chemical products and the chemical industry’s ethical business practices and social responsibilities”. However, the survey also shows that the public recognition of the contributions the industry makes to the quality of life has slightly improved (CEFIC, 2000a).

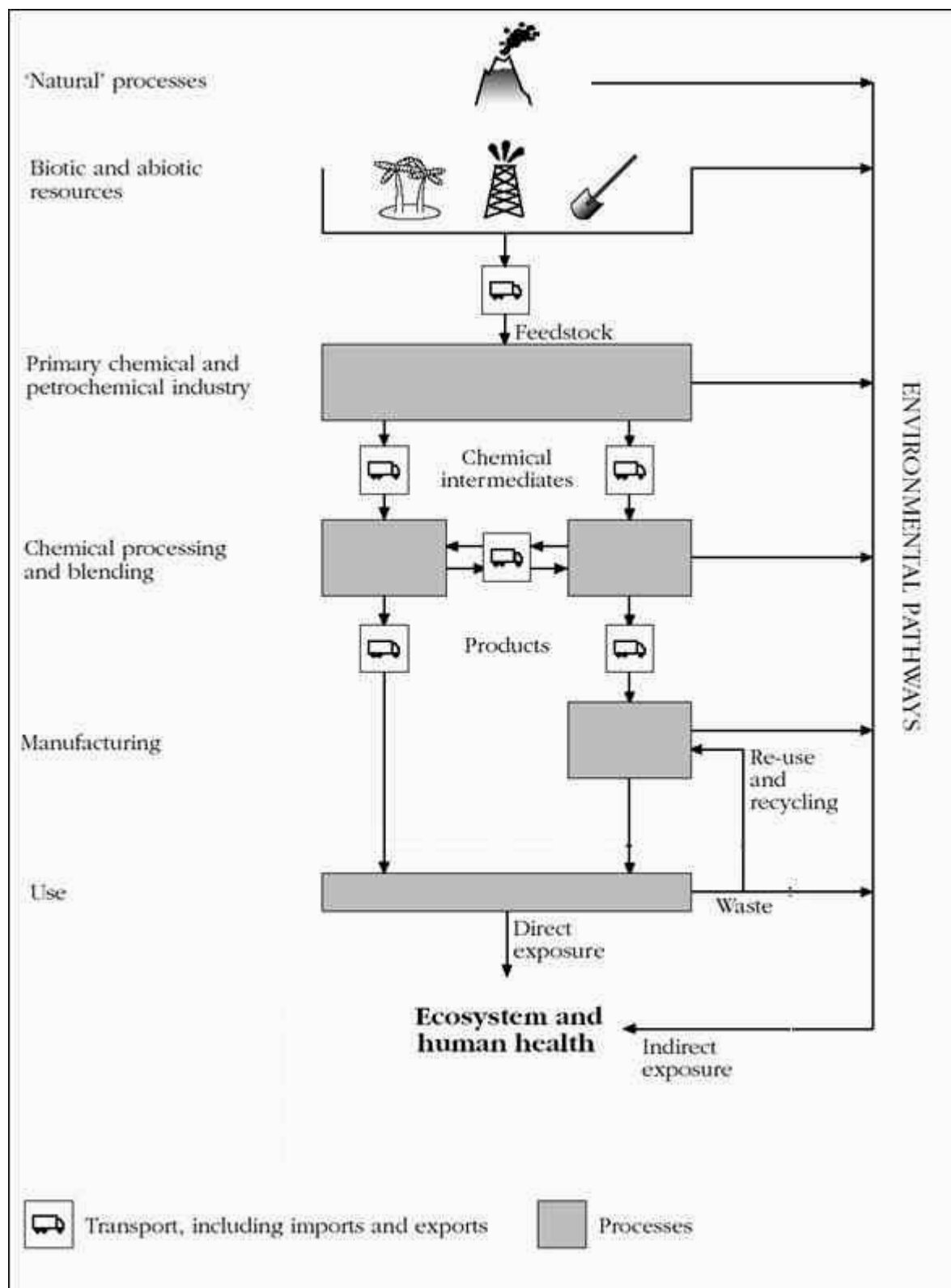


Figure 1-1: Pathways of chemicals to environment (Royal Commission on Environmental Pollution, 2003)

Role of Product Service Systems

Product-service systems (PSS) provide a new approach for changing both the production and consumption patterns and may facilitate the move towards sustainability. “A product-service system is a system of products, services, supporting infrastructure, and networks of actors that is designed to be competitive, accepted by customers and have lower environmental impact than traditional business models” (Mont, 2000).

In a product service system the value of utilisation is recognised i.e. the consumer pays for the utilisation of the product. The concept is based on the assumption that customers actually need the function provided by the product rather than the product itself (Dalhammar, 2002). The focus on function rather than the product shifts the producers’ attention from generating profits by selling more material products to selling added value decoupled from material artefacts. For realising the dematerialisation benefits of PSS, the relationship between the supplier and the customer needs to be changed (Reiskin et al., 2000).

Chemical Management Services (CMS) is an application of PSS in the chemical sector. CMS can provide solutions to various environmental problems by altering the relationships between the suppliers and the customers and realigning the incentives of the suppliers and the customers in a way that they work towards reducing chemical consumption and achieving better efficiency of chemical use. CMS can help reduce the consumption of chemicals and promote safer use of chemicals (Chemical Strategies Partnership, 2000, 2001).

The CMS concept in USA was developed by General Motors in the 1990s (The ENDS Report, 2001b). In the USA, CMS has developed mostly in the automotive, electronics and aerospace sectors where it has penetrated 80% of the market (The ENDS Report, 2001b). The other prominent sector where CMS has extended includes metalworking industry. There are numerous success stories of CMS in USA, which have led to significant cost savings, better compliance, increased competitiveness and safer working conditions to name a few (Chemical Strategies Partnership, 2000). This research work is a step towards understanding CMS in a European context.

1.2 Research Objectives

This research was carried with the objective of finding facts on CMS implementation in Europe. The aim was to get a real picture of CMS and cull the opportunities, barriers and drawbacks related to providing/adopting CMS. This information may be useful for companies who are deciding to either provide or adopt CMS. Research questions which were framed considering the study objective are as follows:

- ☞ What are the reasons and motivations for companies to transit to chemical management services in Europe?
 - What opportunities are usually associated with CMS and were they realised by the companies providing/using chemical management services in Europe?
 - What are the barriers and drawbacks related to CMS in Europe?

1.3 Research Methodology

The research was initiated with the setting up of the research questions and objectives. A literature review was then done with the research questions in focus. The objective of this literature review was to identify the reasons for companies to transit to CMS, benefits realised

by them, and the barriers faced and drawbacks realised by these companies in providing/adopting CMS.

To answer the research questions it was important to contact companies who are either providers or customers of CMS in Europe and learn from their experience. To identify these companies a survey among the stakeholders of the chemical industry was needed. Thus, several stakeholders in the field of CMS who could participate in this survey were identified during the literature review.

A framework was developed using the information gathered in the literature review. This framework was used to design two different questionnaires with the purpose of gathering data from the providers and customers of CMS. This data coupled with interviews, of companies and stakeholders, and information gathered from other sources was analysed to provide answers to the research questions.

The research was carried in the following steps:

1. Literature review was done to identify the opportunities, barriers and drawbacks for companies to transit to CMS. The stakeholders who could help identify the providers and customers of CMS were also identified during the review.
2. A survey was carried with stakeholders to identify providers and customers of CMS in Europe. These stakeholders included representatives from CEFIC (European Chemical Industry Association), FECC (European Association of Chemical Distributors), national chemical industry associations, environment ministries, research institutes, NGOs and major chemical industries in Europe.
3. Several providers and customers of CMS were identified as an outcome of this survey with stakeholders. These identified companies were contacted by phone to verify if they were actually providing/buying CMS. Concurrently, contact persons in these companies were also identified.
4. Frameworks were developed to analyse the opportunities, barriers and drawbacks using the information gathered during literature review. These frameworks were used to design two questionnaires, one for the providers and the other for the customers.
5. These questionnaires were sent out to the identified and contacted group of companies to cull the reasons for companies to transit to CMS and the related barriers and drawbacks. Further to this, interviews were done with some of the companies. The questionnaires that were sent out to the companies are attached in appendix I and appendix II. Appendix III provides the list of companies that replied to the questionnaires. In addition to these listed companies, there were several other companies who had implemented some kind of chemical service models but could not be included in the research.
6. Representatives from several stakeholders active in the field of CMS were interviewed about their perceptions on CMS. Appendix IV specifies the providers, customers, and stakeholders who were interviewed.
7. Cases were developed based on the interviews, available literature and the questionnaire responses from the companies. These cases facilitate the readers'

understanding of the benefits gained, barriers faced and the drawbacks realised by the companies.

8. The opportunities, barriers and drawbacks related to CMS were analysed using the framework developed.
9. The framework was modified to include the relationships between the various components. This modified framework can be used by companies to identify the opportunities related to CMS.

Table 1-1: Companies contacted regarding CMS

Name of Company	Role	Details
Ashland Speciality Chemicals Limited	Supplier	Ashland Speciality Chemical Company is a chemical manufacturing company providing CMS to semiconductor industry through its FAB services division. The company has been providing CMS for more than 14 years.
BASF Coatings AG	Supplier	BASF Coatings AG is a chemical manufacturing company that has been providing CMS to its customers in the car manufacturing industry for the past 13 years.
Castrol	Supplier	Castrol offers both metal working fluid management programme and lubrication management programme, with the aim of delivering customer value through optimising their manufacturing processes and improving productivity. Castrol has been providing chemical services for more than 16 years.
Dow Corning	Supplier	Dow Corning is a chemical manufacturing company which provides chemical services to its clients in addition to products. Dow has been providing chemical services since last year and a half.
Fuji Hunt Photographic Chemicals NV	Supplier	Fuji is a manufacturer, chemical service provider and distributor of photographic chemicals. It provides CMS through a separate division for last 15 years.
Henkel Technologies	Supplier	Henkel Technologies is a chemical manufacturing company providing CMS, as a part of its overall business strategy, since last 14 years.
PPG Industries	Supplier	PPG Industries, a chemical manufacturing company provides CMS through its business unit, Optima Solutions, to the automotive industries. PPG Industries Poland Sp z.o.o has been providing CMS for the last 5 years to an automobile company.
Quaker Chemicals Corporation	Supplier	Quaker Chemical Corporation provides CMS to its customers through its CMS division since last 14 years.
Rockwood	Supplier	Rockwood provides CMS because of the demand from its customers who want to implement CMS. Rockwood is providing CMS for the last few years.
Shell Services	Supplier	Shell is involved in the business of chemicals as a manufacturer, service provider and as a distributor of chemicals. Shell has a separate division, Shell Services, which provides Fluid Management Services (FMS). Shell has been providing FMS for the last 15 years.
ABB	Customer	ABB is buying CMS for some of its sites in Europe for operations involving cleaning.
STMicroelectronics	Customer	STMicroelectronics is a leading semi-conductor company. ST had adopted CMS since long for its operations.

Table 1-2: Interview guidelines

The following interview guidelines were used while interviewing the companies and stakeholders.

- Interviewee’s understanding of CMS.
- Opportunities realised by providing/buying CMS.
- Role of policy in initiating/supporting CMS.
- Barriers faced in implementing CMS.
- Drawbacks related to CMS.

1.4 Scope

The research work has been limited to identification of opportunities, barriers and drawbacks for companies in Europe. Though most of the opportunities identified would also exist for the companies elsewhere around the world, some of them for example, related to legislation may be specific to the European nations. The companies that have been included in this research work are all large scale companies that have multiple facilities in Europe.

The number of the cases on CMS suppliers exceeds the cases on CMS customers for several reasons. Some CMS customers had multiple facilities in Europe and did not have one common supplier for all of these facilities. The suppliers of CMS were also reluctant in disclosing the names of their customers because of confidentiality issues.

1.5 Research Contribution

The research aims to contribute to current level of knowledge in CMS in the following ways:

- ❖ It provides companies with frameworks for identifying the opportunities related to providing/adopting CMS. The frameworks can serve as a tool for informed decision making by the companies.
- ❖ It can encourage companies to go for CMS by providing them with success stories in the European context.
- ❖ It could be used for matchmaking by the companies.

2. European Chemical Industry and Chemical Management Services

2.1 Overview of the European Chemical Industry

Chemical industry is one of the most competitive and successful industries in Europe. It is Europe's third largest industry employing approximately 1.7 million people directly. In addition, approximately 3 million jobs are dependent upon the chemical industry. The turnover of the European chemical industry for the year 2001 was €519 billion (CEFIC, 2002a).

According to a CEFIC report released in 2001, the European Union is the world's leading exporters and importers of chemicals and accounts for more than half of the global trade. Europe comes only next to Asia in the production of chemicals and accounts for 28% of the world's chemical production (CEFIC, 2002c).

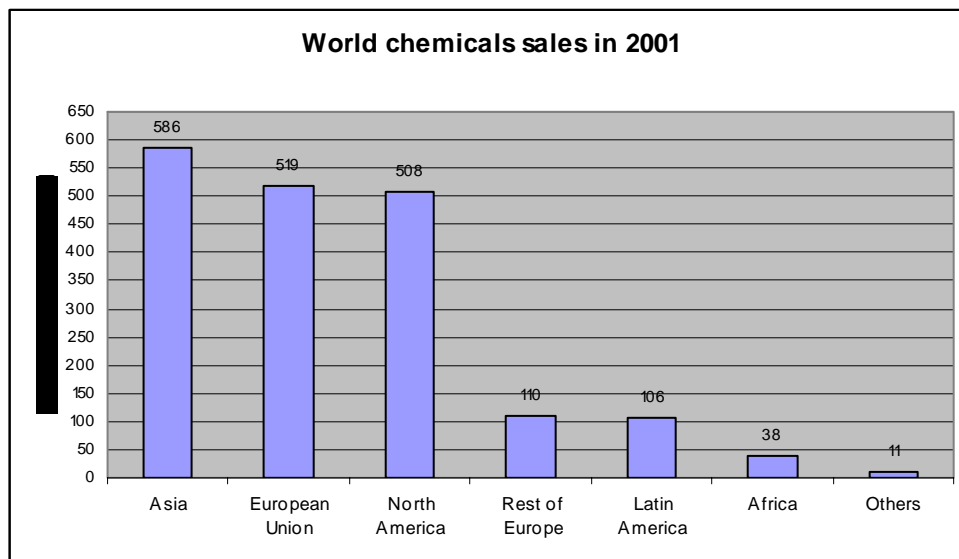


Figure 2-1: European Union is the second largest chemicals producing area in the world (CEFIC, 2002c)

The European chemical industry covers a range of processing and manufacturing activities and supplies to probably all the economic sectors.

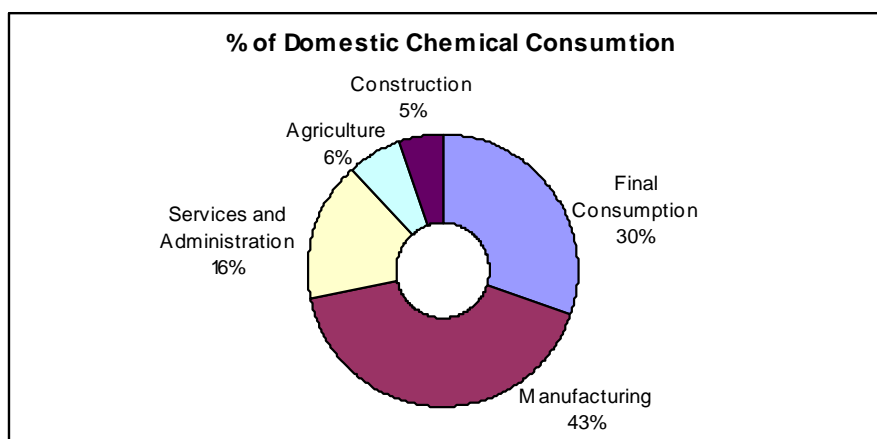


Figure 2-2: Chemical consumption of various sectors in Europe (CEFIC, 2002c)

2.2 Chemical Management Services

CMS is a strategic, long term relationship of the supplier with the customer in which a supplier manages the chemicals and processes at the customer's facility. CMS provides a way for chemical manufacturers to simultaneously reduce the chemical costs and the chemical throughput (Reiskin et al., 2000). The core of CMS is the paradigm shift in the focus from selling chemicals to selling services that decouples profit from the volume of the chemicals sold. CMS combines approaches as Total Chemical Management (TCM)¹, Third Party Logistics (3PL)², and Supply Chain Management (SCM).

2.2.1 Need for CMS

Chemicals are not consumed optimally by the companies using them for the following general reasons:

1. The existence of traditional model of supplier-customer relationship.
2. Lack of knowledge on the real management costs of chemicals.
3. Lack of the requisite expertise with the chemical user.

CMS provides solution to this by altering the traditional relationship between the suppliers and the customers, helping in identification of the real costs and bringing supplier's expertise in the management of chemicals (Votta, 2003).

In the traditional relationship between the customer and the provider, the profits of the provider are based on the volume of the chemicals sold. Elimination or reduction of chemicals may, thus, be in the interest of the chemical user but may harm the interests of the chemical supplier (Johnson, White, Hearne, 1997). The more chemicals a customer buys the more is the profit for the provider. The CMS model works by altering this conflicting relationship between the two parties and creating a win-win situation for both. In CMS, the financial

¹ Total Chemical Management includes all aspects of handling chemicals. It ranges from procurement, analysis, inventory management, delivery to disposal of waste chemicals.

² Third Party Logistics implies that an external supplier manages all or parts of a firm's logistics.

incentives for both parties are realigned in a way that they profit from reducing the chemical consumption, and increasing the process efficiency. The compensation of the supplier is based on the service provided rather than the products delivered (Chemical Strategies Partnership, 2001).

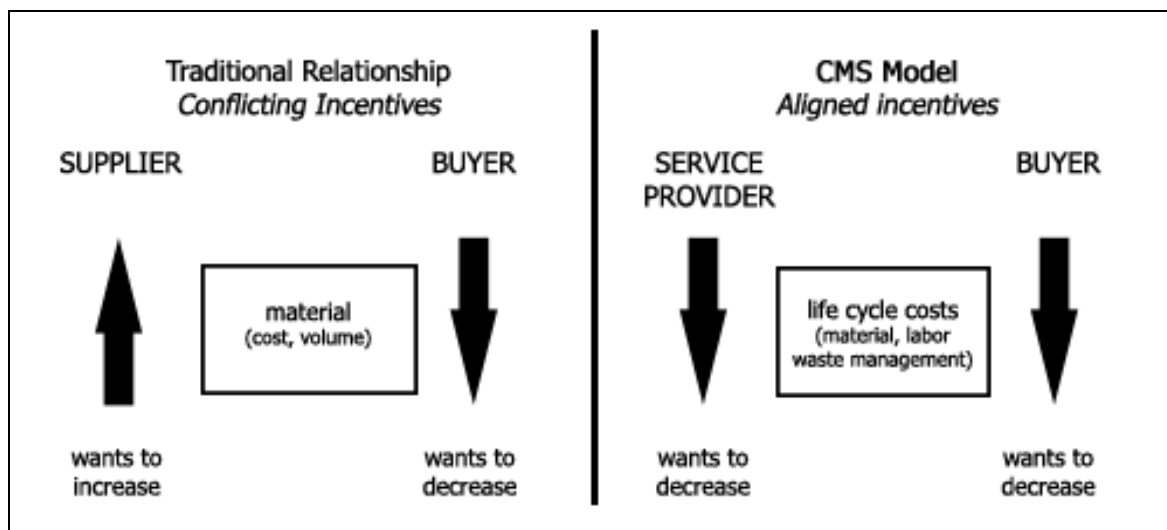


Figure 2-3: Difference in traditional relationship and CMS model (Chemical Strategies Partnership, 2000)

Table 2-1: Shift from the traditional approach of doing business to a CMS approach (Votta, 2003)

<u>Traditional Approach</u>	<u>CMS Approach</u>
Focus on the cost of material	➔ Focus on the lifecycle costs
Costs based on volume	➔ Unit-pricing ³
Discounts based on volume	➔ Shared Savings ⁴
User-driven chemical management	➔ Supplier-driven chemical management
Arms-length negotiation	➔ Partnership approach
Opposed financial incentive	➔ Aligned financial incentives

There are several hidden costs related to chemical use ranging from 1 to 10 times the purchase costs of the chemicals (Chemical Strategies Partnership, 2001). These costs include (Chemical Strategies Partnership, 2001):

- ▲ Procurement costs
- ▲ Inventory costs
- ▲ Delivery costs
- ▲ Regulatory compliance costs

³ Unitpricing: The costs are based on units of service delivered.

⁴ Shared Savings: The savings made at the customer's site by process efficiency, better management, reducing the costs, etc are shared between the customer and the CMS provider

▲ Safety training and emergency preparedness costs

▲ Disposal costs

Significant resources are also spent on tracking and monitoring of the chemical use. Most of the companies do not keep an account of these costs and just consider the purchase costs of the chemicals. By introducing CMS the customers become aware of the real costs of the chemicals which are far more than the purchase costs.

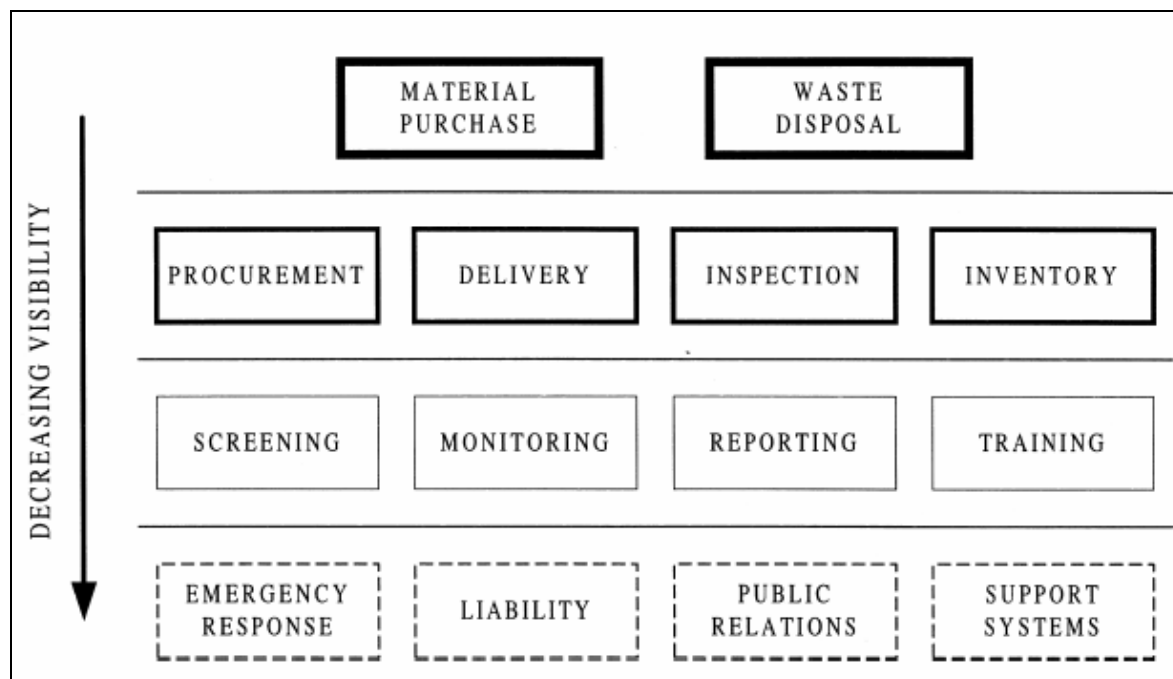


Figure 2-4: Cost visibility of chemical management (Reiskin et al., 2000)

The distribution of various costs related to chemical management for the automobile industry is shown in the following figure.

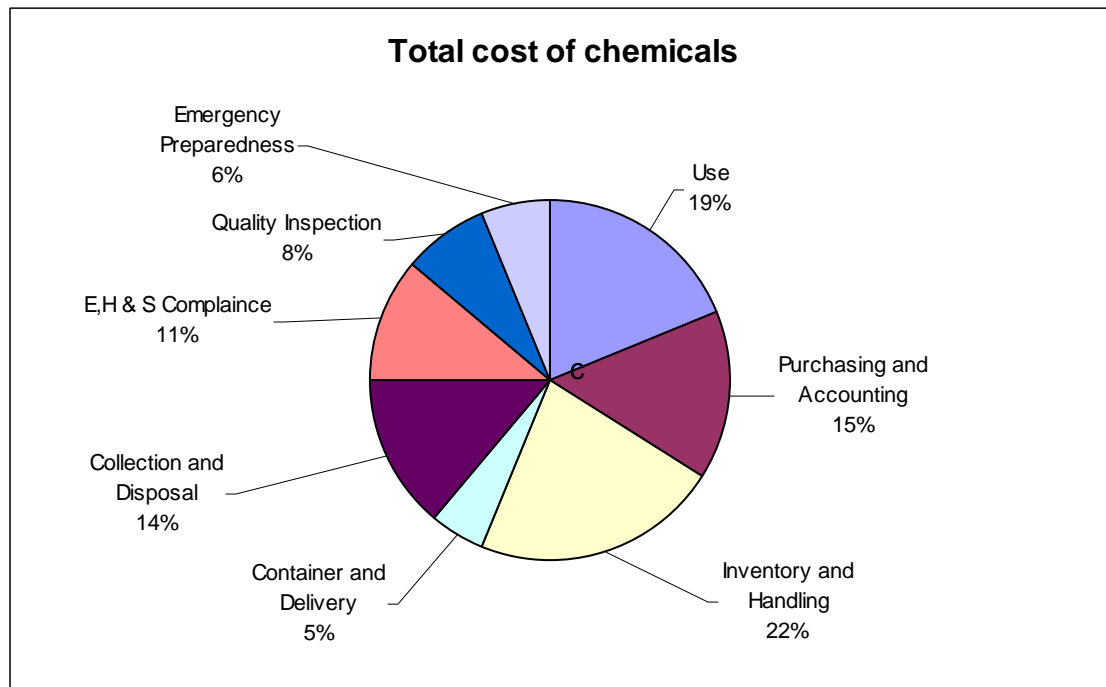


Figure 2-5: Total cost of chemicals in automobile sector (Haas TCM, 2003)

In a CMS program, the service provider takes over the responsibility of performing most or all of the operations related to chemical management. CMS, thus, brings in the expertise of the supplier for the management of the chemicals.

The net savings to a customer from implementing CMS may range from 5% to 25% (The ENDS Report, 2001c). Some of the reasons in addition to monetary savings for companies to adopt CMS are:

- Improvement in productivity of staff which now focuses at its core activities
- Safer working conditions
- Reduction in emissions from the plant
- Reduction in liability
- The expertise of the supplier is brought to use
- Reduction in the number of accidents

Table 2-2: Benefits of Chemical Management Services realised by GM

According to the experience of General Motors, chemical management helps in (Knoblock, 2003):	
<ul style="list-style-type: none"> • Toxic risk management • Process optimization • Non-productive output reduction • ISO 14000 reporting • Material rationalization 	<ul style="list-style-type: none"> • MSDS management • Logistics management for chemicals • Disposal/Recycling management • Environmental reporting • Chemical quality control management

A case study produced by Chalmers Institute of Technology depicts the benefits of selling services (Agri et al., 1999).

Table 2-3: Case study depicting benefits of selling services

<p><u>Selling painting of car instead of selling paint box</u></p> <p>Perceived Benefits</p> <p>For Purchasing:</p> <ul style="list-style-type: none"> - Saves time spent in negotiations as contracts for services are signed for a longer period of time - Motivation to suppliers to perform well - Shared cost savings provide the incentive to the company - Decrease in lead times <p>For Operation:</p> <ul style="list-style-type: none"> - Reduction in the consumption of paints

2.3 Types of CMS Contracts

The foundation of CMS is the financial model, which provides incentives to both the service provider and the customer. The payments in CMS are based on the service delivered rather than the amount of chemicals sold.

Table 2-4: Guidelines for designing financial model of CMS

<p>The design of a CMS is guided by the following concepts (Klocek, 2003):</p> <ul style="list-style-type: none"> - Setting of a cost baseline based on the chemical usage pattern and correlated to plant production - Chemical costs based on a pass-through so that the chemical manager has no financial incentive in selling more chemicals - Establishment of a budget and agreement on the level of target savings - Sharing of savings below the agreed chemical budget - Management fees to cover the cost of on-site personnel and the services provided. The chemical manager is a fixed fee for the services provided.

There are several kinds of CMS contracts. The common ways of contracting include:

- A limit is put on the annual purchase costs of chemicals used at the customer's site and guarantee is made for cost reduction over the time of the contract by the supplier. The cost reductions generally lie in the range of 3-5% and take place in a typical time span of 3-5 years (The ENDS Report, 2001a).
- The customer pays the service provider a fixed fee after defining the scope of the work. When the customer pays a fixed fee for a defined work, there is a direct incentive for the service provider to reduce the amount of chemicals being used for that work to reduce his costs.
- Shared savings is another contractual mechanism which entails sharing of the savings, between the provider and the customer, made at the customer's site by the service provider (The ENDS Report, 2001a). The shared savings model gives the provider incentives to improve process efficiency, reduce the chemicals consumption and the price of the chemicals (Reiskin et al., 2000; The ENDS Report, 2001c).
- In some contracts the provider gets a fixed price per unit of function performed like price per painted car (The ENDS Report, 2001a). This gives an incentive to the service provider to carry the work efficiently.

In some contracts incentives for environmental improvements like lowering emissions, substitution by non-hazardous chemicals and reduction in chemical consumption are included. The CMS providers in some contracts are also rewarded with a portion of the financial savings from reductions in the unit price of chemicals.

Generally, two to three kinds of compensation mechanisms are being followed by companies in the field of CMS the most prominent being management fees and shared cost savings (Chemical Strategies Partnership, 2000).

2.4 CMS in Europe

CMS is not as widely present in Europe as in USA according to the available literature (James, Hopkinson, 2002). The main reasons for this include the absence of strict liability regimes and regulations. Moreover, there are no institutions like Chemical Strategies Partnership or Tellus Institute who can play an active role in moving the concept forward and help in marrying the suppliers and the customers (James, Hopkinson, 2002).

Contrary to this claim made by various organisations, the Chemical Industrial Association (CIA), UK states that CMS is not a new concept for the chemical industry in the United Kingdom (The ENDS Report, 2002). According to some chemical manufacturing/using companies, CMS has been present in Europe for a long time and there are many companies that either provide or utilize CMS (Droulez, 2003; McConachie, 2003a; Rothwell, 2003a).

In UK, an environmental NGO called Green Alliance is campaigning to kick start the work on CMS. BP, Castrol and PPG have been given funds by the UK government to do pilot projects of CMS (The ENDS Report, 2003). The government of UK is strongly supporting the concept as it estimates several benefits out of the programme (The ENDS Report, 2002).

Royal commission on environmental pollution, UK in its twenty-fourth report has also laid emphasis on CMS. It has recommended that promotion of CMS in appropriate sectors should be one of the functions of a central unit on chemicals (Royal Commission on Environmental Pollution, 2003).

The Ministry of Environment, Austria is promoting “Chemical Leasing” model in the Austrian chemical industry. The underlying concept behind chemical leasing is that the chemical company provides a chemical for specific use, but keeps the ownership, advises the customer on the chemical usage, takes the chemical back after it has been used and recycles/disposes it. The overall potential of the chemical leasing model in Austria amounts to an annual input of approximately 153 000 tons of chemical substances and approximately 3900 relevant companies. It has been estimated that there is a potential of reducing approximately one-third of the chemicals presently being used having an economic potential of € 24 million (Ecotec/Institute for Industrial Ecology, 2002). Austrian government is working to put CMS on EU’s policy agenda and is hosting an OECD conference in November, 2003.

An environmental NGO, Friends of the Earth (FOE) claims that though the initiative of CMS is good and needs a strong regulatory environment to be promulgated in Europe (The ENDS Report, 2001b).

3. Development of a Framework for Analysing Opportunities for Companies to Provide/Adopt CMS

In this chapter, various opportunities have been identified from the literature which companies that provide or adopt CMS may realise. The literature reviewed included research work done by Chemical Strategies Partnership and Tellus Institute of USA, research on applications of PSS, state of the European chemical industry and the existing structures and the influencing regulations. A framework has been developed using this information for analysing reasons for companies to transit to CMS. This framework shall be later modified, if required, during the course of analysis.

There are several reasons which the literature acknowledges for companies to shift to CMS. These include competitiveness, better relationships, compliance with regulations, management of EHS issues etc. In this chapter all these reasons have been analysed in detail and used for development of the framework.

3.1 Competitiveness

A strategically competitive company is the one that improves its operational effectiveness by increasing its resource productivity and making itself unique in its activities. Competitive advantage is classified into two types: Lower costs than rivals or ability to differentiate and get a premium price that exceeds the costs (Porter, 1991).

Resource Productivity/Operational Effectiveness: Competitive advantage resulting from a company's ability to perform its activities at a lower cost depends on its operational effectiveness. Operational effectiveness means performing similar activities better than the competitors. It can be achieved by better efficiency which may lead to costs reduction or numerous other ways like reducing the number of defected products by which the company increases its productivity (Porter, 1996).

Chemical Management Services lead to better resource productivity due to improved efficiencies and lower costs (Chemical Strategies Partnership, 2000). According to the CSP Industry Report, the customers of CMS have reported net savings of 5 to 25% a year most of them emerging from the reductions in the chemical lifecycle costs. This can lead both the customers of CMS to have better operational effectiveness leading to a competitive edge.

Strategic Positioning/Differentiation: "A company can outperform its rivals only if it can establish a difference that it can preserve" (Porter, 1996). The second way of gaining competitive advantage is to perform activities in a unique way that create a buyer value and allow the firm to charge a higher price (Porter, 1991). Strategic positioning is all about doing the activities in a different way than the competitors or doing different activities.

The position that a company occupies due to differentiation can be based on the needs of the customer (need-based positioning), customers' accessibility (access-based positioning) or the variety of products or services provided by the company (variety-based positioning) (Porter, 1996). Competition in strategy is about identifying new positions that would draw existing customers from their established positions or would draw new customers to the market. "*Positioning is a function of the supply side*", thus a supplier should identify some unique activities for himself in order to attract customers (Porter, 1996).

CMS gives the suppliers an opportunity to establish a unique position for themselves and offer a unique set of product-service to their customers. The CMS providers have reported profit margins ranging from 5-30% in which half of the profits have been derived from service rather than selling chemicals (Chemical Strategies Partnership, 2000).

Strategic fit: The positioning of a company in the market also determines how the individual activities will be carried in a company and what the relationship between them will be. A fit among the various activities binds the strategy and makes it difficult to imitate an organisation's strategy (Porter, 1996). The linkages between these activities can even extend outside the company to its suppliers and buyers.

In CMS, the special arrangements and relationships between the supplier and the user act as a fit/linkage which make strategy difficult to imitate.

3.2 Supplier-Customer Relationships

In the chemical business the firms that have adopted demand-driven supply chain processes have made significant improvements in performance and profits. The most favourable strategy in the chemical business is to focus on achieving excellence in supply chain. Evidence suggests that demand-driven supply chain excellence has allowed companies to make significant profits. Supply chain excellence requires firms to work closely with their customers and understand their demand (Langabeer, Joshi, 2001).

When a supplier is extensively involved in operations of its clients he has a better understanding of the needs, requirements, and conditions. This enhances the suppliers ability to quickly adapt to the changes in the customer's requirements (Mattson, 1995).

Selling services brings the supplier and customer closer to each other and facilitates the collection of market information. This enables the management to react in a smaller duration. Closer relationships also help to increase the sales (Buttle F, 1996).

Literature suggests that CMS improves the supplier/customer relationships significantly and brings in more of confidence and loyalty (Chemical Strategies Partnership, 2002; Reiskin et al., 2000; Stoughton, Votta, 2003).

3.3 Stakeholder Assurance

CMS helps industry to increase profits, reduce chemical consumption, lower emissions, ensure safer working conditions, have proper disposal of chemicals and be responsible for the life cycle of the chemicals. All these benefits may help assure the stakeholders about the environmental performance of the providers as well as the customers of CMS.

The community is assured about better environmental conditions and lowered risks of incidents/accidents. The chemical associations and the policy makers are assured about the environmental improvements in the chemical industry. The workers in the facility are assured because of safer working conditions. The shareholders of the company are assured about the growth of the company and the raise in the revenues. Some of the most important stakeholders in the European chemical industry along with their roles are specified in appendix V.

3.4 Market Demand for Outsourcing

“The activities or functions which do not represent the essence of the objective of the company should be contracted to others” (Drucker, 1989).

The main trends which have been influential since the 1990s and have led companies to change to new strategies are flexibility, focus, partnership, competitiveness and quality (Pagnoncelli, 1993). Two central qualities which various authors have deemed to be the most important among these are flexibility and focus (Kanter, 1990). Outsourcing is a way to make the companies more flexible in their approach and focussed on their core activities as it is difficult for a company to develop competence in each and every activity that they do. For competitive reasons, the companies are following the trend of outsourcing some of the non-core activities, to the suppliers who can produce at a lower cost or provide better quality of job (Agri et al., 1999).

Outsourcing has increasingly gained popularity as a way to reduce costs and gain competitive advantage. The main thinking behind outsourcing is that it is difficult to perform all activities as productively as specialists (Porter, 1996). Outsourcing helps the companies to commit themselves and their outsourcing partners to their core work.

According to an estimate from the Outsourcing Institute, the companies are saving 9% on costs and a 15% increase in the production and quality by outsourcing (Elmuti, Kathawala, Monippallil, 1998). The companies have increasingly found that they are able to cut costs and provide quality by using service providers (Elmuti, Kathawala, Monippallil, 1998). Outsourcing requires having a good relationship with the suppliers and to share responsibility for decision making (Monczka, Morgan, 2000).

The growing demand in the market for outsourcing applies to chemicals as well. Chemical companies are providing value added packages to demanding customers who want to concentrate on their core competencies rather than chemical management (Global Environmental Management Initiative, 2001). The companies using chemicals in their processes tend to increase their resource productivity by concentrating on their core competence and outsourcing management of chemicals.

3.5 Voluntary Standards

The customers to CMS gain environmental benefits such as lower emissions, reduced risk, reduced amount of wastes, better data for reporting etc. These benefits help in meeting the requirements of various voluntary standards. CMS specifically helps to gather data required for the implementation of Environmental Management System (EMS) in accordance with ISO 14001 and Eco-Management and Audit Scheme (EMAS). CMS also helps to meet the environmental objectives and targets set under EMS.

3.6 Real Chemical Management Costs

Chemical users are generally unaware of the total costs incurred on the management of chemicals at their own site. The only cost identified by the chemical users is the cost of the chemical purchase. There are other significantly high costs related to the management of the chemicals. For each dollar that the chemical user spends for purchasing a chemical, he spends an additional of a minimum one dollar and as many as ten on the subsequent stages of managing chemicals (Stoughton, Votta, 2003). This cost results from the delivery, inventory

management, compliance, training of the workers and disposal of the chemicals (Chemical Strategies Partnership, 2001).

CMS helps in the identification of the real costs related to chemical management.

3.7 EHS Issues

“There is a potential for a negative impact at every stage of chemical production and product use” (OECD, 2001).

For the chemical manufacturers, CMS provides an opportunity to take stewardship of their chemicals while for chemical users CMS provides a way to tackle issues related to environment, health and safety in their facility.

3.7.1 Product Stewardship for Suppliers

“Product Stewardship is the responsible and ethical management of the health, safety and environmental aspects of a product throughout its total life cycle. Product Stewardship is Responsible Care applied to products”⁵.

Chemical Industry faces multiple issues related to safety, health and environment. Product stewardship means that the chemical manufacturers take the responsibility for the entire life cycle of the chemicals right from the stage of raw material procurement to the disposal of waste chemicals. Product stewardship also gives the responsibility to the producers to understand all the possible applications of their products so that all necessary controls can be put in place. It promotes cooperation and discussion along the supply chain on the issues of safe storage, transportation, usage, disposal of products and ways to deal with emergencies. It also helps in meeting regulatory compliance and helps meet stakeholder expectations (CEFIC, 2000b).

According to CEFIC, product stewardship has been one of the important requirements of Responsible Care which has not yet been fully implemented by the chemical industry. CEFIC wants all of its members to put in programs for product stewardship. A healthy relationship between the supplier and the customer is considered essential for implementing product stewardship (CEFIC, 2000b; Jackson).

Many multinationals in Europe as well as several national chemical associations want to go beyond the requirements of the responsible care as the general image of the European chemical industry among the population is poor. A continually growing group of large European chemical manufacturers are claiming that they need to look beyond Responsible care to sustainability concerns. The Chemical Industries Association (CIA) of UK has updated its guidance for Responsible Care and has put a major focus on product stewardship. Product stewardship programs are generally difficult to implement as they pose problems like preventing customers from misusing the product. CMS can help on the issue of product stewardship as the company providing CMS takes care of the life cycle of the chemicals.

The costumers in the market are also moving towards suppliers who are providing environmentally benign products and services. The development of CMS also relates to the concept of the Extended Product Responsibility (Habicht). Some chemical companies have

⁵ CEFIC's definition of product stewardship.

used solvent leasing services, a concept similar to CMS to hold responsibility for their products. By providing CMS, the chemical manufacturers provide services which help in reducing the environmental load on the environment.

Moreover, the users of chemicals for example the semiconductor and automobile industries have their own goals to reduce the amount of chemicals they use for manufacturing products. Adopting CMS helps these industries to make products which are much environmentally friendlier as they consume lesser amount of chemicals during their manufacturing stage.

3.7.2 Safe Working Environment and Reduced Risk for Customers

The chemical customers want to reduce the volume of chemicals used at their site so as to avoid environment and health related problems (James, Hopkinson, 2002). When the chemicals are used in a facility, the workers handling them are also required to through some special training and require proper safety equipments.

A CMS provider takes the responsibility of all the tasks related to the management of environment, health and safety issues thus reducing the responsibility of the customer.

3.8 Legislative Compliance

“Chemical management services are both a response to existing regulation and an attempt to head off further regulation” (James, Hopkinson, 2002).

The legislation requires a range of information about the chemicals related to their usage, disposal, concentration in the environment and the emission levels to name just a few. The CMS serves the purpose of meeting existing regulations, both for suppliers and customers, and attempts to tackle the upcoming legislation (James, Hopkinson, 2002; Stoughton, Votta, 2003). The new EU chemicals directive is deemed important as it may serve as a new driver for CMS in Europe (Jakl, 2003a; James, Hopkinson, 2002).

The countries in Europe have different levels of environmental regulation. The environment standards in Austria for instance are very high. For the Swedish Chemical Association the issue of transportation and distribution is very important (Milmo, 2002). Thus, specific regulatory requirements which may be met by following CMS have not been accounted in this research. However, the EU chemicals policy has been looked in detail with regards to CMS.

3.8.1 New EU Chemicals Policy (REACH)

In February 2000, the European Union published the White Paper which proposed a new chemicals policy. Following this, DG Enterprise and DG Environment of European Commission published the draft new chemicals regulation in May, 2003 for public consultation. The present system of evaluation and control of risks from existing chemicals⁶ is carried out under Council Regulation 793/93 (European Council, 1983) and the evaluation and control of risks from new chemicals⁷ is carried under the directive 67/548 (European Council, 1967). The regulation of existing and new chemicals differs presently. The existing

⁶ Existing chemicals are those listed in the European Inventory of Existing Commercial Chemical Substances (EINECS). EINECS contains substances reported to the European community before September 18, 1981.

⁷ New chemical substances are those listed in the European List of Notified Chemical Substances (ELINCS). ELINCS contains substances introduced to the EU market after September 18, 1981.

substances which account for 99% of the production volume are not subjected to the same testing requirements as new chemicals (Rogers, 2003).

The new EU Chemicals Policy lays a greater onus on the industry and mandates the availability of information on the hazards, risk and risk reduction measures. Of the several objectives of the new chemicals policy are included objectives of “Increased transparency” and “Protection of human health”.

Table 3-1: Difference between the present legislation and REACH (European Commission, 2003)

Present System	REACH
Public authorities are required to identify and address possible safety issues for the chemicals on the market.	Industry is required to take the responsibility of assessing the risks of chemicals and to take appropriate measures for reducing risk
Public authorities perform comprehensive risk assessments	Industry has to assess the safety of the anticipated uses prior to manufacturing and marketing the chemical
It is relatively costly to bring a new substance to the market	Innovation of safer substances shall be encouraged under REACH

Increased transparency & Information Flow: In the draft of the new EU Chemicals Policy there is a requirement for the manufacturer to register the information on “uses for which the substance is intended and information on whether/how it may come into contact with people and/or the environment (known as the exposure scenario)”. The new policy requires a statement on how the producers or users are managing the risks associated with the use(s) of the chemicals (European Commission, 2003).

REACH will require transparency and shall make the information, required by the downstream users, workers, consumers, available. The downstream users⁸ will also be able to receive more information on the safety of the chemicals purchased by better MSDS and labelling systems (Rogers, 2003).

The downstream users are required to provide information about the safe usage of their products to the customers. In case, the downstream user uses a chemical in way not covered under the registered purposes then he has to report this usage to the Agency⁹ (European Commission, 2003).

The CMS model fits extremely well with the requirements mentioned in the draft of the new chemicals policy (Jakl, 2003a). CMS promotes closer relationships between the supplier and the customer which is essential for the flow of information in the chemical supply chain.

Disappearance of Chemicals: There is fear among the chemical users that many chemicals will disappear from the market as it would not make economic sense to get them registered (European Commission, 2003). The findings of CEFIC with regard to the business impacts of

⁸ REACH defines downstream users as those who make industrial or professional use of chemicals and encompasses users who make preparations by preparing chemicals, use preparations to make articles or use the chemicals for other purpose like cleaning.

⁹ The Agency will serve as a central point for the REACH system. It will be funded primarily through the fees charged for registrations and authorisations.

the New Chemicals Policy include the DOMINO¹⁰ effect on the formulation industry. It has been estimated that the electronics, automotive, textiles and plastics and rubber transformation industry will have the greatest impact which may require them to make changes in their processes.

Various studies, which have been done to identify the business impacts of REACH, have identified that the major impacts in the chemical industry and downstream shall happen due to the de-selection of chemical substances (CEFIC, 2003). According to the European semiconductor association there can be issues regarding the availability of the chemicals along the supply chain.

In case some of the chemicals disappear, after the new EU chemicals policy come in force, the CMS provider who is involved in the chemical processes at the customer's site can assist the customer in identifying the appropriate alternatives.

Based on the above mentioned factors, a framework has been developed to identify reasons for companies in Europe to provide/adopt CMS. The framework shows the possible opportunities which the companies can realise after transiting to CMS. The framework will be later used for analysis.

¹⁰ The disappearance of one chemical will trigger a series of many chemicals disappearing down the chain as this chemical may be required to manufacture another chemical(s) which subsequently may be used for producing another chemical(s).

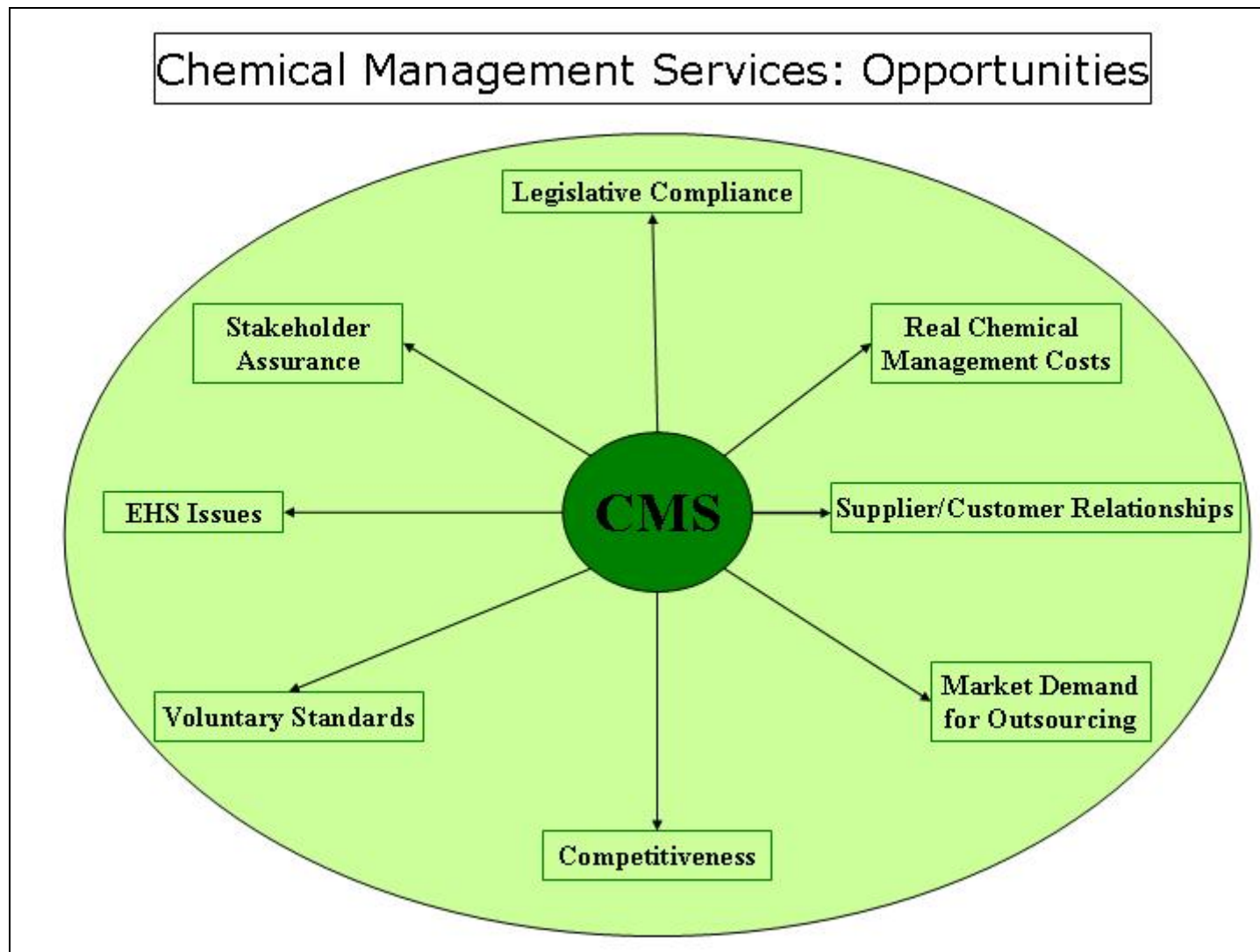


Figure 3-1: Framework for analysing reasons for companies to transit to CMS

4. Development of a Framework for Analysing Barriers and Drawbacks of CMS

This section identifies various barriers faced and drawbacks realised by the companies from the existing literature on CMS. The constraints/fears faced by the companies before providing/adopting CMS have been termed as barriers whereas the term drawback has been used for the disadvantages realised by the companies after they transit to CMS. Barriers and drawbacks overlap in a sense that some of the barriers perceived by the companies before transiting to CMS convert to drawbacks after transiting to CMS.

4.1 Barriers

4.1.1 Adverse Supplier-Customer Relationships

Selling services requires establishment of a long-term relationship which is essential for the cooperation between the supplier and the buyer of the function.

A significant barrier to the establishment of CMS is to change the existing adverse relationship between the supplier and the customer to a partnership approach based on mutual trust and confidence (The ENDS Report, 2001b). CMS requires essential cooperation and confidence between the supplier and the customer (The ENDS Report, 2001c).

4.1.2 Lack of Communication

Purchase managers generally focus on the price at which a material is purchased rather than the total costs related including handling and management. This acts as a significant barrier for the service provider as the purchase managers do not appreciate the higher costs attributed to services. The task of implementing CMS requires establishment of close communication between the purchasing department, materials management, production department and waste management.

4.1.3 Lack of Knowledge on Real Costs

Chemicals are small percentage of the total operating costs. The customer should be aware of the real costs in order to appreciate the value of a supplier taking more responsibility. The lack of knowledge about the real costs of handling and managing chemicals makes the customers ignorant of the benefits related to CMS and acts as a barrier.

4.1.4 Secrecy about Processes

The customers in some sectors like semiconductor, automobile are secretive about their processes and chemical usage (Kollins, Bechler, 1999). These companies face the fear of losing their competitive edge and control by sharing their process knowledge with the CMS provider. This acts as a barrier for the suppliers to provide chemical services to them.

4.2 Drawbacks

4.2.1 Competing with Customers

Selling a function may lead to a situation where the supplier may have to compete with his immediate customers (Agri et al., 1999). This may happen because the supplier develops competence in the processes of his customers. This might be a drawback for the CMS customers as there is an increase in the number of his competitors.

4.2.2 Loss of Control & Depletion of Knowledge

Outsourcing can reduce the control of a company over the activity (Elmuti, Kathawala, Monippallil, 1998). Companies buying services face the risk of depletion of knowledge and loss of competence in the function/process outsourced.

4.2.3 Resistance from Workers and Lowered Morale

Companies that outsource face resistance from the workers and unions as they fear that it will ultimately lead to loss of jobs. Outsourcing can also lead to reduction in the morale of the workers as it creates the fear of the loss of jobs. Outsourcing could imply that the labour may have to shift to the suppliers or may have to loose the jobs (Elmuti, Kathawala, Monippallil, 1998). Companies adapting CMS may face resistance from workers because of similar reasons. Outsourcing can also lead to the reduction in workers' morale as it may create a fear of loss of jobs among the work force (Elmuti, Kathawala, Monippallil, 1998).

4.2.4 Single Sourcing

Single sourcing could hinder the competition between the supply and demand (The ENDS Report, 2001b). As the company buys services from one supplier, it makes it difficult for other suppliers to compete which ultimately results in the diminishing of alternatives. This is a potential drawback for the chemical user as there are no alternate suppliers.

Based on these barriers and drawbacks a framework has been developed which is used later for analysis.

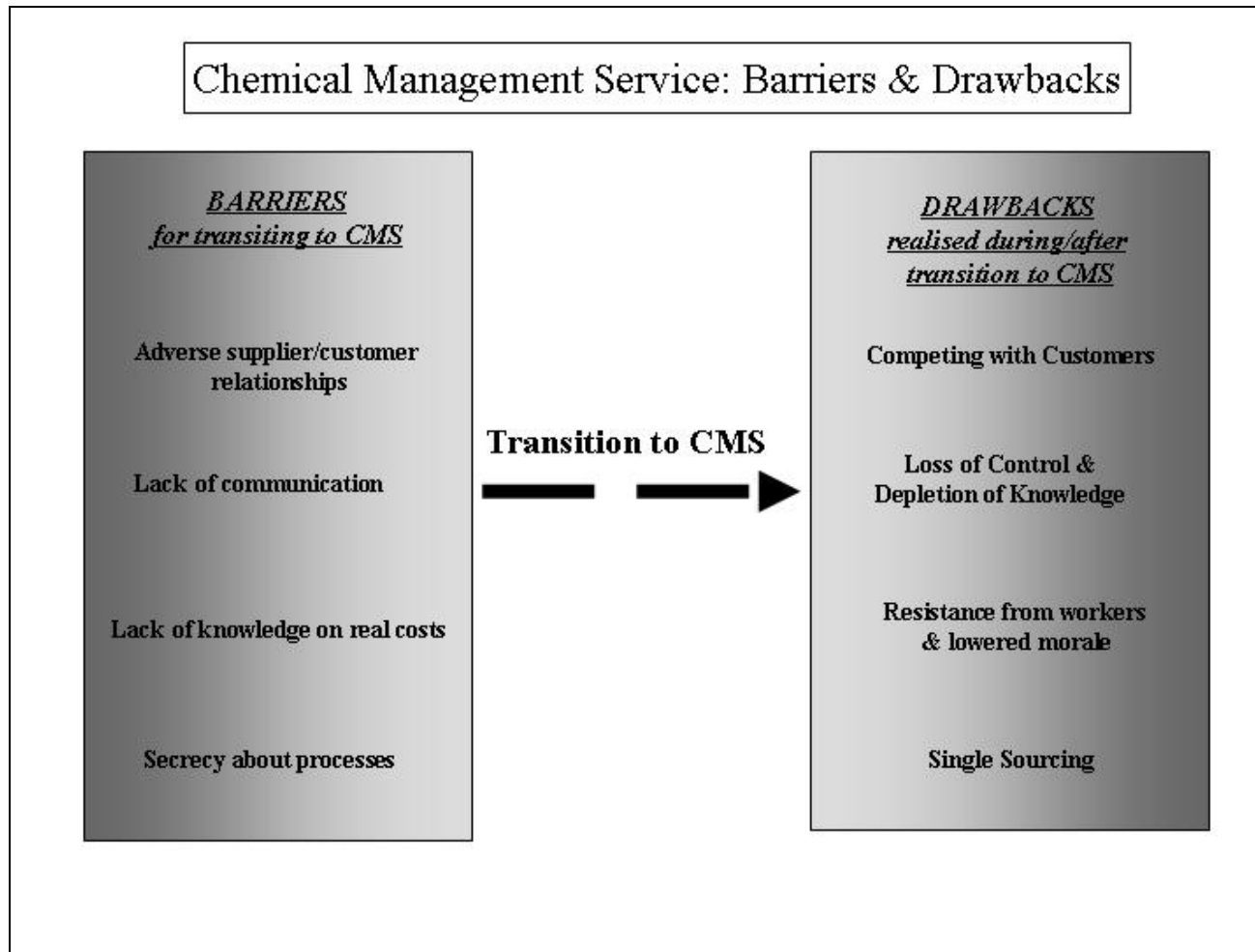


Figure 4-1: Framework for analysing barriers and drawbacks related to CMS

5. CMS Application in Europe

This chapter includes several case studies from both the suppliers as well as the customers of CMS. The case studies were developed on the basis of the questionnaire response from the suppliers/customers, interviews with company representatives and information available on the websites. The focus of questionnaires was determined by the frameworks developed. The last section specifies the views of various stakeholders that are active in the field of CMS. Some more case studies on CMS are presented in the appendix VI.

5.1 Cases on CMS Suppliers in Europe

5.1.1 Ashland Speciality Chemical Company

Ashland Speciality Chemical Company is a chemical manufacturing company which provides CMS to the semiconductor industry through its FAB services division. The company has been providing CMS to its clients for more than 14 years (McConachie, 2003b).

Modules in CMS

The CMS provided by the company includes the following services (McConachie, 2003b):

- Purchasing: *Procurement of chemicals*
- Inventory: *Receiving, Inspection and verification, Testing, Warehousing*
- Application: *Movement of chemicals to the application area*
- Data Management: *Order tracking, MSDS management, Chemical use tracking*
- Disposal: *Waste handling and collection (inclusive of packaging material)*
- EHS Services: *Providing data for reporting, Safety procedures, Emergency preparedness and response plan.*

Contracts

Ashland makes four different kinds of contracts with its clients namely implementation fee, management fee, unit pricing (price/unit of function) and shared cost savings (McConachie, 2003b).

Opportunities

The primary motive of Ashland to become CMS provider was to provide value-added services as the organisation perceived the market demand for them. Some of the major benefits gained by Ashland after becoming a service provider include (McConachie, 2003a, 2003b):

- Unique position of being a provider of total solutions in the market
- Close relations with the customers
- CMS helped in gaining market information

- Increase in the range of products and services offered by the company
- Gain in the process knowledge after being at the customer's site
- Close tie-ups with the customer

According to Ashland, the most important reasons for its customers to adopt CMS are the changing EHS requirements, which force them to manage issues that are not their core competence. It, therefore, becomes essential for them to choose experts for outsourcing the work.

The liability of any accidents and incidents remains generally with the customer but it largely depends on the contractual agreement with Ashland. The government in European nations are not providing any kind of incentives or support to CMS providers (McConachie, 2003b).

Barriers

An important barrier faced by Ashland in providing CMS is that the semi-conductor industries are very secretive about their processes, which makes it difficult to suggest process improvements and alternative chemicals. According to the company representative, the customers do not lay 100% trust on the CMS provider which is a big barrier for the provider to take initiatives in helping the customer (McConachie, 2003a).

Drawbacks

A drawback faced by Ashland after becoming a CMS provider is that if the company provides a product then, for example, the price would be €100 but if the company provides both products and services then the total billing becomes €150. In such a case, the customer tends to think that this is due to the higher volume of chemicals used (McConachie, 2003a).

5.1.2 BASF Coatings AG

BASF Coatings AG is a chemical manufacturing company that has been providing CMS to its customers in the car manufacturing industry for the past 13 years (Lenz, 2003).

Modules in CMS

The CMS provided by BASF generally includes the following services (Lenz, 2003):

- Purchasing: *Procurement of chemicals*
- Inventory: *Receiving, Inspection and verification, Warehousing*
- Application: *Movement of chemicals to the application area*
- Value Added: *Process changes for improving efficiency*
- Data Management: *Chemical use tracking*
- Disposal: *Waste handling and collection (inclusive of packaging material), Treatment of waste*
- EHS Services: *Providing data for reporting, Safety procedures.*

The CMS arrangement of BASF differs from customer to customer depending on his specific requirements. BASF does not have any standard arrangements for providing CMS.

Contracts

BASF charges an implementation fee from its clients for the services it provides. CMS represents fixed costs for BASF which are to be paid by the client. The main profit driver for BASF is the shared costs saving mechanism (Lenz, 2003).

Opportunities

BASF provided CMS as a part of its overall business strategy as there was a demand from the customers for it. Chemical management is not the core competence of the car manufacturers, thus, BASF can help these car manufacturers in managing their paint shop by supporting and advising them and coordinating their supply processes (Lenz, 2003).

Major benefits gained by BASF by providing services include (Lenz, 2003):

- Building of a wider trust relationship by helping the customers to monitor the processes.
- The customers' confidence in BASF capabilities has grown
- Significant profits are made from shared cost savings
- Gained a unique position in the market and became less imitable by the competitors
- Trusted by the customers as a partner for all matters related to coating paints
- By offering service concepts, BASF has gained a competitive advantage in the market
- Provided assurance to the stakeholders
- Savings made at the customer's site represent an ecological advantage due to reduced chemical consumption

BASF's purpose is to guarantee customer satisfaction during the process and with the results obtained. The main opportunities related to CMS lie with the existing customers in the case of BASF.

There have been no pressures from stakeholders on BASF to provide CMS. There were neither any legislative drivers nor any legislative barriers for the company to provide CMS. Environmental liability does not get transferred to BASF when the company provides CMS to the customers (Lenz, 2003).

Barrier

The main barrier realised by BASF in providing CMS is that some customers are still reluctant to outsource chemical management (Lenz, 2003).

5.1.3 Castrol

Castrol offers both metal working fluid management programme and lubrication management programme, with the aim of delivering customer value through optimising the manufacturing processes and improving productivity. Castrol has been providing chemical services to clients for more than 16 years.

Castrol purchases, stores, deploys, manages and disposes chemicals on its customers' behalf. Castrol generally places people on-site to conduct these activities and becomes integrated into the customer's operations. Majority of Castrol's customers belong to the following sectors: automotive OEMs and components, machinery manufacture, food and beverage, aerospace, metal production.

Castrol provided fluid and lubricant management programmes as a part of its overall business and environmental strategy. There was neither any stakeholder pressure nor there were any legislative drivers for Castrol to provide CMS when it introduced it in 1985 (Garbett, 2003).

Modules in CMS

The CMS provided by the company includes the following services (Garbett, 2003):

- Purchasing: *Identification, Sourcing and Procurement of chemicals*
- Inventory: *Receiving, Inspection and verification, Testing, Labelling, Warehousing*
- Application: *Movement of chemicals to the application area, Usage of chemicals*
- Value Added: *Process changes for efficiency*
- Data Management: *Order tracking, MSDS management, Chemical use tracking*
- Disposal: *Waste handling and collection (inclusive of packaging material), Treatment of waste*
- EHS Services: *Providing data for reporting, Safety procedures, Emergency preparedness and response plan.*

Contracts

Castrol makes four different kinds of contracts with its clients namely management fee, unit pricing (price/unit of function), mandatory cost reduction and shared cost savings. The main profits for Castrol come from shared cost savings (Garbett, 2003).

Opportunities

The primary motive of Castrol to become a service provider was to meet the demand from customers who were moving towards out-sourcing of non-core activities. The customers were also facing the challenge of managing stringent EHS requirements.

As the manufacturing industry was in decline, having a differentiated service offer helped Castrol to protect its existing business rather than boost new business growth. Castrol is focussing on CMS to maintain its market share and leadership position in the metalworking fluids and lubricants market. According to the company, Fluid management services (FMS)

are an outsourced fluid management program providing a strategic & unique partnership involving people, products and processes (Garbett, 2003).

Major benefits gained by Castrol by providing services include (Garbett, 2003):

- As Castrol was the first to offer a full CMS, it gained a unique position in the market
- Gained a market leadership position through a differentiated offer of FMS. The introduction of Castrol Plus (Fluid management brand) provided a differentiated offer in the market. It took 2-3 years for competitors to develop similar offers and enter the fluid management market space.
- Increase in the range of products and services offered by the company
- Faced relatively less competition in the field of selling services
- Developed stronger customer relationships driven by a partnership approach
- Customers have realised that Castrol has a strong technical and process expertise going beyond the management of products

Any CMS programme by Castrol is based on the development of Key Performance Indicators (KPIs) and the achievement of added value to customer's manufacturing operations. Castrol has realised the growth opportunities in CMS from the new customers and the old customers who are returning to Castrol. After providing CMS, Castrol realised its ability to recycle products and extend the system life, and reduce usage and waste of chemicals (Garbett, 2003).

Barriers

According to Castrol the existing legislation specifies that the responsibility of any waste generated within the manufacturing process (including chemicals) is the manufacturer's responsibility. Castrol thus facilitates the management of chemicals but can not take full responsibility for the waste (Garbett, 2003).

Drawbacks

The main drawback faced by Castrol is that the services become commoditised and de-valued when major providers compete on price rather than value added to customers' operations (Garbett, 2003).

5.1.4 Henkel Technologies

Henkel Technologies is a chemical manufacturing company providing CMS, for last 14 years, as a part of its overall business strategy (Rothwell, 2003c). Henkel offers products (coolants, cleaners, surface treatment, adhesives, sealants, water and waste water treatment chemicals, etc.) in every stage of the manufacturing process and the value chain. Henkel also works on product compatibility i.e. how things affect each other and the chain of effects. For all these products Henkel has capabilities in R&D, production, technical service, process engineering, etc (Rothwell, 2003a, 2003b).

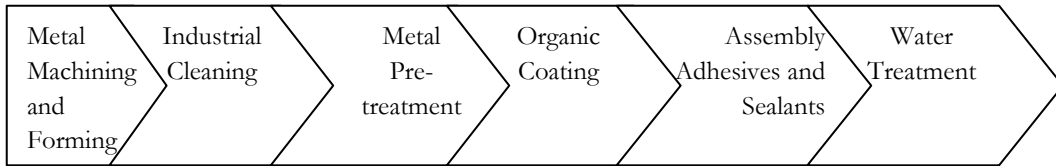


Figure 5-1: Henkel's service capabilities across the customer's value chain (Rothwell, 2003b)

Henkel's policy is to reduce chemical consumption at customer's place, add value to the services offered and use products that meet health and safety requirements during application and recycling processes.

In Europe, Henkel has a dedicated service support organisation which supports the local sales organisation in marketing, contract closing and signing, implementation and running of contracts. This ensures conformity of approach and standards across Europe. The contact with the customers and the day to day handling of the contracts is done through the local sales organisation within existing structures (Rothwell, 2003a). The customers to Henkel belong to the automotive industry, automotive supply industry and machine manufacturing industry (Rothwell, 2003c).

For implementing CMS at the customer's site, Henkel forms a joint management team which includes representatives from the customers. Henkel makes proposals to the joint management team specifying the reasons and benefits for its actions and then carries a trial. During this stage, Henkel involves representatives from finance and quality control so that they can confirm Henkel is meeting the quality requirements (Rothwell, 2003a).

Modules of CMS

The CMS provided by Henkel includes the following services (Rothwell, 2003c):

- Purchasing: *Identification, Sourcing and Procurement of chemicals*
- Inventory: *Receiving, Inspection and verification, Testing, Labelling, Warehousing*
- Application: *Movement of chemicals to the application area, Usage of chemicals*
- Value Added: *Process changes for efficiency*
- Data Management: *Order tracking, MSDS management, Chemical use tracking*
- Disposal: *Henkel is not directly involved in waste disposal. Disposal is done using authorised disposal companies to carry out the necessary work. Henkel's aim is to introduce processes and procedures which reduce the amount of waste produced. This involves regeneration of product for reuse instead of disposal.*
- EHS Services: *Providing data for reporting, Safety procedures, Emergency preparedness and response plan.*

Contracts

Henkel makes four different kinds of contractual mechanisms in its CMS namely management fee, unit pricing (price/unit of function), mandatory cost reduction and shared cost savings.

Some other types of CMS contracts are also made by Henkel based on the customer requirements (Rothwell, 2003c).

Opportunities

The driving force for CMS, according to Henkel, always come from the urge to reduce the process costs which means reducing the volume of products, reducing chemical consumption, reducing the disposal and extending the life of products (Rothwell, 2003c).

In Europe, Henkel perceived that there was a requirement for CMS in the market although there was no existing market demand for it. Henkel went into the market, promoted and sold the concept as a part of its business development strategy. CMS has offered Henkel a unique selling point which differentiates it from other competitors and has allowed it to avoid price underbidding and offer its customers cost reductions, process and quality improvements to its customers (Rothwell, 2003c).

Some of the major benefits gained by Henkel after providing CMS include (Rothwell, 2003b, 2003c):

- Gained unique position in the market
- Met the demands of clients
- Became less imitable
- Improved relations with the customers
- Provided assurance to stakeholders
- Confirmed the good environmental image

Henkel has realised most growth opportunities in CMS with its existing customers. According to Henkel, though the competition among companies offering CMS is strong, it is not the ruinous type of price-underbidding competition that takes place when a company is just selling chemicals (Rothwell, 2003c). The CMS concept has however been misused by few companies as a disguised form of price under-bidding, which has lead to ruinous CMS contracts, and has brought the CMS concept into discredit (Rothwell, 2003a).

Henkel is using CMS as a tool to take responsibility of its chemicals. There has been no stakeholder pressure on Henkel to provide CMS to its clients. According to Henkel, legislation has been an indirect driver for the adoption of CMS, the direct drivers being process cost reduction, process and quality improvement. Environmental legislation influences all these factors for e.g. there are legislative requirements for chlorine-free coolants, chromate free surface treatment of aluminium, and dramatic increase in the disposal costs. Henkel uses 80% of its own chemicals for the CMS it provides and rest are procured from its preferred suppliers (Rothwell, 2003a, 2003b, 2003c).

CMS has provided Henkel with a definitive edge in the European market, in view of contracts that are presently in place. There have been no government initiatives that have encouraged Henkel to provide CMS (Rothwell, 2003c). The liability of any accidents and incidents remains with the customer in the case of CMS provided by Henkel (Rothwell, 2003c).

Barriers

The main barrier faced by Henkel in providing CMS is that it is being misused by various clients as a disguised form of price underbidding (Rothwell, 2003a). In the case of Europe due to the political, geographical, taxation and language situations, rules and regulations, it seems necessary for Henkel to have a dedicated CMS company in each country to replicate the approach¹¹ adapted in USA. Presently, this is not economically viable for Henkel (Rothwell, 2003c).

Drawbacks

Henkel believes that if CMS programs are selected carefully than there are no drawbacks. Henkel has not faced any drawbacks as it avoids offers which are disguised price reduction programs and goes for process oriented contracts where the customer is looking for process/quality improvements and genuine partnership (Rothwell, 2003a, 2003c).

5.1.5 Quaker Chemical Corporation

Quaker Chemical Corporation is providing CMS to its customers through its CMS division for last 14 years. The motto of the company as CMS provider is to add value to its offers. Quaker provides CMS as a part of its overall business, marketing and environmental strategy. It started providing CMS because of the demand principally driven by General Motors (Leech, 2003).

Modules of CMS

The CMS provided by the company includes the following services (Leech, 2003):

- Purchasing: *Identification, Sourcing and Procurement of chemicals*
- Inventory: *Receiving, Inspection and verification, Testing, Labelling, Warehousing*
- Application: *Movement of chemicals to the application area, Usage of chemicals*
- Value Added: *Process changes for efficiency*
- Data Management: *Order tracking, MSDS management, Chemical use tracking*
- Disposal: *Waste handling and collection (inclusive of packaging material), Treatment of waste*
- EHS Services: *Providing data for reporting, Safety procedures, Emergency preparedness and response plan.*

Opportunities

Following benefits have been realised by Quaker after providing CMS (Leech, 2003):

¹¹ In USA, Henkel has a separate company called Henkel Chemical Management (HCM), Nashville, Tennessee, which handles all CMS contracts from beginning to end as a dedicated CMS provider. In the USA, the local Henkel sales organisation is, therefore, treated as a second tier product supplier in competition to other second tier suppliers by HCM, the aim being to provide best in class products.

- Competitive advantage because of differential position in the market
- Enhanced customer relations and product sales
- Additional value for the customer
- Inimitable position in the market

Quaker's strategy is to succeed by creating new value for its customers and shareholders. The organisation defines the business based on three concepts (Leech, 2003):

- Creating high technology-advantaged products that improve productivity and quality for the customers
- Delivering application and process expertise to optimize application performance
- Providing demonstrable value for the customer as the basis for Quaker's compensation offer

Quaker has not noticed any change in the competition even after providing CMS. The customers to Quaker belong to the automotive industry, automotive tier II industry, heavy equipment industry, aerospace and bearing industry. Quaker has noticed a significant change in the business growth after providing CMS to its clients. The main profit driver for the organisation is gain share. CMS has significantly helped in decreasing the environment impact of chemicals according to Quaker (Leech, 2003).

Taxes on waste discharge dramatically increase the acceptance of CMS according to Quaker's experience. Environment management System in accordance with ISO 14001 has also helped build customer acceptance for CMS (Leech, 2003).

Barriers

The main barriers perceived by Quaker in providing CMS include (Leech, 2003):

- Lack of real environmental commitment by governments and manufactures
- Lack of global structure and dedication to CMS by customers
- Lack of communication between customers' purchasing and manufacturing personnel. Purchasing people are driven by price reduction and not by the value-added to the processes.

5.2 Cases on CMS Customers in Europe

5.2.1 ABB

ABB is buying CMS for some of its sites in Europe. ABB has some operations like winding which involves cleaning with some solvents. For these operations, ABB has a contract with suppliers to maintain a minimum quantity of chemicals in the factory. The suppliers have to manage this minimum amount of chemicals by checking the tanks time and again and refilling them when required. The suppliers are also involved in helping ABB in their processes (Dejoux, 2003).

There is a clear trend within ABB to outsource some activities which are not core to its business. According to ABB, CMS is not a new concept for it.

Opportunities

ABB has found that there are certain advantages when the supplier helps them in the process and believes that CMS will grow as it provides several advantages. The CMS supplier to ABB is responsible for the chemicals provided and handles all the security around the chemicals. Some of the benefits that ABB has derived from CMS include (Dejoux, 2003):

- No internal management of stocks of chemicals has to be done by ABB as supplier has taken the responsibility of the chemical management
- Supplier manages all the environmental issues at the site

According to ABB, implementing CMS has helped in better compliance as the supplier who is competent in chemical management is taking care of all the issues.

The supplier according to ABB has strategic reasons to provide CMS, which include increase in service value, added value and economic benefits. The CMS supplier makes long-term agreements with customers for which means constant profits and loyalty (Dejoux, 2003).

Regarding liability, providing a service does not imply that the supplier is responsible for all the risks. The liability, thus, lies with ABB regarding the chemicals. The supplier is required to take care of the chemicals but in the plant ABB holds the responsibility (Dejoux, 2003).

The workers at ABB were cooperative in establishment of the CMS program. In the traditional approach the worker would have to fill the tank and manage the chemicals but through CMS approach the workers were happy to see the supplier doing this work. There were no legislations which influenced the decision of ABB to implement CMS (Dejoux, 2003).

Barriers

According to ABB, there is a lack of suppliers for chemical services for all the required services. ABB uses a lot of winding varnishes in its operations but its supplier for these varnishes did not provide the required chemical services, though ABB would have liked to subscribe to them. According to ABB, availability of CMS depends on the industry sector, for example the automotive industry can push the suppliers to get the required service of painting which means that the supplier is responsible for delivering, mixing, cleaning, application and all the work in the paint shop (Dejoux, 2003).

According to ABB, the resistance to provide CMS is coming from suppliers' side as it is a change management issue and needs many specialists so not all suppliers want to provide them. It also depends on the top management of the supplier company and the size of the supplier. ABB has not found any disadvantages in implementing CMS (Dejoux, 2003).

5.2.2 STMicroelectronics

STMicroelectronics (ST) is a global independent semiconductor company and is a leader in developing and delivering semiconductor solutions (STMicroelectronics, 2003). STMicroelectronics had implemented CMS since long for its operations. Outsourcing chemical management is a part of ST's environmental strategy (Droulez, 2003).

Opportunities

The main benefits that ST has derived from implementing CMS include (Droulez, 2003):

- Avoidance of chemical wastes
- Process efficiency improvements
- Better ambient environmental conditions
- Improvement in the safety conditions in the plant
- Reduced number of accidents
- Closer relationships with suppliers which has promoted loyalty
- Assurance to stakeholders

There have not been very significant direct cost savings for ST but there have been many indirect cost savings which have come from good quality, less down time, lower accidents etc (Droulez, 2003). According to ST, as the providers had to gain knowledge about the process for supplying CMS, it was a good improvement for them too.

There were no legislations that drove CMS implementation at ST. It adopted CMS to improve efficiency, economics and quality (Droulez, 2003). ST did not face any problems in identifying CMS suppliers and has 3-4 CMS suppliers for its operations at various facilities (Droulez, 2003).

According to ST, if appropriate chemicals are taken away from the market after the implementation of new EU chemicals policy, the CMS provider can develop, do research and help ST with alternative chemicals (Droulez, 2003).

Drawbacks

ST has not realised any drawbacks related to CMS. In the initial stages, there were some interruptions in production but that lasted only for a short period (Droulez, 2003).

During CMS implementation, ST faced some resistance from the workers as it was outsourcing some services. This resistance varied between from country to country for ST because of differences in work culture (Droulez, 2003).

5.3 Stakeholder Views on CMS in Europe

5.3.1 European Association of Chemical Distributors (FECC)

FECC is not working in the field of CMS but believes that it is difficult for CMS concept to grow in Europe (Megen, 2003). According to a representative, to carry a job involving chemicals at the manufacturer's site, for example painting a car, requires broad and specific knowledge. The expertise needed for painting automobiles which only car manufacturers have is difficult for the paint industry to emulate. It is easier for a car manufacturer to buy a paint factory and rather than outsourcing the chemical services to the paint manufacturer or the service provider (Megen, 2003).

According to FECC, what happens in Europe in a large context is as follows: For all non-strategic chemicals, the customers generally use outsourcing strategy. In this case, customers ask a single trading company to procure all the chemicals for them. In another case, the customers ask the chemical supplier to take care of tanks of chemicals. The user can ask the supplier to keep the tank filled for a certain period. There will be no orders for filling the tank time and again by the customer to the supplier. Supplier fills the tank for that period irrespective of the number of times it has to be filled (Megen, 2003).

The new EU chemicals policy may have no major influence on CMS according to FECC. According to FECC, if REACH is implemented then 30-40% of chemicals presently used may disappear as producing or importing them would not make commercial sense due to the costs involved. The impact of the disappearance of these chemicals is not very apparent. There could be a *domino effect* which means that disappearance of one chemical may lead to disappearance of many chemicals down the line which are produced by using the first chemical. This is the major concern regarding downstream users in regard to the EU chemicals policy (Megen, 2003).

5.3.2 Green Alliance, UK

Green Alliance, an NGO in UK, is actively promoting the “servicizing” concept. It is supporting the use of services concept in the policy area to promote resource use efficiency. Green Alliance launched a programme in UK called “Service Innovation for Sustainability” in the year 2002 through which it is promoting CMS. Green Alliance identifies the need of CMS to address the concerns related to human health and the environment because of chemicals. The NGO held a major conference in London to advance CMS in February 2003 (Oldham, 2003).

According to Green Alliance, the Chemical Industries Association (CIA) of UK which represents a part of the supply chain is very interested in CMS. CIA is doing some research on specific sectors to understand what it means to their members and whether they want to promote it among their members. A lot of chemical companies who are working towards EMS/EMAS have reported to Green Alliance that CMS helps in obtaining the required data. Some Members of European Parliament (MEPs) and Department of Environment, Food and Rural Affairs (DEFRA) are also supporting the CMS concept in UK (Oldham, 2003).

According to Green Alliance, the proposed REACH policy is drawn in a way that it supports initiative and information transfer in the supply chain which CMS promotes. The other policies that may affect CMS are related to producer’s responsibility and substitution of chemicals. Green Alliance suggests that the EU White Paper on chemicals could provide an opportunity for the wider adoption of CMS approaches in Europe (Royal Commission on Environmental Pollution, 2003).

CMS is not as common in Europe as USA according to Green Alliance, though are some companies in UK who are outsourcing water and effluent management (Oldham, 2003).

5.3.3 International E-chem, UK

International E-chem, a chemical consultancy in UK, has put together a program in UK with the Chemical Strategies Partnership of USA. The organisation has approached government for funding and now is trying some pilots. It sees a lot of potential for CMS in UK and has initiated a test program in which CIA, Green Alliance, PPG, Ford, BP, Castrol and Vauxhall are working together (Hodges, 2003).

There is a difference between USA and Europe regarding supply/demand for CMS. In USA, the drive is coming from the users while in UK it is not the same. In Europe, the suppliers are providing CMS as a new form of service and are taking a lead (Hodges, 2003).

Considering the triple bottom-line approach, CMS enables suppliers to have new source of service driven income, reduces the environmental impact as expertise of providers is utilised and leads to generation of jobs as a new income stream is set up. According to International E-chem, CMS will surely create a unique position for the provider in the market as the suppliers move from a traditional system to a better system where they are supplying services in addition to the products (Hodges, 2003).

Local community, investors, employees are traditional and main stakeholders in CMS according to International E-chem. There is no particular promotion or a problem from policy side to CMS. Companies are virtually free to do what ever they decide at their own will and there is no encouragement or discouragement to CMS from the government. International E-chem believes it is better that the CMS market develops because of supply and demand and rather than legislation (Hodges, 2003).

5.3.4 Ministry of Environment, Austria

The Austrian Environment Ministry is promoting chemical leasing in Austria and plans to advance CMS to a European level. The Ministry wants to decouple the profits of chemical industry from the volume of chemicals sold, and make the industry ready for the new EU chemicals policy (Ecotec/Institute for Industrial Ecology, 2002; Jakl, 2003a, 2003b).

In a study conducted by the Ministry, to identify the potential of CMS, it was estimated that 3900 companies in Austria use 153 000 tonnes of chemicals per year. The study claimed that with chemicals leasing there is a potential of 33% reduction in chemical consumption which amounts to a reduction of 53 000 tonnes. This huge potential could be gained in greasing, cleaning and fluid management (Ecotec/Institute for Industrial Ecology, 2002; Jakl, 2003b).

In this study made by the Ministry in 2001, its consultants performed projects with select companies to get an overview of areas where service oriented models are implemented to gain experience. This led to identification of business models which ranged from simply selling the chemicals to highly integrated business models in which the suppliers were helping the customers in their processes. There are models where the service is at the focus and the business model is based on service units like sq. metre degreased, working hours of hydraulic system, temperature management. The Ministry is focussing on such kind of business models and identifies opportunity of decoupling economic success and the consumption of chemicals as an outcome of CMS (Jakl, 2003a).

The Ministry plans to design subsidy program for the introduction of the chemical leasing models in Austria wherein it can get public funding in the framework of such a program. It is in the stage of developing a robust criterion which shall decide the circumstances on which the subsidy will be grounded, the necessary preconditions are and the monitoring criteria (Jakl, 2003a).

A stakeholder dialogue was arranged by the Environment Ministry wherein discussion with 20 companies was carried about the project. The Ministry is planning to perform pilots where in half of the consultant costs for implementing CMS will be covered by itself. The Ministry shall gain in the process by getting information on the CMS process in an aggregated form (Jakl, 2003a).

The main partners of the Ministry in CMS include the companies and NGOs. The lobbying organisations have taken quite a calm position regarding CMS and don't want to get involved too much in this area (Jakl, 2003a).

Opportunities

According to Ministry, CMS shall surely help in better compliance management by laying a new ground of understanding of regulations (Jakl, 2003a).

The new EU chemicals policy will stimulate in an indirect way the CMS models. CMS models fit in a very neat way in the context of the new EU chemicals policy. With regard to the service oriented model, the information transfer that REACH will mandate is an important aspect. REACH will mandate the flow of information from the producer to the end user through the whole supply chain. This enhanced dialogue and transparency in information flow is also the ground for CMS model. If the companies are to comply with the REACH requirements the activation energy to introduce service model will be down to a remarkable extent after the implementation of CMS (Jakl, 2003a).

According to the ministry, there are two simultaneously acting tendencies which fit very well as REACH will mandate the information exchange which will be facilitated by the introduction of chemical service models (Jakl, 2003a).

In its communication strategy on CMS, the Ministry does not link regulations and CMS as it believes that chemical leasing systems must develop out of a ground of acceptance by industry. The Ministry disseminates the information that REACH will be easy to adapt with chemical leasing already in place (Jakl, 2003a).

Barriers

The main concern which companies articulate is regarding the transfer of know-how. The companies now applying chemical process know how to their processes will loose this know-how if an external service provider performs their processes. There could also be extreme consequences of loosing know-how which may result in the original partner developing into a future competitor.

Another core issue in a leasing program is that companies involved in such a program have to have a transparent partnership, their responsibilities should be clear and liability issues must be defined (Jakl, 2003a).

There is a threshold in terms of scale of chemical industries that can provide CMS. There is a potential that very small chemical industries may be left out of CMS and have a disadvantage. The Ministry is yet to make an assessment about the possible impacts of CMS on SMEs (Jakl, 2003a).

5.3.5 Swedish Plastics and Chemical Association

The Swedish Plastics and Chemical Association is promoting the CMS concept but not actively working on CMS as it doesn't have the competence (Lundqvist, 2003).

The association believes that CMS promotes chemical business growth and helps the customers to focus on their core competence and refrain from developing knowledge on chemical management. It assists the companies in gaining competitive edge and provides a

way for suppliers to make closer bonds with the customers. CMS will help in regulatory compliance and will reduce risk at the customer's site as the service provider has better knowledge about the use/disposal of chemicals (Lundqvist, 2003).

CMS reduces the environmental impacts related to chemicals as there are economic motivations to reduce the amount of chemicals used. As providing/adopting CMS yields economical and environmental benefits, there may be stakeholder interest in CMS. Swedish Environment Protection Agency is also supporting the uptake of CMS (Lundqvist, 2003).

The representative from the association gave an example of Shell's carwash facility where CMS is deployed. In the Shell's carwash facility, instead of getting paid per litre of chemicals used, the facility was getting paid per car washed. This motivated the facility to keep the use of chemicals low and there was an economic incentive to reduce the use of chemicals (Lundqvist, 2003).

According to the association, the new EU chemicals policy is not directly promoting CMS. The issue of CMS has been taken up during meetings for the Integrated Product Policy (IPP) by the association (Lundqvist, 2003).

5.4 Contrast in USA and Europe regarding CMS

The contrasts in CMS are highlighted in the following table:

Table 5-1: Contrasts in CMS between USA and Europe

<ul style="list-style-type: none"> In USA the tendency is to get an independent impartial service supplier as a chemical manager (Rothwell, 2003a). Thus, the current trend is that the “emerging CMS providers” are not into the manufacturing of chemicals. These providers include environmental engineering businesses, chemical distributors and waste management firms. Most of the new kinds of CMS contracts have been designed by these types of providers as they do not derive revenue from the sales of chemicals but from the management of chemicals (The ENDS Report, 2001c). They make profits from providing excellent services and sharing the savings made at the site along with the customer. These providers declare they are impartial and so they can do benchmarking and offer the best product on the market (Rothwell, 2003a). 	<ul style="list-style-type: none"> In Europe the tendency is that that the companies don’t trust these kinds of providers as the users in Europe believe that these kinds of providers don’t have the knowledge and the required expertise. In Europe the trust is on the companies who have broad manufacturing bases, good understanding of research, development, production and application. Thus, in Europe the tendency is to look for high performance chemical companies. The customers tend to rely more on big chemical manufacturers rather than just the service providers (Rothwell, 2003a).
<ul style="list-style-type: none"> Liability rules have been a major force in driving the concept of CMS in USA (The ENDS Report, 2002). 	<ul style="list-style-type: none"> This liability driver is absent in the case of European countries (The ENDS Report, 2002). According to DTI - UK, the key drivers for the establishment of CMS must come from the market and the companies engaged in manufacturing of chemicals. The job of the government in this process is of awareness spreading (The ENDS Report, 2001b).
<ul style="list-style-type: none"> Factories are generally run in a more efficient way in Europe than in US. 	<ul style="list-style-type: none"> In the automotive industry/supplies in Europe there are many good systems in place already. The processes in Europe are better organised than in USA due to higher stakeholder pressure. European companies had taken measures earlier to reduce waste material costs so that in USA there are more low hanging fruits. Thus, in Europe the potential savings are less as compared to a typical USA company owing to higher environmental pressure, political agenda and the attitude towards environment.

6. Analysis

In this section the research findings have been analysed using the frameworks that were developed in chapter 3 and chapter 4. The relationships between various factors mentioned in the framework have also been analysed. Finally the opportunity framework has been revised and the relations between the various factors have been portrayed.

6.1 Opportunities

6.1.1 Competitiveness

Competitiveness has been found to be a significant benefit of CMS. CMS has helped all the providers and customers, which were contacted, in gaining a competitive edge. All the companies that have transited to CMS deem competitive advantage as one of the most crucial benefits of it. The CMS providers have gained a competitive edge due to unique positioning whereas the CMS customers have become competitive due better resource productivity.

All the contacted CMS providers namely Ashland, BASF, Castrol, DowCorning, Fuji, Henkel, PPG, Quaker, Rockwood, Shell have confirmed that CMS has provided them with a niche in the chemical market. These companies have primarily attained this niche due to the differentiated offer they make to their customers. Views of the company representatives as mentioned during the telephonic interviews and in their questionnaire responses, on competitiveness due to CMS are specified in Table 6-1.

Table 6-1: CMS offers a competitive advantage to suppliers

Views of CMS suppliers on competitive edge due to CMS:

- **Ashland** has gained a unique position of being a provider of total solutions in the market as it is proving value added services. Moreover, the range of products/services offered by the company has also increased (McConachie, 2003b).
- **BASF**, by offering the service concept, has gained competitive advantage in the market. The financial bottom-line of the company has also benefited because of the profits made due to the shared cost savings (Lenz, 2003).
- **Castrol** managed to maintain its market share and gained a leadership position by providing a differentiated offer of FMS. Castrol gained a first-mover's advantage in the market by providing FMS. Some of the old customers of Castrol have returned to it after it started providing CMS. As the manufacturing industry was in decline, having a differentiated service offer helped Castrol to protect its existing business (Garbett, 2003).
- **DowCorning's** brand name has been repositioned and it has become inimitable because of providing chemical services (Makela, 2003b).
- **Fuji** gained a unique and exceptionally well perceived reputation of being "professionals" due to CMS. Fuji has seen a noticeable change in business growth owing to CMS. The range of products provided by Fuji has also increased due to CMS (Dejonghe, 2003; States, 2003).
- **Henkel** used CMS as a unique selling point owing to its expertise in process management and services for every stage of the manufacturing process. CMS has been used by Henkel as a strategy to avoid price-underbidding (Rothwell, 2003a, 2003c).
- **PPG** started providing CMS primarily to differentiate from competition. CMS provided PPG with a competitive advantage from differentiation leading to more business opportunities and gave it a strong position in the market. PPG is now offering a wider portfolio to its customers (Benson, 2003a).
- **Quaker** realised a competitive advantage because of the differential position gained by providing new value to its customers. Quaker has noticed a significant business growth after providing CMS (Leech, 2003).
- **Rockwood** gained a unique position and competitive advantage. Providing CMS has helped Rockwood in improving its economics and maintaining its profitability (Brinklow, 2003).
- **Shell** provided CMS to improve the customer retention and as it sees a growth potential in the CMS market (Mottershead, 2003).

The **customers** of CMS have gained a competitive advantage owing to the cost savings due to better resource productivity. In addition to ABB and STMicroelectronics, who were the only contacted CMS customers, Castrol, Henkel, Fuji and Rockwood confirmed on behalf of their customers that CMS has helped in achieving better efficiencies and cost savings which has provided a competitive advantage to them. The views of these companies as stated during the telephonic interviews and questionnaire responses are mentioned in Table 6-2.

Table 6-2: CMS offers a competitive advantage to customers

<p>Views of CMS Customers and some suppliers on behalf of their customers on competitiveness:</p> <ul style="list-style-type: none"> – STMicroelectronics has realised several indirect cost savings because of better process efficiency, less down time and better quality (Droulez, 2003). – Customers to Castrol had better resource productivity after adopting CMS (Garbett, 2003). – Customers of Henkel who have adopted CMS have lower costs due to reduction in chemical consumption, reduction in the amount of wastes to be disposed and increased life of the products (Rothwell, 2003c). – Clients to Fuji are the chemical users who are looking to reduce the chemical consumption as it helps in reducing costs (States, 2003). – Customers to Rockwood have realised cost savings after adopting CMS (Brinklow, 2003).
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Stakeholders like International E-Chem have also confirmed that, CMS provides a competitive edge to the suppliers as they are providing services in addition to the products and leads to making profits at both the supplier’s as well as the customer’s end (Hodges, 2003).

6.1.2 Supplier-Customer Relationship

Strong and enhanced relationship between the suppliers and customers has been found to be another significant benefit of CMS. All the contacted companies have agreed that CMS has made their relationship with the supplier/customer healthier. The views of the some CMS providers like Ashland, BASF, Castrol, DowCorning, PPG, Rockwood, Shell and customers namely STMicroelectronics as stated in their questionnaire response and during the telephonic interviews are mentioned in Table 6-3

Table 6-3: CMS and Supplier/ Customer Relationships

<p>CMS has helped in enhancing the relationships between the customers and the suppliers:</p> <ul style="list-style-type: none"> – Ashland has developed close ties with its customers after providing CMS (McConachie, 2003a). – BASF has built a trustworthy relationship with the customers by helping them in process improvements. The customers have also acknowledged BASF’s capabilities after it started providing CMS. BASF is now accepted as a partner for solving issues related to coating paints (Lenz, 2003). – CMS has helped in establishing of strategic partnership between Castrol and its clients leading to stronger relationships (Garbett, 2003). – By providing CMS, DowCorning has developed confidence and trust among its customers and this has led to better relationships (Makela, 2003b). – PPG experienced the change from being a chemical supplier to being a business partner of the customer. PPG is now involved integrally with in clients and is a part of decision making at its customer’s site. Change in relationships has helped put PPG long term contracts in place (Benson, 2003b, 2003c). – The customers of Rockwood look at it as a long term credible partner (Brinklow, 2003). – Better relationships of Shell with its customers due to CMS have led to customer retention (Mottershead, 2003). – At STMicroelectronics, CMS has helped in developing closer relationships with suppliers and has promoted loyalty (Droulez, 2003).
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Good relationship with the customers has helped suppliers to maintain their customer base and have longer contracts. It has also helped the customers to better understand the capabilities of the supplier allowing them to have more contracts with the supplier. The customers have gained in this process by having assured supplies. They don't have to worry about chemical management in the plant and chemical use in the process any more as they are assured of their supplier's capabilities. Good relationships have helped both the suppliers as well as the customers to gain a competitive advantage primarily due to longer contracts and cost savings.

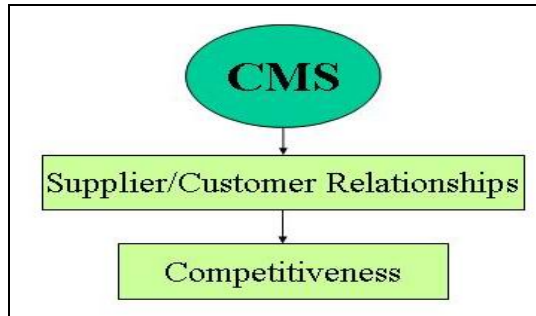


Figure 6-1: Good relationship between suppliers and customers fosters competitiveness

6.1.3 Stakeholder Assurance

Providing assurance to stakeholders has been found to be a benefit of CMS though it is not deemed as significant as competitive advantage and enhanced supplier-customer relationships by the contacted companies. CMS has helped companies in providing assurance to stakeholders as they have better environmental image, reduced risk and are making savings. Some of the contacted companies namely BASF, Henkel, PPG, Rockwood and Shell have strongly stated that CMS has helped in assuring their stakeholders whereas other companies have given a relatively lower or no importance to this factor. The suppliers and customers of CMS provide assurance to their stakeholders by communicating the benefits gained by them owing to CMS. The views of the contacted companies, as mentioned in the questionnaire responses and telephonic interviews, who believe that CMS has helped them in assuring their stakeholders, are specified in Table 6-4.

Table 6-4: CMS provides assurance to stakeholders

<p>Views of contacted companies on assurance to stakeholders as an outcome of CMS:</p> <ul style="list-style-type: none"> - The stakeholders of BASF are better assured of its performance. CMS has helped provide assurance to the stakeholders in the way that it has helped them achieve their environmental targets (Lenz, 2003). - Providing CMS has helped in confirming the good environmental image of Henkel among its stakeholders (Rothwell, 2003a). - The stakeholders of PPG are better assured of its performance after it provided CMS (Benson, 2003c). - CMS helped Rockwood in providing assurance to the community and the government. Customers are convinced as now Rockwood is taking care of the chemicals throughout their lifecycle (Brinklow, 2003). - The stakeholders are better assured of Shell's performance (Mottershead, 2003).

6.1.4 Market Demand for Outsourcing

Meeting market demand for outsourcing chemical management has been found as a benefit of CMS by the chemical suppliers. Many contacted suppliers like BASF, Castrol, DowCorning, Fuji started providing CMS to meet the customer demand for outsourcing chemical management, whereas other suppliers like Ashland, PPG initiated CMS as they perceived a market demand for it in the future. The experience of some contacted companies as learnt from the questionnaire responses and the telephonic interviews is specified in the Table 6-5.

Table 6-5: CMS helps in meeting the market demand for outsourcing

<p>CMS as a tool for meeting the market demand for outsourcing:</p> <ul style="list-style-type: none"> - Ashland started providing CMS as it perceived a future market demand for it (McConachie, 2003b). - BASF provided CMS as its customers in the automobile sector were demanding management of their paint shop (Lenz, 2003). - The primary motive of Castrol to start FMS was to maintain its customers who were demanding services (Garbett, 2003). - By providing chemical services DowCorning is meeting exact customer demands (Makela, 2003b). - Fuji is able to sell chemicals to its customers only because it provides CMS else it would have been impossible (Dejonghe, 2003). - Henkel is meeting the demand from the customers for outsourcing chemical management by providing CMS (Rothwell, 2003c). - PPG perceived a market demand for chemical services in the future when it started providing them. By providing CMS, PPG is meeting the exact customer requirements (Benson, 2003c). - ABB wants to outsource the non-core activities and CMS has provided it with that opportunity (Dejoux, 2003).

CMS has helped the suppliers to meet the market demands and the expectations of their customers. This has further led to the development of healthy relationships with their customers. Meeting the market demand has also resulted in better growth opportunities for the suppliers further leading to a competitive edge.

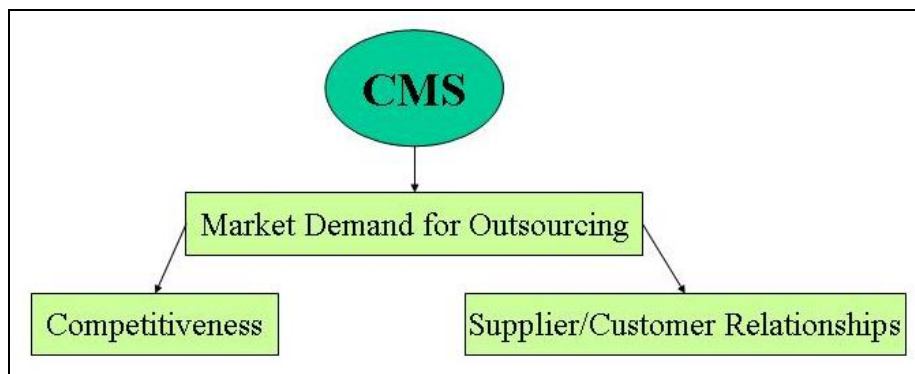


Figure 6-2: Meeting market demands helps companies to gain competitive edge and enhance relationships

6.1.5 Voluntary Standards

Meeting the data requirements of the voluntary standards like ISO 14001 by using CMS as a tool has been found to be an important benefit of CMS. CMS has helped the contacted

companies in generating data on chemicals useful for legislative purposes and for environmental management systems. Some of the companies like ABB, Rockwood and Quaker have specified in the questionnaire response that as CMS leads to data generation, development of operational procedures and proper management of wastes, it helps in meeting the requirements of EMS in accordance with voluntary standards like ISO 14001.

Table 6-6: CMS assists in meeting requirements of voluntary standards

CMS helps companies to meet requirements of ISO 14001/EMAS:

- According to **Quaker** ISO 14001 has helped in building customer acceptance of CMS.
- **Rockwood's** customers have gained by implementing CMS as now it is easier for them to manage the requirements of EMS as per ISO 14001.
- The issues related to environmental management at **ABB** are managed by the supplier.

CMS helps the customers to implement voluntary standards like ISO 14001 and improve their environmental performance. This results in reducing their environmental impacts and improving the working conditions within their facility. Companies also gain a good image among their stakeholders by implementing the voluntary standards. Implementing standards like ISO 14001 helps them to have a competitive edge due to good market image and cost savings. Voluntary standards also help the companies to improve compliance with regulations. The relationships between these factors have been traced in Figure 6-3.

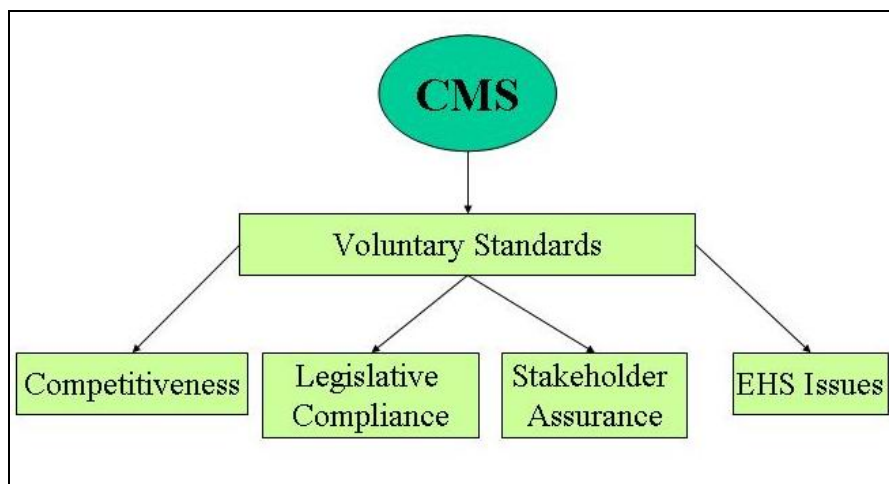


Figure 6-3: Following voluntary standards helps in gaining competitiveness, complying with legislations, assuring stakeholders and meeting EHS requirements.

6.1.6 Real Chemical Management Costs

Identification of total costs related to chemicals has not been found to be a significant benefit of CMS. Identification of true chemical management costs helps the customers in developing the base line of the CMS contracts. None of the contacted companies has commented on the identification of real management and operational costs related to chemicals as an outcome of CMS though it is the basis on which the financial contracts between the suppliers and the customers are made.

6.1.7 EHS Issues

Use of CMS for taking stewardship of chemicals by the suppliers and management of environment, management and safety conditions at the customer's facility has been found to be significant outcome. Managing EHS issues has been a driver for all the contacted customers to adopt CMS. CMS has significantly helped companies in tackling EHS issues. CMS has acted as a tool for suppliers like Castrol, Henkel, Fuji and Quaker to take stewardship of their chemicals and for customers like STMicroelectronics and ABB to reduce their environmental impacts and maintain safer working conditions at the site. The views of some of the contacted companies as mentioned in their questionnaire responses and during telephonic interviews are specified in Table 6-7.

Table 6-7: CMS has helped in managing EHS issues

<p>CMS helps in better management of environment, health and safety issues:</p> <ul style="list-style-type: none">– The most important reason for the customers of Ashland to adopt CMS is the changing EHS requirements (McConachie, 2003b).– Providing CMS has helped Castrol to recycle its products, extend their life and thus reduce wastes from them (Garbett, 2003).– Providing CMS is part of environmental strategy of Fuji as it helps to reduce the chemical load on the environment (Dejonghe, 2003).– CMS provided by Quaker has helped reduce the environmental impact pertaining to chemicals at its customer's facilities (Leech, 2003).– One of the reasons for customers of Castrol to adopt FMS was to tackle EHS issues. These customers were able to better manage EHS conditions once they had FMS in place (Garbett, 2003).– STMicroelectronics has realised that CMS has led to safer working conditions in the plant. It has also helped in lowering the number of accidents (Droulez, 2003).
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The representative from Swedish Plastics and Chemicals Association mentioned, during the telephonic discussion, that CMS helps in reducing the chemical load on the environment (Lundqvist, 2003). Similarly the FECC representative mentioned that renting of chemicals helps in closing the chemical loop (Megen, 2003). The Ministry of Environment, Austria anticipates that CMS will help in reducing the consumption of chemicals and reduce the environmental impacts (Jakl, 2003a). It can thus be synthesized that CMS helps in better management of EHS issues.

It has been well established by various researchers that the companies who are proactively managing their EHS issues have gained a competitive advantage in the market (Porter, Linde, 1995). Better management of EHS issues also provides assurance to the suppliers and leads to compliance with regulations. Considering all this, the relationships between these factors have been traced in the Figure 6-4.

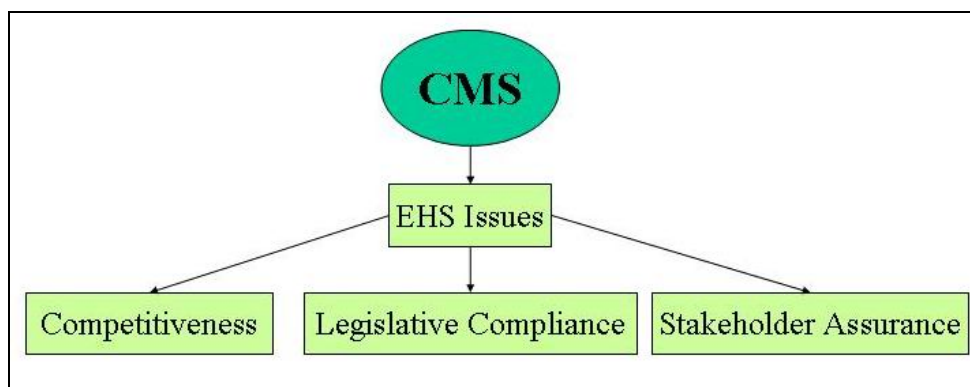


Figure 6-4: Better management of EHS issues helps gaining competitive advantage, meeting legislative requirements and assuring stakeholders

6.1.8 Legislative Compliance

Legislative compliance has been found to be a benefit gained by companies that have adopted CMS. Though all the contacted companies were complying with regulations even before they transitioned to CMS, it helped them with easy ways to access and generate the data required for disclosure. Companies like Quaker, Rockwood and PPG perceive that the increasingly stringent regulations are driving the adoption of CMS by the customers. CMS Customers like STMicroelectronics also perceive that CMS may be useful when the new EU chemicals policy comes into force. The views of some contacted companies have been mentioned in Table 6-8.

Table 6-8: CMS assists in legislative compliance

CMS helps in promoting legislative compliance:

- According to **Quaker**, taxes on waste discharge have increased the acceptance of CMS as it leads to reduction in waste quantities (Leech, 2003).
- If the new EU chemicals policy leads to disappearance of chemicals from the market then the CMS provider can help **STMicroelectronics** in identifying alternative chemicals (Droulez, 2003).
- CMS has helped meeting disposal regulations for customers of **Rockwood** (Brinklow, 2003).
- **PPG** has learnt about various legislations and process requirements and is helping its customers in meeting them (Benson, 2003a).

CMS very well fulfils the requirements of REACH of information transfer according to the representative from Green Alliance and shall help in meeting the EHS requirements (Oldham, 2003). According to the Austrian Ministry of Environment, CMS will help in better compliance management by laying a new ground of understanding regulations (Jakl, 2003a). The Swedish Plastics and Chemicals Association views that CMS will help in better regulatory compliance as the supplier has better know-how (Lundqvist, 2003). CMS thus leads to better understanding and compliance with regulations. By managing and complying with the applicable requirements the customer provides assurance to his stakeholders.

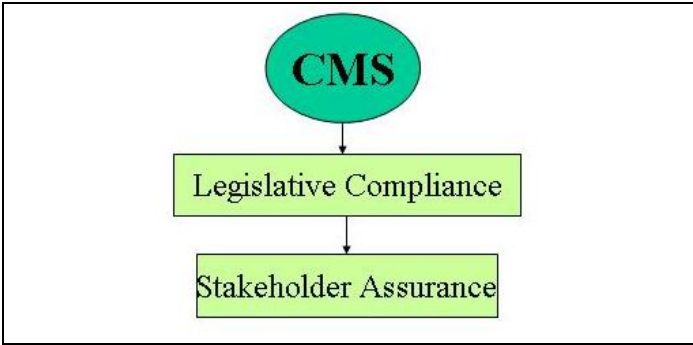


Figure 6-5: Complying with regulations provides assurance to the stakeholders

The relationships between the various opportunities of CMS, identified in this section, have been synthesised in the new revised framework in Figure 6-6. This framework can be used by companies to identify benefits they would gain by transiting to CMS. The relationships between the benefits have been marked by dotted lines. These dotted lines specify how the CMS benefits are related to each other and how gaining one benefit leads to gaining other benefit(s).

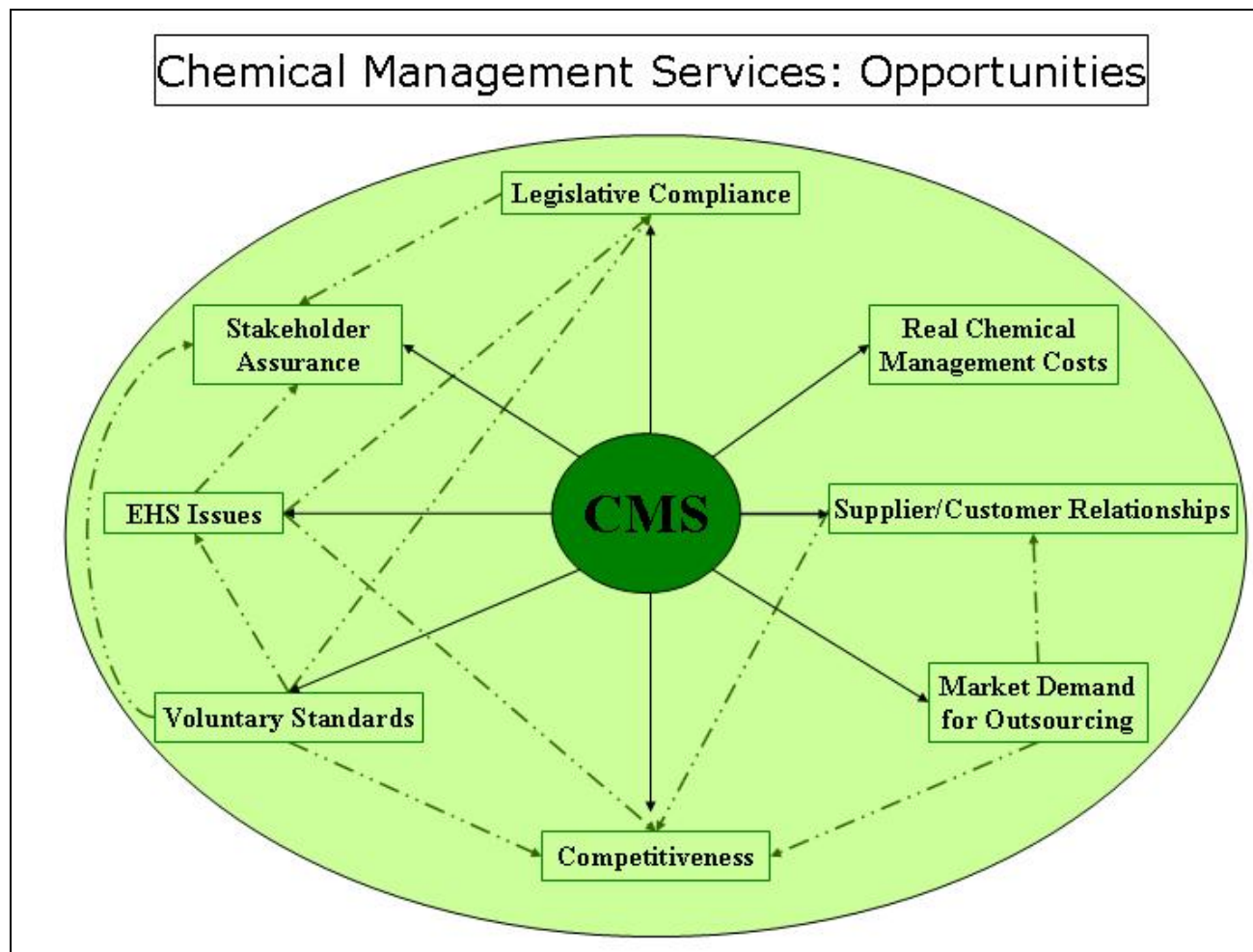


Figure 6-6: Framework to evaluate benefits of CMS

6.2 Barriers

In this section, the barriers faced by the companies either providing or adopting CMS have been analysed using the framework developed in chapter 4.

6.2.1 Adverse Supplier-Customer Relationships

Existence of adverse relationship between the suppliers and the customers wherein the customers do not lay full trust on the suppliers has posed as a significant barrier for companies to transit to CMS. The contacted companies like BASF and Rockwood have mentioned in their questionnaire response and telephonic discussion that it is difficult for the supplier to provide CMS until there are good relationships which promote trust and loyalty. The views of these companies are specified in Table 6-9.

Table 6-9: Adverse supplier/customer relationships are a barrier to CMS

Adverse supplier/customer relationships create a barrier for companies to transit to CMS: <ul style="list-style-type: none">– The customers to BASF are still reluctant to outsource chemical management due to lack of confidence (Lenz, 2003).– The customers do not lay 100 % trust on their suppliers and this is a significant barrier to provide CMS for Rockwood (Brinklow, 2003).
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6.2.2 Lack of Communication and Knowledge on Real Costs

Lack of communication which leads to lack of knowledge on real costs of chemical use has been found to be significant barrier to CMS. These two barriers as suggested by the framework developed earlier have been found to be overlapping. Generally, the purchase department does not communicate effectively with the quality, maintenance, production, and waste management departments and is not aware of the real costs related to chemicals. This leads to a situation wherein the purchase department just focuses on the price offered by the suppliers rather the value added services provided by them. Table 6-10 specifies the views of the contacted companies mentioned during the telephonic interviews.

Table 6-10: Lack of communication & knowledge on real costs are barriers to CMS

Lack of communication & lack of knowledge on real chemical management costs are barriers for customers to adopt CMS: <ul style="list-style-type: none">– According to Ashland, the customer who does not fully understand the costs of chemical management gets an impression that the consumption of chemicals has increased as the bill of value added chemical services is more than the bill of chemicals purchased in a traditional way (McConachie, 2003b).– A barrier to CMS as recognised by DowCorning is that the purchase department of the customers just looks at the price and does not focus on the total cost of chemicals. DowCorning had to change its business strategy owing to this reason and had to untie its products and services.
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6.2.3 Secrecy about Processes

The attitude of customers to maintain secrecy on processes from suppliers and not allow them to participate in the process improvements is another significant barrier faced by the CMS providers. The companies using chemicals are generally secretive about their processes

and do not wish to share their process knowledge even with the chemical suppliers. This has acted as a barrier for the CMS providers to sell chemical services to these users.

Table 6-11: Maintaining secrecy about the processes is a barrier to CMS

Secrecy about the process by chemical users has acted as an obstacle for CMS providers:

- According to **Ashland** the semiconductor industries are very secretive about their processes. This is a significant barrier for the providers to suggest any process improvements. The customer does not lay total trust on suppliers which is another significant barrier (McConachie, 2003a).

6.3 Drawbacks

There are no significant drawbacks, which the companies have faced after transiting to CMS. Most of the contacted companies agree that if CMS is provided and implemented carefully then there are no drawbacks related to it.

6.3.1 Competing with Customers

Competing with customers has not been found to be a drawback of CMS. It is however counted as a potential drawback by the Austrian ministry of environment and some contacted companies. It is anticipated by some companies who plan to transit to CMS that their chemical providers could become their future competitors. This may however be an extreme consequence of CMS and may take place because the CMS providers would gain knowledge about the customer's processes.

Table 6-12: Competition with customers as a drawback to CMS

Competition with the customers could be a potential drawback related to CMS:

- A concern raised by companies in Austria is that the suppliers can become future competitors because of CMS (Jakl, 2003a).

6.3.2 Loss of Control and Depletion of Knowledge

Loss of control and depletion of knowledge has not been found to be a drawback of CMS. Loss of control over the processes and gradual depletion of the process knowledge is a potential drawback which may take place at the customer's end. Adopting CMS may make the customers dependent on the CMS providers. So far no contacted company has realised this drawback. Loss of control and depletion of knowledge has acted as a barrier to CMS rather than a drawback.

Table 6-13: Lack of control and depletion of knowledge as a barrier rather than drawback to CMS

Loss of control and depletion of knowledge has acted as a barrier to CMS:

- The main barriers faced by **PPG** include the fear of customers to lose key controls and job protection at the plant level (Benson, 2003a).

6.3.3 Resistance from Workers and their Lowered Morale

Resistance from workers and lowered morale has been found to be a drawback of CMS. The companies that outsource their activities have faced resistance from the workers who agitate as outsourcing may lead to loss of their jobs. This fear of the loss of jobs further leads to the

reduction in the morale of the work force. Except for STMicroelectronics none of the companies have realised this as a drawback of CMS.

Table 6-14: Resistance from the workers and their lowered morale as a drawback to CMS

Resistance from workers and lowered morale of the workforce is a drawback related to CMS: <ul style="list-style-type: none">– STMicroelectronics has faced resistance from the workers at some of its sites when it was outsourcing chemical management (Droulez, 2003) .
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6.3.4 Single Sourcing

Single sourcing and diminishing of alternative suppliers has not been found to be a drawback of CMS. Single sourcing may be an extreme consequence of CMS but it not been reported by any of the customers that have adopted CMS.

6.4 Additional Barriers and Drawbacks

In addition to barriers and drawbacks portrayed in the framework and confirmed by the companies there are several others barriers and drawbacks which the companies have realised.

An important barrier identified by Quaker and Dowcorning is the diversity in Europe on legislation, cultures, politics which makes it difficult for the chemical suppliers to provide CMS. Another barrier/drawback identified by Castrol and Henkel is the unhealthy competition on price, rather than added value, in the market. According to ABB an important barrier to CMS is the non-existence of suppliers for all the required chemical services. The views of the contacted companies on additional barriers and drawbacks, as mentioned in the questionnaire response and telephonic discussion, are specified in Table 6-15.

Table 6-15: Other barriers and drawbacks faced by the companies

Additional barriers related to CMS:

- There are not enough suppliers for all the desired chemical operations according to **ABB**. The resistance to provide CMS comes from suppliers as it's a change management issue and requires special knowledge (Dejoux, 2003).
- For **Quaker** it is difficult to replicate the US approach in Europe because of differences in political, taxation, language, legislation and geographical situations. Lack of environmental commitment by governments and manufacturers and dedication by companies using chemicals in their processes is another concern (Leech, 2003).
- **DowCorning** finds it difficult to provide services because of the barrier of understanding local regulations, languages and the geographic distances. For managing the chemical wastes some consents are also required to be taken (Makela, 2003a, 2003b).
- The services become commoditised and lose their value when the major players compete on price and not on added-value according to **Castrol** (Garbett, 2003).
- The main barriers for **Fuji** in providing CMS are managing manpower and the costs involved (States, 2003).
- Demonstration of credibility to the potential customers is a barrier faced by **Shell** (Mottershead, 2003).

Additional drawbacks of CMS:

- CMS is being used by some suppliers as a form of price under-bidding leading to ruinous CMS contracts but there are no drawbacks of the program if it is selected carefully by **Henkel** (Rothwell, 2003a).
- Full time employment for providing 24hrs/7days service is a drawback for **Rockwood** as it needs to employ people even at times when it doesn't have CMS contracts (Brinklow, 2003).
- During the initial stages of CMS implementation, there was some interruption in production at **STMicroelectronics** but it lasted for a very short period (Droulez, 2003).

7. Conclusions and Recommendations

CMS is a business model that focuses on efficient chemical use, sound chemical management, legislative compliance and product stewardship. CMS provides a way for companies to reduce their environmental impacts and at the same time make significant profits. In Europe the contacted suppliers and the customers to CMS are quite satisfied with their transition to CMS.

The providers of CMS in the European market tend to be large chemical companies who have the resources to do so. These CMS providers are primarily providing chemical services to automotive and the semiconductor industry. Compensation and cost sharing (gain-sharing) mechanisms are the foundations of CMS and are used by most of the providers as it gives them incentives for efficient use of chemicals.

The most significant driver for uptake of CMS by the customers is the scope of cost reductions. The principal benefits that companies have realised after transiting to CMS include competitive edge, enhanced supplier-customer relationships, better management of EHS issues and generation of data required for regulatory purposes and voluntary standards. It has also been found that CMS may help in meeting the requirements of the new EU chemicals directive. Some of the benefits resulting from CMS are interlinked, with one benefit leading to the other.

A key barrier for implementing CMS is the existence of adverse supplier-customer relationship which results in the lack of trust. Another noteworthy barrier is the clandestine approach of the companies using chemicals who do not want to share their process knowledge with their suppliers. The geographical, cultural and political settings also vary significantly from one region to the other in Europe, making it difficult for companies to replicate the approach followed in USA. There are no major drawbacks related to CMS that could be identified in this research. There are pitfalls though but these can be avoided if the transition to CMS is done carefully.

A contradiction, pertaining to existence of CMS in Europe, in the existing literature on CMS has been identified during this research. According to the literature, CMS is a new concept in Europe which is still in its infancy stage but as witnessed during the conduct of this research work there are several chemical manufacturers which have been providing chemical services in Europe for long. The perspective from which the chemical service models are now looked at has though gone a change, with companies now focussing on environment, health and safety issues.

The frameworks developed during the research can be used by the companies, who want to provide/adopt CMS, to make decisions and know what to expect if they transit to CMS. The companies can use these frameworks as a starting point towards their move to servicizing.

Chemical management services could play a crucial role in reducing the quantity of chemicals used without affecting their utility. It is thus recommended that CMS should be brought under a broader agenda by various government agencies, NGOs and other stakeholders. These agencies and institutions can promote CMS by creating awareness.

This research has identified benefits, barriers and drawbacks of CMS at a macro-level and it is still uncertain if the companies will experience the benefits, barriers and drawbacks

mentioned in this report. It is thus suggested that research be carried on each of these benefits, barriers and drawbacks at a micro-level.

There could also be some negative implications of CMS on the business of small and medium scale enterprises (SMEs). A small chemical supplying company doesn't have the resources to take the responsibilities related to CMS and may face a negative impact. It is thus suggested that research be carried to identify the potential impacts of CMS on the business of SMEs.

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Abbreviations

CEFIC	European Chemical Industry Association
CIA	Chemical Industries Association, UK
CMS	Chemical Management Services
CSP	Chemical Strategies Partnership
EC	European Commission
ECB	European Chemicals Bureau
EEA	European Environmental Agency
EEB	European Environmental Bureau
EHS	Environment, Health and Safety
EMS	Environment Management System
EPA	Environmental Protection Agency
FECC	European Association of Chemical Distributors
FMS	Fluid Management Services
FOE	Friends of the Earth
LMS	Lubrication Management Services
MEP	Member of European Parliament
MSDS	Material Safety Data Sheet
NGO	Non Governmental Organisation
PSS	Product-Service Systems
RC	Responsible Care
REACH	Registration, Evaluation and Authorisation of Chemicals
SHE	Safety, Health and Environment
SMEs	Small and Medium Scale Enterprises
TCM	Total Chemical Management
3PL	Third Part Logistics
OEM	Original Equipment Manufacturer

Appendix I: Questionnaire for Chemical Management Service (CMS) Customers

Contact Information

1. Name of Organisation:
2. Name of Interviewee:
3. Position:
4. Complete Address:
5. Phone Number:
6. Fax Number:
7. Email Address:

Organisation Profile

8. Type of Organisation: (Tick all appropriate choices)
 Individual Facility Multi Facility
 National International
9. Industrial Sector:
10. Division using that uses CMS:
11. For how long is the company buying CMS?
12. Name(s) of the CMS Provider(s):
13. What goods are covered by your CMS program? (Tick all appropriate choices)
 Chemicals Gases Wastes

If others, please specify
14. What percentage of total chemicals used in the plant are taken care for by the CMS provider(s)?
15. A CMS program can include the following list of services. Please mark the services that are included in your CMS program. (Tick all appropriate choices)
Purchasing
 Sourcing the chemicals (identification)
 Procurement (buying)

Inventory

- Receiving
- Inspection and verification
- Testing
- Labelling
- Warehousing

Application

- Movement of chemicals to the application area
- Use

Value added

- Process changes for efficiency

Data Management

- Order tracking
- MSDS management
- Chemical use tracking

Disposal

- Waste handling and collection (inclusive of packaging material)
- Treatment of waste

EHS Services

- Providing data for reporting (related to compliance, EHS Report)
- Safety procedures
- Emergency preparedness and response plan

Additional services:

16. How is the CMS working at your facility?

Company Strategy

17. What was the motive for your plant to go for CMS? (Please put a number in front of the following applicable motives in the order of importance starting from 1; 1 being the most important; Put X in front of those which are not applicable)

- Decrease of risk related to chemicals :
- Employee health and safety concerns:
- Reduce liability:
- Improvement in process efficiency:
- Lower costs related to chemicals:
- Stakeholder assurance (by reduced chemical use):
- Improvement in Supplier/Customer relationship:
- Environmental considerations:
- Others (Please specify and number them):

18. The company implemented CMS as a part of: (Tick all appropriate choices)

- Outsourcing strategy Environmental Strategy

Other:

19. Have there been any pressures from stakeholders (interest groups) for implementing CMS?

- Yes No

If yes, please specify.

20. According to your experience please briefly define the role CMS plays in providing competitive advantage to your organisation?

CMS Providers

21. What influences your plant's decision in selecting the CMS Provider? (Tick all appropriate choices)

- Price Services Provided
 Quality of service Experience of the provider
 Market Image of the provider Other

If other, please specify.

22. What kind of payment mechanisms do you have in your CMS? (Tick all appropriate choices)

- Implementation Fee Management Fee
 Unit Pricing (Price /unit of function) Mandatory Cost Reduction
 Savings of Shared Cost Other

Please briefly describe the basis for your organisation to pay the CMS provider.

23. Please name the major CMS providers that can match your CMS requirements of your plant?

CMS General

24. Does CMS provide you with the opportunity of assuring stakeholders, like shareholders, community, NGOs and media, of your good environmental performance or responsible behaviour? Please explain briefly in what way.

25. Were there any legislative drivers for your company to implement CMS? Which Legislations/EU Directives made an influence on your organisation's decision to implement CMS?

26. What will be the influence of the upcoming new EU Chemicals Directive on your chemical usage? What benefits do you think CMS will provide when the directive comes into force? Please explain your answer in detail?

27. Has implementing CMS resulted in better compliance with the legislative requirements? Please explain how and mention the concerned legislations?

28. Has CMS helped in reducing the costs related to legislative compliance? If yes, Please specify the various legislative compliance costs reduced due to CMS?

29. What kind of change has CMS brought into your relationships (Loyalty/Confidence/Trust etc.) with your chemical supplier? Please explain with reasons.

30. Has CMS given you the opportunity of fulfilling the market demand for environmentally benign products (products with lesser environmental impact during their life cycle)? Please briefly explain your answer.

31. Has implementing CMS resulted in a better/safer working environment in the facility?

Yes No

If yes, please specify the main reasons.

32. Does your company track and measure the performance of CMS?

Yes No

If yes, please specify what do you track and measure in CMS?

33. Please mark the significant benefits realised after implementing CMS in the following list?

Improved inventory management

Improved delivery of chemicals

Improved data management

Improved process efficiency

Reduced costs

Please specify by the percentage reduction in chemical costs for the first three years of implementing CMS.

The reduced costs due to CMS comprises of: (Tick all appropriate choices)

Reduced chemical purchase costs

Reduced chemical handling/management costs

Reduced legislative compliance costs

Reduced costs of waste management/disposal

Please specify if your company realised any other reduction of costs:

34. What are the environmental benefits from the implementation of CMS in your facility?

- a. Reduction in chemical use (please explain):
- b. Elimination of hazardous chemicals (please explain):
- c. Reduction of waste (please explain):
- d. Improved MSDS management (please explain):
- e. Others (please explain):

35. What were/are the main barriers faced by your organisation in implementing CMS?

36. Please specify any drawbacks which your organisation faced because of implementing CMS?

Please provide any other information that you think may be useful in determining the opportunities for CMS users.

Thank you!

Appendix II: Questionnaire for Chemical Management Service (CMS) Providers

Contact Information

1. Name of Organisation:
2. Name of Interviewee:
3. Position:
4. Complete Address:
5. Phone Number:
6. Fax Number:
7. Email Address:

Organisation Profile

8. Type of Organisation: (Tick all appropriate choices)
- Chemical Manufacturer Chemical Management Service
- Distributor Waste Manager

9. Do you have a separate division that provides CMS Services
- Yes
- No

If yes, Name of the Division:

10. What kind of Chemical Management Services do you provide to your clients? Please mark the services that your CMS provides to the clients. (Tick all appropriate choices)

Purchasing

- Sourcing the chemicals (identification)
- Procurement (buying)

Inventory

- Receiving
- Inspection and verification
- Testing
- Labelling
- Warehousing

Application

- Movement of chemicals to the application area
- Use

Value added

- Process changes for efficiency

Data Management

- Order tracking
- MSDS management
- Chemical use tracking

Disposal

- Waste handling and collection (inclusive of packaging material)
- Treatment of waste

EHS Services

- Providing data for reporting (related to compliance, EHS)
- Safety procedures
- Emergency preparedness and response plan

Additional services:

11. Please briefly describe your CMS arrangements.
12. What kind of payment mechanisms do you have in your CMS? (Tick all appropriate choices)
 - Implementation Fee
 - Management Fee
 - Unit Pricing (Price /unit of function)
 - Mandatory Cost Reduction
 - Shared Cost Savings

Other

Please describe briefly how the customer pays your organisation in CMS.

13. For how long has your company been a provider of CMS? (In years)

Company Strategy

14. What was the primary motive of your organisation in being a CMS provider?

15. The company provided CMS as a part of: (Tick all appropriate choices)

Overall business strategy Marketing strategy

Environmental

16. Did the company provide CMS because of demand from its existing customers?

17. Did the company provide CMS because it perceived that there would be a market demand for it?

18. Did the company gain a unique position in the market after starting CMS? What kind of positioning (differentiation) advantage did the company get?

19. According to your experience please briefly define the role CMS plays in providing competitive advantage to your company?

20. Does your new role of CMS provider make you less imitable by the competitors?

21. Where do you realise the most growth in CMS opportunities?

Existing Customers New Customers

22. Has there been relatively less competition in the field of providing chemical services as compared to selling chemicals?

CMS Customers

23. How many customers do you have for CMS?

Number of organisations:

Number of facilities:

24. Please define the percentage of new customers (customers gained after introducing CMS) and old customers (customers existing prior to introducing CMS) in the customer base for CMS?
% of New Customers:

% of Old Customers:
25. What percentage of old customers switched to CMS after the introduction of CMS by your organisation?
26. What kind of change has CMS brought into your relationships (Loyalty/Confidence/Trust etc.) with your customers? Please explain with reasons.
27. Which sectors do your CMS customers belong to? Please list the sectors in a descending order as per the number of customers?

CMS Business

28. Has there been a noticeable change in the business growth after the introduction of CMS? Can this change be attributed to CMS? Please specify.
29. Please give an estimate of the present and expected growth rate of CMS business:
Growth rate in the present year:

Expected growth in the following year:
30. What are your organisations main profit drivers? Please define the order.
 Cost of products sold Cost of services sold

 Savings/Gain Share Other

If others, please explain.
31. What are the main economic incentives for your company to provide CMS?
32. Does your organisation use CMS as a tool to take responsibility of its chemicals? Do you think CMS is a way by which chemical companies can hold responsibility for their chemicals during their life cycle? Please briefly state your views.
33. Have there been any pressures from stakeholders (interest groups) for providing CMS?
34. Does CMS provide you with the opportunity of assuring stakeholders, like shareholders, community, NGOs, media, of your good environmental performance or responsible behaviour? Please explain briefly.

35. Were there any legislative drivers for your company to go for CMS? Which Legislations/Directives made an influence on your organisation's decision to provide CMS?
36. Does your organisation see the upcoming of New European Chemicals Directive as an opportunity for CMS providers? Please explain what opportunities can this new directive provide and how?
37. Does the environmental liability get transferred to the CMS provider in your CMS model?
38. Are there any legislative barriers in providing CMS in your case?
39. What opportunities did the company expect before providing CMS?
40. What opportunities did the company utilise after providing CMS?
41. Please arrange the following opportunities of CMS as per their degree of importance for CMS providers? (Put a number in front of the opportunity starting from 1, 1 stands for the most important) Make any additions/deletions if required.
- Competitive advantage (Unique position in market)
 - Legislative advantage
 - Meeting demands of clients
 - Stakeholder assurance
 - Economic incentives
 - Supplier/Customer relationship
 - Environmental Image of organisation
42. What are the main barriers faced by your company in providing CMS?

Please provide any other information that you think may be useful in determining the opportunities related to CMS.

Thank you!

Appendix III: List of the contacted companies providing/adopting CMS in Europe

<u>Providers of CMS</u>	<u>Customers of CMS</u>
Ashland Speciality Chemicals Company	ABB, Switzerland
BASF Coatings AG	STMicroelectronics, Europe
Castrol	
DowCorning	
Fuji Hunt Photographic Chemicals NV	
Henkel Technologies	
PPG Industries	
Quaker Chemical Corporation	
Rockwood Chemicals	
Shell Services	

Appendix IV: List of Interviewees

<u>Providers of CMS</u>	<u>Customers of CMS</u>	<u>Stakeholders</u>
Mr. Albert Brinklow, Rockwood Chemicals	Mr. Pascal Droulez, STMicroelectronics	Dr. Hans Out, Director General, FECC
Mr. Brian James Rothwell, Henkel Technologies	Mr. Fabrice Dejoux, ABB	Mr. Henrich Van Megen, FECC
Mr. Sandy McConachie, Ashland Speciality Chemicals Company		Dr. Thomas Jakl, Ministry of Environment, Austria
Mr. Patteri Makela, Dow Corning		Mr. Paul Hodges, Chairman, International E-Chem
Mr. Walter Dejonghe, Fuji Hunt Photographic Chemicals NV		Ms. Jennie Oldham, Policy Advisor, Green Alliance
Mr. Andy Benson, PPG Industries		Mr. Greger Lundqvist, Swedish Plastics and Chemical Association
Mr. Borje Kronström, Svenska Shell AB		

Appendix V: Stakeholders in the European Chemical Industry

POLICY MAKERS/INFLUENCERS

- **European Commission (EC):** EC is responsible for making and implementing the policies at the European level.
- **European Environmental Agency (EEA):** EEA is responsible for providing data to policy makers so as to enable them to make informed and timely decisions to protect the environment and promote sustainable development. EEA is itself not involved in any kind of policy making or implementation of it but is involved in providing data on the state of the environment to the public and the policy makers.
- **European Environmental Bureau (EEB):** EEB is the federation of NGOs dealing with the protection of the environment in Europe. EEB plays a role in influencing the formation of various legislations.
- **European Chemicals Bureau (ECB):** ECB is the centre of Europe for data and the assessment procedures on dangerous chemicals. It provides data and procedures on various issues related to dangerous chemicals.
- **National Environment Ministries:** The environment ministries are responsible for the formation and implementation of environmental regulations at the national level.

INDUSTRY

- **CEFIC:** CEFIC is the European Chemical Industry Association. The European chemical industry voices its opinions through CEFIC at the international level. CEFIC represents around 40 000 large, medium and small scale companies and national chemical industry associations of 25 different European nations. CEFIC's mission as mentioned on its website is to "To maintain and develop a prosperous chemical industry in Europe by promoting the best possible economic, social and environmental conditions to bring benefits to society with a commitment to the continuous improvement of all its activities including the safety, health and environmental performance".
- **FECC:** FECC is the European Association of Chemical Distributors. The main objectives of FECC are monitoring and influencing European legislation, promotion of the chemical distribution industry and promotion of responsible care. FECC coordinates activities with relevant industry organisations at the European (e.g. CEFIC) and national levels. FECC has several working committees two of which are for Responsible Care (RC) and Safety, Health and Environment (SHE).
- **National Industry Associations:** Each and every country has its own chemical industry association. These chemical industry associations voice the opinions of the chemical industry in their respective countries. Chemical Industry Association (CIA) of UK has voiced its opinion on CMS.

COMMUNITY (NGOS)

There are several NGOs in Europe who are working in the field of chemicals. The author contacted WWF, Green Alliance and Friends of the Earth regarding CMS. Green Alliance was the only NGO, among those contacted, who was working with CMS.

Appendix VI: Additional Cases on CMS in Europe

DOWCORNING

DowCorning is a chemical manufacturing company which provides chemical services to its clients in addition to products. In Europe, DowCorning has facilities in Belgium, Italy, UK and Germany. The organisation is providing chemical services to its clients since last year and a half (Makela, 2003a).

Modules in CMS

The chemical services provided by DowCorning include (Makela, 2003a, 2003b):

- Data Management: *MSDS management*
- EHS Services: *Product safety assessments, Chemical registrations, Toxicity/Eco-toxicity and Chemistry testing, SAP EHS consulting and analytical testing*

DowCorning makes short and long term contracts with its clients for specific projects. The organisation makes two kinds of contracts with its clients namely implementation fee and unit pricing (price/unit of function). The primary motives of DowCorning to become a CMS provider included:

- Repositioning of DowCorning brand
- Growth through services and solutions &
- Leveraging in-house capabilities to a large client base

The clients of DowCorning include chemical industries, process industries and personal/household-care industries. There are no legislative drivers for DowCorning to provide CMS to its customers.

Opportunities

DowCorning used to provide chemical services to its clients free of cost in the past but now it has unbundled its products and services and has given the choice to its customers to pay only for the services they require (Makela, 2003b).

The benefits realised by DowCorning after being a service provider include (Makela, 2003a, 2003b):

- Meeting exact customer demands
- Repositioning of DowCorning brand
- Unique and inimitable position leading to competitive advantage

- Development of confidence and trust among the customers
- Improvement in supplier/customer relationship

The company feels that CMS does not really provide any additional assurance to the stakeholders about the company's environmental performance. The company sees CMS as a way of outsourcing. DowCorning foresees that if the new chemicals policy is implemented as mentioned in the draft version it could bring opportunities related to chemical registrations and regulatory testing services (Makela, 2003b).

According to DowCorning, the responsibilities related to chemical management are generally spread across different parts of the customer's company. The procurement department of these companies does not focus on the total cost of chemicals and tends to buy chemicals as cheaply as possible. The more value a supplier adds to its chemical products the more expensive they become, thus making it difficult for the supplier to sell them. This was one primary reason for DowCorning to have the current business model wherein it has unbundled a lot of services from the products and given a choice to the customers to choose the service and pay accordingly (Makela, 2003a).

DowCorning perceives that REACH may build the ground for uptake of CMS. If REACH comes in force, the chemical users, especially those for whom chemicals are essential for processes but handling them is not their core competence, may start outsourcing to CMS providers (Makela, 2003a).

Barriers

The main barriers identified by the company for providing chemical services include understanding of local regulations, language complexity and geographic distance which complicate the service delivery and make it difficult to meet the needs of the customer. For becoming a total chemical service provider and providing services like waste management there are also some national qualifications. Dow Corning is not able to manage the disposal phase because of such reasons (Makela, 2003b).

FUJI HUNT PHOTOGRAPHIC CHEMICALS NV

Fuji is a manufacturer, chemical service provider and distributor of photographic chemicals. Fuji is providing CMS to its clients since last 15 years. The company has, since its inception, sold products along with the technical services. Fuji's primary motive for providing CMS was to offer added value with its products (States, 2003).

Fuji provides CMS to its clients primarily as a part of its business strategy. Providing CMS also lies under the purview of its environmental strategy as it leads to reduction in the chemical load (States, 2003).

The photochemical market in Europe has three major suppliers Fuji, Alfa, Kodak, and some small local suppliers. These three major suppliers have brought most of their customers which means that they are vertically integrated with them, though there are some independent customers who buy at their own will. Fuji supplies chemicals both to its integrated customers as well as independent customers (Dejonghe, 2003; States, 2003).

In the past there were bigger customers in the photochemical market in today's comparison. Some of these big customers still exist and have very good technical staff. These customers generally do not share their process knowledge with the suppliers. Presently, the market has changed to smaller customers with smaller machines that do not have technical staff. The customers treating emulsions on the smaller machines come to Fuji so as to avoid all the technical problems (Dejonghe, 2003).

Modules in CMS

The chemical services provided by Fuji include (States, 2003):

- Purchasing: *Identification, Sourcing and Procurement of chemicals*
- Inventory: *Receiving, Inspection and verification, Testing, Labelling, Warehousing*
- Application: *Movement of chemicals to the application area*
- Value Added: *Process changes for efficiency*
- Data Management: *Order tracking, MSDS management, Chemical use tracking*
- EHS Services: *Safety procedures*

Fuji offers "auto replenishment" to its clients i.e. Fuji controls the stock and delivers chemistry when and wherever required. Fuji also offers its customers advanced services such as chemical audits, checks for incoming materials to outgoing finished products and advises the customer on optimising inventory control, chemical handling, safety on the production floor, process optimisation, waste generation charts etc (States, 2003).

Contracts

Fuji has two kinds of contractual mechanisms for its CMS namely implementation fee and unit pricing (States, 2003).

Opportunities

Customers who want to reduce their environmental load come to Fuji. Fuji is able to sell to such customers only for the reason that it provides chemical services. Customers to Fuji are large photofinishers, prolabs and minilabs (Dejonghe, 2003).

Some of the major benefits realised by Fuji as a chemical service provider include (States, 2003):

- Exceptionally well perceived reputation of being “Professionals”
- Unique positioning in the photo-chemicals market
- Offering of a wide range of services
- Strengthened relations with the customers
- Replacement of hazardous chemicals with non-hazardous chemicals
- Enhanced market image because of green policies

Fuji has faced relatively lesser competition in the CMS arena though some companies have now started offering similar services (States, 2003).

Fuji has observed a noticeable change in the business growth due to excellent reputation of its technical services. According to Fuji, taking full responsibility on chemistry at the customer’s production floor helps in controlling chemical performance and in keeping up with the latest technological developments (Dejonghe, 2003).

Barriers

The main barriers according to Fuji for providing CMS are the manpower and costs involved (States, 2003).

In the photochemical market the customers generate huge amounts of chemical wastes. Only a part of this waste can be recycled. Fuji supplies its customers with all the chemicals that they need to recycle the waste but is not able to participate in the treatment process as it also involves treatment of emulsions from other suppliers like Kodak, Alfa (Dejonghe, 2003).

PPG INDUSTRIES

PPG Industries, a chemical manufacturing company provides CMS through its business unit, Optima Solutions, to the automotive industries. The Polish unit of PPG, PPG Industries Poland Sp z.o.o has been providing CMS for the last five years (Benson, 2003c).

The primary motive of PPG Industries to be a CMS provider was to differentiate from the competition. PPG provided chemical services as a part of its overall business and marketing strategy as it perceived a market demand for CMS (Benson, 2003a, 2003c). There were neither any legislative drivers for PPG to provide CMS, nor there are any government initiatives that support the provision of CMS by PPG (Benson, 2003c).

Modules of CMS

The chemical services provided by PPG include (Benson, 2003c):

- Purchasing: *Identification of chemicals, Sourcing the chemicals, Procurement*
- Inventory: *Receiving, Inspection and verification, Testing, Warehousing*
- Application: *Movement of chemicals to the application area, Application of materials at the customer's site*
- Value Added: *Process changes for efficiency, Process management*
- Data Management: *Order tracking, MSDS management, Chemical use tracking*
- Disposal: *Waste handling and collection (inclusive of packaging material), Treatment of waste*
- EHS Services: *Providing data for reporting, Safety procedures, Emergency preparedness and response plan., Operation of the water house*

Contracts

In its CMS contract in Poland, PPG charges a management fee fixed as per the scope of the work. PPG is paid a monthly fee for the agreed amount of work and that fee is not linked to volume of chemicals used (Benson, 2003c).

Opportunities

The benefits realised by PPG Poland after being a service provider include (Benson, 2003b, 2003c):

- Enhanced relationship with customer
- Meeting exact customer requirements
- Offering customers a wider portfolio
- Competitive advantage from differentiation leading to more business opportunities

- Strong position in the market
- Assurance to stakeholders

PPG is now involved as a business partner with its clients. PPG representatives participate in all the director meetings and are a part of the decisions made at the customer's plant. PPG officials are also involved in the safety meetings at the client's site (Benson, 2003a).

Providing CMS has helped PPG to understand import requirements, local regulations and process requirements which further helps in providing suitable services to the customer allowing him to just focus on his core business.

Enhanced relations with the customers have enabled PPG to put long term contracts in place (Benson, 2003c). According to PPG, a crucial benefit for the CMS customer is that the service provider deals with the concerned regulations. The customers buy CMS from PPG as they believe that the PPG understands the chemistry involved and has competence in management of chemicals (Benson, 2003c).

Barriers

The main barriers faced by PPG in providing CMS are the fears of the customers to loose key skills/control and job protection at the plant level (Benson, 2003c).

ROCKWOOD CHEMICALS

Rockwood is a chemical manufacturer and a CMS provider. Rockwood provides CMS because of the demand from its customers who want to implement CMS for cost savings. In terms of legislation, there are no drivers for Rockwood to provide CMS (Brinklow, 2003).

Contracts

Rockwood looks at customer's processes and cost savings as soon as it starts providing CMS. The company feels that CMS provides a win-win situation for itself as well as the customer. Rockwood takes a proportion of the savings it makes at the customer's site (Brinklow, 2003).

CMS has extended the liability of chemicals for Rockwood. There has been no stakeholder pressure on Rockwood to provide CMS. According to Rockwood, the government is not playing a direct role in implementing CMS but the presence of strict rules, continuous monitoring, and stringent effluent standards is promoting the adoption of CMS by the customers (Brinklow, 2003).

Opportunities

Rockwood helps in cost savings and participates in process improvement meetings with its customers to reduce chemical consumption. Rockwood has gained a competitive edge and unique positioning by being a supplier of CMS. The customers now look at Rockwood as a more credible long term partner in terms of the chemical supply. Providing CMS has helped Rockwood in improving its economics and has made it more competitive. The price pressure on chemicals in the industry is too much and margins are decreasing rapidly. In such a situation, Rockwood has maintained its profitability by offering chemical services (Brinklow, 2003).

CMS has helped Rockwood to provide assurance to the government and community. The customers are also better convinced of Rockwood as it now takes care of the life cycle of the chemicals. The main driver for the customers of Rockwood to adopt CMS is the cost shifting, bonuses and shift in liability (Brinklow, 2003).

Rockwood takes over the responsibility for safe disposal, procedures and documentation related to chemicals. CMS has thus helped Rockwood's customers in meeting the requirements of the ISO 14001 environment management system standard and the regulations related to waste disposal (Brinklow, 2003).

Drawback

For providing chemical services Rockwood has to employ staff for 24 hrs/7 day coverage. At times when there are not enough CMS contracts, maintaining this staff becomes a burdensome task for Rockwood (Brinklow, 2003).

SHELL SERVICES

Shell is involved in the chemical business as a manufacturer, CMS provider and distributor of chemicals. Shell has a separate division, Shell Services, which provides Fluid Management Services (FMS). Through its service division, Shell takes full responsibility of running and maintaining a customer's unit. Shell has been providing FMS for the last 15 years to its customers. Shell Services is an early start up and has been providing CMS only for last 2 years (Mottershead, 2003).

FMS/CMS is the standard part of Shell's integrated asset management services, where the company diagnoses areas for improvement in terms of production, equipment maintenance & reliability, design, implementation and ongoing maintenance services.

Shell provides FMS as a part of its overall business and marketing strategy. Auto manufacturers, auto component manufacturers, industrial machining industry, mining industry, metal industries form majority of customers to Shell Services. This service unit handles the customer requirements and it is expected to grow significantly in the future (Mottershead, 2003).

Modules of CMS

The CMS provided by the company includes the following services (Mottershead, 2003):

- Purchasing: *Identification, Sourcing, Procurement of chemicals*
- Inventory: *Receiving, Inspection and verification, Testing, Labelling, Warehousing*
- Application: *Movement of chemicals to the application area, Usage of chemicals*
- Data Management: *Order tracking, MSDS management, Chemical use tracking*
- Disposal: *Waste handling and collection (inclusive of packaging material), Treatment of waste*
- EHS Services: *Providing data for reporting, Safety procedures, Emergency preparedness and response plan.*

There were no specific legislations which drove Shell to provide FMS to its clients. The liability of any accidents and incidents largely depends on the work being carried out by Shell Services. According to Shell, providing chemical services requires careful consideration of SHE requirements (Mottershead, 2003).

Contracts

Shell Services makes combinations of several contracts namely implementation fee, management fee, unit pricing (price/unit of function), mandatory cost reduction and shared cost savings based on the needs of its customers. The main profits for Shell Services are derived from gain share (Mottershead, 2003).

Opportunities

The primary motive of Shell to become FMS provider was to increase the sources of revenues and improve the customer retention. There was a demand from the customers which motivated Shell to provide FMS. Shell was also under pressure from the lubrication clients to provide FMS (Mottershead, 2003).

According to Shell, in the lubricant market the traditional business is not growing. Thus, providing services is a way for business growth. There is a need to apply new concepts of not only selling products and related know-how but also maintenance. Shell clearly foresees a growth potential for services in the market (Kronström, 2003a).

Shell did not gain any unique position in the market by providing FMS as most of the major oil companies were already doing it. Shell had to provide FMS as fluid management has become a table-stake for major companies. The differentiation of Shell Services comes through integrating a wide range of services. There are many specialist service providers as well as major oil companies who are providing FMS. A quarter of Shell's customers switched to FMS once it became a service provider. Shell Services perceives that the customer retention time will increase because of FMS (Mottershead, 2003).

Some of the major benefits realised by Shell Services include (Kronström, 2003b; Mottershead, 2003):

- Meeting demands of clients
- Assurance to stakeholders
- Economic benefits

Barriers

The main barrier faced by Shell Services is to demonstrate credibility to its potential customers (Mottershead, 2003).