Value Creation through Services in Manufacturing Cluster
A Case Study in the Paper Province

Master thesis with 30 credits
Service Science
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Abstract

Manufacturing and service were two distinguished industries in traditional economy theories. With the development of academic and economic, the connections and intersections of these two emerged. The service infusion in manufacturing did affect the industry dramatically. When economic agglomeration phenomenon appears in industries, manufacturing clusters are formed up. Following service infusion in manufacturing clusters will be dynamic and stereoscopically. The research on service manufacturing were mostly focusing on the company level not over industry and cluster. An empirical case study was become valuable and useful to conduct. This paper did an investigation in The Paper Province which is an outstanding and traditional pulp and paper cluster in Region Varmland, Sweden. The case study investigated few representative companies and other institutions, organizations in region Varmland. By analyzing the results in four themes, this paper gave initial results and few discussions. The investigation shows this cluster is a product-oriented cluster with significant service infusion. The cluster was mapped and an extended value chain for value creation through service which was identified as linkage between entities in this cluster.

The introduction illustrates the background and research questions of the paper. Following theoretical framework reviews the literatures and books in three systems: cluster theory, service concepts and value creation. After presenting the case, an analysis is conducted in four themes: service offering, service marketing management, co-operation model and cluster mapping. In the last part, it will summarize the study results and raises few discussions.

Key Words: service manufacturing, service infusion, value creation, manufacturing cluster
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   Service VP, Metso Fiber Karlstad AB  
   President, Metso Fiber Karlstad Service Center AB

Leif Forsberg  
Senior VP, Metso Paper Tissue Business Line

Mikael Nyman  
Business Manager, Metso Paper Karlstad Service Center AB

Joakim Johannesson  
SOMAS Business Developing Manager

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Vice President, Energy Square

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1. Introduction

1.1. Research background and purpose

When district manufacturers were agglomerating, manufacturing cluster emerged. With the development of the industries and economics, services are more and more involved into manufacturing process and business area. Either in the geographic agglomeration or value-chain formed cluster, the importance of services’ connection with the entities in cluster is emerging.

In global competition environment, it is common for manufacturers to transit into service providers. First of all, the transition usually captures more profit than normal product selling and manufacturing. Moreover, the differentiation of product and service offering certainly improved the manufactures’ competitiveness. Some companies had focused on their core business which are their strength such as IBM and Ericsson focusing on their research and service business, peel off or outsource the manufacturing. Other examples can be Volvo, ABB, Scania, etc. These successful transitions from manufacturers to service providers had become business cases which influenced either academic or business world. Furthermore, these companies obtained high acknowledgement from customer and industry, while apparently, they retrieved remarkable numbers on the financial statement.

The service infusion in pulp and paper industry is another story. First, since pulp and paper industry is highly capital-intensive, most services providing have been based on the product sales and equipment installation. Then, the demand of paper declined greatly last year, which results in the reduction in the sales directly. Service income might change the predicament in this situation. Actually, this happened in Metso Paper last year. The service income performed from their previous large installed base and production line kept the whole company’s profit at a significant level. Finally, besides paper mills and machinery manufacturers, there are thousands of sub-suppliers spreads over the region, which are mostly SMEs and an important part of cluster. These firms rely on the supply chain and offer less even no services. The transitions over these firms are rare. Meanwhile, the SMEs competitiveness and research resource accessibility may vary and are weaker than bigger groups inside or outside the cluster. These reasons affected the development of service in this industry as well as regional economic development in some circumstances.

The pulp and paper industry in region Varmland had been recognized as a successful cluster over the world. First of all, in Europe, cluster initialization and development had been put on the governors’ agenda. The European cluster observatory project managed by the Center for Strategy and Competitiveness (CSC) at Stockholm School of Economics present a clearly development of cluster in the whole Europe. Most areas launch regional cluster in policy-oriented. Cluster programs in continental, national and regional are carried out for stimulating economic development. Secondly, the reasons for pulling out clusters by governors are agreed and promoted by academies. Clustering effects certainly has improved the district competitiveness. The investment and governing in regional clusters benefit not only the main players in the cluster,
but also the SMEs. Cluster organization and other facilities coordinate all the entities in the cluster that becomes a dynamic group. At last, as one of most recognized cluster in Europe, the Paper Province brought out an innovated development way in cluster development and management. In this successful story, service made rather important contributions.

This thesis is aiming to discover and explore the role of service in manufacturing based cluster. This research restricted in the pulp and paper cluster in central Sweden. According to the Paper Province, officially, the cluster region covered Värmland, northern Dalsland and Närke in central Sweden. With the development of this pulp and paper cluster, the service is becoming an increasingly important actor on this stage. Most manufacturers had realized the advantages and benefits of developing services as extent business, which results in basically competitive advantage. Moreover, within this cluster, service is always the hot topic for discussion between each entity. Apparently, service is linking each other inside this cluster and becoming a core element for business development. The pulp and paper industry would not sell only the products and technologies. Within this background, the exploration of service roles and activities in this cluster is becoming valuable either in business or academic.

1.2. Research question

The main research question will explore the service role and the value creation through service in this manufacturing cluster. Narrowed question can be described as: Can services replace the value chain for value creation and link the entities to each other in manufacturing clusters?

The whole research framework will expand as following questions:

1. What services are offered by the manufacturers in this cluster? What role of service is in manufacturers? How services are managed and create value for their customers?

2. What is the role of service in this cluster? How does the value chain in this cluster form? What’s the process for value creation through the value chain?

1.3. Contributions and value

This thesis absorbed previous research conclusion, reviewed the literature and analyzed into practical as case study. The pulp and paper cluster around Varmland is still product-oriented cluster and focusing on production development. The mapping of the cluster will be helpful for academic research and business administrative.

1.4. Thesis structure

There are six chapters in this thesis:
Chapter one introduces the background of this study, research questions, limitations and contributions.

Chapter two illustrates the methodology of the thesis. It explains the reason to use empirical investigation and how the methods are used.

Chapter three reviews the theories related to the research, covering the cluster theories from different scholars and methods, the service basic theory, service dominant logic, updating service manufacturing research, value creation and value chain theory.

Chapter four presents the case studies which the base on research questions. The case shows three business lines and their services from Metso Paper, sub-supplier SOMAS which mainly produce valves, and other information about the cluster organization in The Paper Province and other facilities.

Chapter five examines four steps analysis on the case: product and service offering, keeping customer promise, co-operation models, and mapping the cluster by extend value chain.

Chapter six briefly discusses and summarizes the value creation through services in manufacturing cluster.
2. Methodology

This thesis mainly uses empirical investigation on case study with qualitative inductive exploration and interpretation to reach the conclusion. By investigating the pulp and paper cluster in region Värmland, Sweden, this thesis made an exploration study in manufacturing industry and manufacturing based cluster. Theoretical framework was conducted based on the literatures, articles, cases, and business reviews from academic research database and service science courses in Karlstad University. Besides structured interview, secondary data collected from websites, brochures and other press will group up the materials for overall analysis. In order to collect the data and conduct the case study, structured interview was mainly used to ensure the reliability and validity.

2.1. Research method

Firstly, the main theme of this research is case study as empirical investigation. A case study can be conducted in a single organization, a single location, a person or a single event for exploration and induction. A case study was defined as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.” (Yin 2008). The paper and pulp cluster in region Värmland is one of the most successful the manufacturing cluster in Sweden and Europe. The case study in this cluster represents the general manufacturing cluster phenomenon. As well, case study was suitable for varied types of investigations and methodologies (Yin 2008; Stake 1995; Tellis 1997).

Secondly, in purpose of exploring the cluster and phenomenon over the cluster, this thesis chose inductive reasoning to do a case study in region Värmland. This thesis tried to explore and conclude the relationships between entities and the service role in manufacturing clusters by observing one cluster. Induction was helpful to investigate the existence and formation of organizational subcultures. “rather than hypothesizing about subcultures and their locations a priori, an inductive research methodology was chosen so that unknown groupings could emerge” (Sackmann 1992). From the phenomenon observation and findings in appearance, the whole thesis will reason the manufacturing cluster characteristics in role and angles of services. The reasoning process followed the inductive approach.

Third, distinguished from quantitative research method, qualitative research concerned with words rather than numbers (Bryman & Bell 2007). As a qualitative case study research, this thesis conduct structured deep interview and analysis these “words” data to reach the conclusion. Bryman (2007) illustrated qualitative research steps as: 1) general research questions; 2) selecting relevant site and subjects; 3) collection of relevant data; 4) interpretation of data; 5) conceptual and theoretical work; 6) writing up findings and conclusions. Compared with quantitative research, this thesis chose qualitative as the specifications of research purpose and questions with suitable research structure.

Alternatively, a questionnaire was conducted with more than 20 questions, in which tried to
investigate the cluster and conduct an index in quantitative method. In additional, selected interviews were planned as supplements. Limited to research time and accessibility, the initial research plan hadn’t been carried out. Structured deep interview in selected companies which represent different factors in the value chain and the clusters were carried out as follow.

2.2. Research design and data collection

Initially, a system theoretical research was conducted as the analysis toolbox. Based on the knowledge obtained from the courses of service science in Karlstad University, the exploration in public academic data base and joining the seminars in CTF or other facilities provided complement knowledge for me. During the theoretical framework constructing, the discussion with advisors, other professors and classmate certainly assist me certainly.

Structured deeply interview

All interviews were conducted in face to face interview. The cluster organization The Paper Province classified the member companies according to their business type: paper line suppliers, paper mills, upstream equipment suppliers, consultants, etc. Original plan was arranging at least one interview in each company class. Especially for manufacturers, there was a prepared question list for interviewees. In additional, the other supporting clusters in region Varmland were considered into the interviewee scale. Due to the limitation of time and other reasons, finally there were five interviews taken as follow list:

- SOMAS
- Metso Fiber business line
- Metso Paper business line
- Metso Tissue business line
- The Paper Province

The interviews taken in The Paper Province had captured more information than the organization itself, in which covered other organization information (The Packaging Greenhouse, The Packaging Arena) and some useful information provided by government Region Varmland. All the structured interviews in Metso and SOMAS were followed a question list which will be provided in appendix of thesis. The factors influenced the quality of structured interview is choosing enough and right people to interview. Somehow, in this research, the number of interview was limited. I tried to interview the right people for ideal results. All three interviewee in Metso are high level manager and vice president in their own business line, two from who are service center managers. By choosing the right people in limited of numbers, this research tried to capture a wider perspective of the case phenomenon and ensure the reliability and validity.

In order to improve the interview quality for lower risk and more useful information, each interview was reviewed and transcribed after few hours of taking the interview. Respecting of interviewee, the permission of voice recording will be brought out in very beginning of each interview. By transcribing the interview content and reviewing, the following interview could be
improved by asking more and right questions, reasonable order and others.

Besides, the other way for secondary data collection includes website press, newspapers press, brochures providing by companies, The Paper Province and government. Firstly, the online database of Metso Paper which is available for public is extremely helpful for the case presentation, as well as their annual report and online press. Moreover, useful information is collected from the websites of cluster organizations (The Paper Province, The Packaging Arena); governments (Region Varmland, Kommun Karlstad); investment agency and other NGOs like INNOVA. Secondly, some brochures collected during the interview and other ways did provide useful data. Especially the “Varmland Model” and “The Paper Province” present vivid mapping of cooperation model in Region Varmland and the cluster.

With the combination of data collection, the satisfied and reliable theoretical framework and case body will be conducted for following reasoning and analysis.

2.3. Reliability and validity

Reliability and validity of a case study research depends on how the data of the case is collected, illustrated, analyzed and interpreted. Generally, quantitative researchers concern these important criteria to establish and assess their research. The discussion for adapting reliability and validity for qualitative research is still ongoing. Bryman (2007) introduced alternative criteria for evaluating qualitative research as credibility, transferability, dependability and conformability. As well, case study researchers also argued the reliability and validity suitable in which pros from Yin (2008) and cons from Stake (1995). Somehow, this thesis will try to adapt these two traditional criteria for research evaluation.

**Reliability**: Mainly concerned in quantitative research, reliability refers to the question of whether a measure is stable or not (Bryman & Bell 2007). When adapted into qualitative research, the evaluation of research changed in different usage as well. As Yin (2008) claimed, the reliability of a case study is minimizing errors and biases. In this case, reliability could be enhanced by increasing the number of people interviewed, increasing the saturation in the answers and triangulation which entails using more than one method or data source.

In this thesis study, errors and biases are unavoidable under the situations of master thesis accessibility. Particularly, this qualitative case study with empirical investigation is aiming to understand the phenomenon and interviewees’ opinions and experience. In this study, I tried to interview the “right” people to get “comprehensive” answers for ensuring the data reliability. During all the interviews, another interviewer was involved as well as the voice record of the interview for ensuring the reliability of data. Besides, the other data collected from brochures, newspapers, journalists and academic database were sourced and examined as much as possible. The case interpretation and analysis tried to accord the sources and data in systemized and precise description and inductive reasoning. The others would be explained in the research design and data collection.
Validity: The validity will cover the internal validity which connect the observations and theories to reality, and external validity which refers to generalize to social settings (Bryman & Bell 2007). As well as reliability, the usage of triangulation will certainly improve the internal validity (Yin 2008). Regard as qualitative studies, the interviewee selected from the cluster should be on the right positions where could represent the companies’ and organization’s value and culture. Alternatively, pursuit in validity is not only on the “quantity” of interviewee but also the “quality”. Since the main data collection method of this research is interviews, the depth of interviews certainly defines the internal validity of thesis. Somehow, when structured questions were asked to the interviewees in Metso Paper, few information and answer were same perceived from interviewees in some circumstance. Also, there is a risk at selecting more appropriate interviewees for more accurate answers. Definitely, there were more kinds of ways and methods to conduct the study. Due to time and other aspects, deep interviews with triangulation ensured the internal validity of this research.

External validity refers to the generalization of social settings. Choosing the representative manufacturing cluster “The Paper Province” in Sweden can be generalized over the Nordic and Europe manufacturing industry even worldwide. As one of most innovation-oriented cluster in Europe, this paper and pulp cluster could certainly present the service infusion and value co-creation in manufacturing industries overall.

Researchers claimed more cases could lead to greater generalisability (Yin 2008; Bryman & Bell 2007). The investigation in pulp and paper cluster in region Varmland can be regard as single case even though it is a representative cluster over the worldwide manufacturing industry. The external validity could be doubt in some circumstances. Alternatively, the mapping of cluster covered more than single cluster but also the upstream, downstream and related supporting industries and clusters. The mapping would be generalized into the supply chain management in and outside a manufacturing cluster. As the core of this map, paper mills and machinery supplier which occupied the top of global market position would lead the world pulp and paper industry development direction. The top position of companies ensured the research external validity into the whole industry even all manufacturers.
3. Theoretical framework

3.1. Cluster theories

3.1.1. Cluster identification

When term “cluster” been defined, most scholars will refer to Michael Porter’s cluster theory and cluster policy. Porter defined cluster as “a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities.” (Porter 2008). Porter’s cluster theory has become extremely popular either in academic or policy levels. This definition indicates that a cluster is concentrated in a region, not distributed over the space. In geographic scope, a cluster can cover from a single city to a state, a country or a connected network of neighboring countries. Besides, unlimited in only one industry, a whole supply chains and related industries and other facilities. In the value chain, clusters often include firms up and down stream industries. Depending on their depth and sophistication, clusters mostly include end products and service companies, financial institutions, suppliers of production process like machinery, components, and other firms in related industries. Finally, government and supported non-profit association or organizations in clusters are the key point. Policy makers will be a main push power for cluster development. The European Cluster Observatory program could be a good example for policy influence sector to clusters.

Although Porter’s cluster theory popular in politicians and business world, scholars and economists would prefer to define cluster wider than the one given by Porter. Following a transaction cost approach, Gordon and McCann developed a typology covered different research strategies and defined clusters as three basic forms: pure agglomeration, the industrial complex and the social network (Gordon & McCann 2000). From this definition, geographical concentration is rather important. With the empirical investigation, Gordon explored the patterns of linkage and specifications in London region and illustrated the significance of distinction between these types of concentration. Furthermore, this approach was extended into a knowledge-based taxonomy to define clusters by investigate the relationship between location patterns, innovation processes and industrial clusters. These classification systems provide a framework to broadly consist and insight the micro foundations, nature and evolutions of clusters (Iammarino & McCann 2006).

Back to original

All scholars will mention a renowned name when researches on clusters were taken: Alfred Marshall. Currently the most popular cluster theories focus on localized external agglomeration economies. These results from Marshall’s three explanations for the existence of positive agglomeration externalities: local information and knowledge spillovers, non-traded local inputs, and a skilled local labor pool. Following, complex and varied views from simple Marshallian agglomeration model carried out in agglomeration economies,
economic geography, social networks, etc. (Weber, 1929; Harris, 1954; McCann, 1995; Fujita, 1996; Storper and Salais, 1997; Nohria, 1992)

Not only the scholars mentioned above defined their views on clusters, but also critiques were carried out. Somehow, all scholars would not deny the clustering effect is developed basically from the economic geography and agglomeration. The important to choose theories background is to measure the scope of the cluster which will be analyzed in the following chapters. This thesis will focus on Porter’s cluster theory and McCann’s transactions cost classification of clusters to illustrate and exam the local cluster as empirical study resources.

3.1.2. Porter’s Diamond Model

First of all, the elements and scope of clusters is the key to define and indentify a cluster. Porter (2008) covered cluster as end product or service companies, suppliers of specialized inputs, components, machinery, and services; financial institutions; and firms in related industries. Clusters also include downstream industries as channels or customers; producers of complementary products; specialized infrastructure providers; government and other institutions providing specialized training, education, information, research, and technical support (universities, think tanks, vocational training providers); and standards-setting agencies. Moreover, government agencies could significantly influence a cluster development as well as trade associations and other collective private sector bodies that support cluster members. (P215, Porter 2008).

To group up all these above, the connections and linkages between the entities would be formulated. One familiar with Porter’s cluster theory would know the famous diamond model which developed from Porter’s the competitive advantage of nations (Michael 1990). This theory of national, state, and local competitiveness within the context of a global economy gave clusters a prominent role. In this cluster theory, competitiveness was affect by location through productivity and especially on productivity growth. A diamond model was developed for the effect of location on competition using four interrelated influences as following figure.
Figure 1. Porter's Diamond Model (Porter 2008)

This model includes four basic attributes: a) factor conditions (or inputs include tangible assets, such as skilled labor, infrastructure, suppliers, and extending to legal, technological, and consulting services); b) demand conditions (core customers, downstream consumers, and demand in local market or global); c) firm strategy, structure and rivalry (either in the climate for investment which influence by macro and microeconomic policies especially from global market climate, or local policies affecting itself); d) related and supporting industries.

To enhance the competitive advantage, the linkage between those four attributes present collaboration and competition can promote growth, innovation and competitiveness. Porter explained these in three ways: a) by increasing the productivities with specialized inputs, employees, information, complementarities, institutions, public goods, incentives and performance measurement; b) by directing innovation; c) by stimulating new business formations. (P230-241, Porter 2008).

It is easy to raise argument in scholars which element was or not included in cluster model. Skilled labor, supporting and ancillary trades, and specialized suppliers formed up a list provided by Marshall (1890). Porter’s theory developed and improved time by time with other scholar’s views and later works which extend this list for agglomeration and economic geography. Beside the original value chain companies, essentially entities or elements in clusters could cover universities, government research labs, business associations, venture capitals, sophisticated core customers, standards-setting agencies, think tanks and vocational training providers. (P215,
3.1.3. Other theories

A transactions costs classification of clusters

This transaction costs classification of cluster types was originally developed by Gordon and McCann (2000). Not being explanatory theories, but this method is based on the implicit assumptions underlying most literatures on agglomeration and clustering phenomenon.

<table>
<thead>
<tr>
<th>Characteristics of relations</th>
<th>Pure agglomeration</th>
<th>Industrial complex</th>
<th>Social network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm size</td>
<td>Atomistic</td>
<td>Some large firms</td>
<td>Variable</td>
</tr>
<tr>
<td>Characteristics of relations</td>
<td>Non-identifiable fragmented unstable and frequent trading</td>
<td>Identifiable stable and frequent trading</td>
<td>Trust loyalty joint lobbying joint ventures non-opportunistic</td>
</tr>
<tr>
<td>Space outcomes</td>
<td>Rent appreciation</td>
<td>No effect on rents</td>
<td>Partial rental capitalization</td>
</tr>
<tr>
<td>Analytical approaches</td>
<td>Models of pure agglomeration</td>
<td>Location-production theory, input-output analysis</td>
<td>Social network theory</td>
</tr>
<tr>
<td>Notion of space</td>
<td>Urban</td>
<td>Local or regional but not urban</td>
<td>Local or regional but not urban</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nature of technical knowledge</th>
<th>Codified, explicit and mobile, transmitted by way of information</th>
<th>Mixed, routines, R&amp;D-intensive, based on non-transferable experience</th>
<th>Tacit, new, sticky and leaky, transmitted within cognitive networks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamics</td>
<td>Stochastic</td>
<td>Strategic</td>
<td>Mixed</td>
</tr>
<tr>
<td>Technological opportunities</td>
<td>Medium</td>
<td>Low</td>
<td>Very high, uncertain low</td>
</tr>
<tr>
<td>Degree of cumulativeness</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Examples</td>
<td>Silicon Valley California</td>
<td>Silicon Glen Scottish Electronics industry</td>
<td>Silicon fen Cambridge UK Italian industrial districts Emilia-Romagna</td>
</tr>
</tbody>
</table>

Table 1. Industrial clusters: knowledge, technology and innovation dynamics (adopted and selected from (Gordon & McCann 2000))
One of four agglomerations

Back to original, numbers of scholars found their theories on economic agglomeration which would be easy to explain. In order to separate out different types of agglomeration economies, Malmberg, Sölvell and Zender chose a simple classification scheme delineating efficiency advantages versus innovation on one hand, and agglomeration in general versus technologically on the other. This method divided four main types of agglomerations:

![Diagram of Four types of agglomerations](Image)

Figure 2. Four types of agglomerations, Source: (Malmberg et al. 1996)

Many types of firms and organizations constitute the set of actors on the “cluster stage”. Here we have identified six main types: firms, financial actors, public actors, universities, organizations for collaboration and media (see Figure)(Sölvell 2009).
Figure 3. Actors on the cluster stage, source (Sölvell 2009)

As this figure show, actors on cluster include:

1. Upstream and downstream firms involving both large firms and SMEs.
2. Financial institutions, involving traditional banks, commercial banks and other capital
3. Public actors including: a) national ministries and agencies involved; b) regional agencies and units of national bodies; c) local communities
4. Academic actors including universities and colleges
5. Private and public organizations for collaboration (NGOs)
6. Media

Sölvell’s cluster theory focuses on the dynamic characteristic of cluster rather than the others on importance of innovation. Clusters are made up not only of physical flows of inputs and outputs, but also include the intense exchange of business information, know-how, and technological expertise either in trade or not. The clusters facilitate restrict the resources and turn them into competitiveness by dynamics.

There is no doubt of critiques came out to Porter’s theory. Limitations of the cluster theory point out: a) the limitation of the notion of regional competitiveness and specialization, cause cluster theory started from competitive advantage of nations; b) concerning geographical boundaries
and industrial ambiguities; c) universalism (Motoyama 2008). The core arguments on Porter’s are focusing on organized and successful cluster rather than emerged. Empirical study is hard to measure. Analysis of internal organizations and regional scales were lacked in supporting this theory. In the end, Porter’s theory is still extremely popular and potentially powerful. This thesis will follow the big framework under Porter’s Cluster model, and reflect to the reality of the case and unique features. This thesis provides few evidences to support Porter’s theory in certain extent.

3.2. Service and services in manufacturing

3.2.1. The concept of service

Service is distinguished with physical good for a long time in daily life as common explanation. Economists usually classify the national economic into three sectors as agriculture, industry and services which are primary, secondary and tertiary sector of economy. Either in academic research field or define the service and its characteristics, “IHIP” was generally cited to describe service which is inseparability, heterogeneity, intangibility and perishability. With the development of economic and globalization, indistinct boundaries between goods and services emerged. Scholars start to review the traditional service definitions and concept.

Definition of Service

One cannot track the original source of service definition. Service is understood as human activity and interaction between customers and service providers. With the help of IHIP, service definition and its characteristic will be easily to understand by public. When interactions were taken more and more between each sectors of economic, the service definitions are also reviewed by scholars. Rather than distinguish “service” from “good” as a human activity, majority scholars considered activities, interactions and deeds or process as the key sectors of service. (Solomon et al. 1985; Lovelock 2000; Zeithaml & Bitner 2000; Vargo & Lusch 2004). As Vargo and Lusch (2004) defined, service is “the application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself”.

By comparison, certain numbers of scholars define service in three dimensions: activities, interactions and solutions to customer problems (Edvardsson et al. 2005; Gröönoos 2000). These definitions are more related and focused on customers’ need and aiming service as solutions with customer perspective. According to Edvardsson (2005), “Service in time and space linked activities and interactions provided as solutions to customer problems. The service is most often co-produced by the customer. Customers define service on the basis of value in use and the resulting customer experience.”

Either in process oriented or customer oriented, feeding customers’ need will never be the end of service. Leading views considered services as exchange rather than offering. Services are
co-created or co-developed. It would be explained in service dominant logic as follow.

Service Dominant Logic

When service definition reviewed, majority scholars regard “IHIP” cannot cover the characteristics of service more along time. Traditional views on service as a category of market offerings different from good. Edvardsson distinguished service offering as “services” with “service”: “services” views from companies as market offering, “service” views either from customer or company as a perspective for value creation. (Edvardsson et al. 2005). Goods are considered as platform for service where create value for customers.

When Service Dominant Logic initialed by Vargo and Lusch in 2004, continuing debate and argument on new logic for service illustrate the new development direction of service research. Basic on viewing service as exchange or process, Vargo and Lusch shift primary focus to “operant resources” (intangible and dynamic) from “operand resources” (tangible and static). Service dominant logic implies continuous social and economic processes which largely focused on operant resource such as skills and knowledge where value is co-created.

Continuing, reactions and elaborations by other scholars explored a broad theme of “new logics”. Different from goods, value for customers are not embedded in products, instead, it emerges in customers’ sphere as value-in-use in the process. (Gronroos 2008; Vargo & Lusch 2008). Either in process or perspective, SDL innovated in finding more effective ways on resource-integration or value-co-creation. By introducing the SDL in this thesis, the service innovation and new value creation process will be easily explain and analyze at following case.

3.2.2. Services in Manufacturing

Looking backward to the development of industries, successful manufacturers enhance their competitiveness on productivities and quality management, finally present on prices. Mass production and scale of economic lead to lower price and better product quality. The global competition in product price and differentiation in the past had moved into another battlefield. Service infusion in manufacturing influences the industries. Basically from the service offerings of manufacturers, companies are moving to service providers step by step with improving service-oriented strategies.

Service offering and classification

Richard B. Chase told a story about “craftsmanship” (Chase & Garvin 1989). 200 years ago, a craftsman pride himself on being a technician who success depended heavily on his willingness and ability to talk with customers at key point. Before sale, he could get a clear idea of what client need and what features would satisfy him. During the making process he could incorporate any necessary changes. After delivery he could learn what features worked and what the client needed for maintenance, repair and replacement. For these decades, successful manufacturers proved services as catalysis in their business.
Nowadays, manufacturers provide varied services far more than maintenance. Especially in this decade, information system supports the whole industries either in production or service. The information services reformed the service offerings in manufacturing as well as other higher level advisory or consultancy and R&D services. The diversity of services in manufacturing companies makes it difficult to management without reasonable classification. Therefore, researches had been taken to develop services classification in manufacturing companies. At the beginning, services in manufacturing were classified by the process of product sales as before, during and after (La Londe et al. 1976). Kotler (1994) distinguished these services as two broad categories: maintenance and repair services, business advisory services. Moreover, transaction or relationship related was used to classify product services (Frambach et al. 1997), as well as the service to support product and customers (Mathieu 2001).

Gebauer (2008) conducted a case study to exam the validity of his new classification for services in manufacturing: customer service, product-related service and customer support service. Customer service aims at sales; product-related service ensure the functioning of product (more like after sale service), customer support service which is on the top of pyramid aims to increasing efficiency and effectiveness in the primary or adjacent customer processes. The characteristics and examples of this classification show as below:

<table>
<thead>
<tr>
<th>Direct recipients</th>
<th>Customer service</th>
<th>Product-related</th>
<th>Customer support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity of the relationship</td>
<td>People</td>
<td>Product</td>
<td>People</td>
</tr>
<tr>
<td>Complexity</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Credence properties</td>
<td>IT services, order handling, billing, documentation, product description</td>
<td>Training, inspection, spare parts, repair, trouble-shooting, hotline, maintenance</td>
<td>Maintenance outsourcing, service level agreement, process optimization, recruitment outsourcing, process-oriented R&amp;D</td>
</tr>
<tr>
<td>Newness to the market to the form</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 2. Service classification in manufacturing (adopted from (Gebauer et al. 2008))

The classification can certainly improve the management efficiency in manufacturers and stimulate product and service innovation in circumstances. Essentially, whether any classification methods in manufacturing have not separated from the basic: products. Even customer centralized or orientated services are basic on the installed base of products and sales networks. The service offering and classification are all based on goods dominant logic which is product centralized. Can the reality be different? Can manufacturers innovate the service offering into another level? These can be exam at the following case part.
Service infusion and transition

It was not in recent years that manufacturers started to offer their services. Services in manufacturing brought more revenue in results from increasing competitiveness and offering differentiations. Manufacturers saw a bigger cake in service whilst the transition from manufacturer to service provider was taken. Many companies only focus on the new service offering and service innovations rather than the service quality, delivery network, customer relationships, etc. To succeed in this transition, more than the service offering changes, the organization needs to restructure and new strategies as well (Oliva & Kallenberg 2003).

Back to the offering, Kotler (1984) provides a construct for “offering” which also addresses the notion of products and service bundling. Martin and Horne (1992) identify a simple process for service offering transition in manufacturing: a) product only, b) product and service, product dominant, c) service and product, service dominant, d) service only. Two hurdles of this process are identified as the role of customers in terms of productivity management for clients and the new service development. This process cited a term from finance: “portfolio offering” (Martin & Horne 1992). Moreover, the services in manufacturing are improved step by step and focus on supporting customers and customer orientations (Mathieu 2001; Gebauer et al. 2008). New ideas “integrated solutions” (Wise & Baumgartner 2000) was carried out to describe a combined products and services offering to feed specified customer needs. In this case, the problem solving is the centralized core offering. Either in individual innovated new service or bundle of services in portfolio or integrated solutions, manufacturers unanimous knew the service will change the firm. The transition is far more than offering changes.

The company’s orientation, corporate culture, structure, service network could also influence and are influenced the transition. Oliva and Kallenberg (2003) described a process for manufacturers’ transition more than integrate services into core product offering: a) consolidation product-related services; b) entering the installed base service market; c) expanding to relationship-based services or process-centered services; d) taking over the end-user’s operation. This process suitable for manufacturers who provide products require services through their life cycle: installed base. Especially in pulp and paper industry, most services are provided for wide installed manufacture lines or process. It could be examined in the analyze chapter.

3.3. Value creation through services

3.3.1. Understanding Value, Value Chain and Value co-creation

Whether in psychology, sociology or economics, the concept of value can be traced back to the ancient Greeks, which had a long and complicated history. Since 18th century, economics had been separated from research field of moral philosophy. It became an independent discipline. Adam Smith’s value theory in The Wealth of Nations and value-in-use/exchange from Marxism influenced modern economic theories system as well. Since then, value was regards as utility in economic (Ramirez 1999).
The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky & Morris 2001). Porter (1985) developed the famous value chain analysis in his *Competitive Advantage: Creating and Sustaining Superior Performance*. The value chain categorizes the generic value-adding activities of an organization. The "primary activities" include: inbound logistics, operations (production), outbound logistics, marketing and sales (demand), and services (maintenance). The "support activities" include: administrative infrastructure management, human resource management, technology (R&D), and procurement (Porter 1998). Whether value chain theories, the value chain is defined as a chain of activities. Traditional views regards value is created and added in the value chain, embedded in products or services offerings.

The figures following present the value creation process under different dominant logic:

![Value creation under good dominant logic](source)

*Figure 4. Value creation under good dominant logic source: Service Science course materials, Edvardsson (2008)*
The emerging view regards value is co-created with customers (Edvardsson et al. 2005; Gronroos 2008; Vargo & Lusch 2008; Ramirez 1999). Customer value includes not only economic value but also value linked to values (ideals). Much of customer value is the outcomes, basis of value in use and consumption experiences. According to Holbrook (2006) customer value have four basic characteristic: interactive, relativistic, judgment of performance or outcome, resides in a consumption or use experience. Emerging view is customer-based and use-related. The value chain theory will not be suitable since it regards the value chain works for value adding and customer is destroying value and ended with the end of value chain. The service dominant logic regards value is always co-created and created by customers (Gronroos 2008).

### 3.3.2. Service Manufacturing Strategies

Scholars had research on service manufacturing decades. A mixed product and service offering brought a service perspective into factory operation. Goods and service marketing blended with goods production viewing factory as a selling tool. The manufacturers had developed a set of new strategies for managing the services. A new type of manufacturing organization called “service factory” is oriented directly to customer service and as such blends the best practices of manufacturing with operating logic commonly found in effective service organizations. (Chase & Erikson 1989). Moreover, customer services in manufacturing considered as component of the product or element of product strategy accompany goods (Bowen et al. 1989; Gilmour et al. 1994). Incorporate service-oriented goals in firm strategy and adopting appropriate service organization arrangement formed up the characteristic of customer service orientation in manufacturing.
Service strategies in manufacturing suggest more than expand the service offerings. In tend to deliver greatest possible value to customers, manufacturer could focus on what it does best, avoids distractions and leverage its organizational and financial resources. In a short, focus on what gives competitive edge and outsource the rest (Quinn et al. 1990). McDonald’s Hamburger chain and service model provided “a production line approach to service” (Levitt 1972). By contrast, a service-based manufacturing strategy reverses it in forms of using available capacity to meet customer demand rather than inventories (Fry et al. 1994). Gebauer (2008) identified four service strategies in manufacturing: after-sales service providers (ASPs), customer support service providers (CSPs), outsourcing partners (OPs), and development partners (DPs). These strategies are classified in transaction-based and relationship-based as well.

Whether there are classifications on service offering or strategies, the new strategies for operating and managing services in manufacturing, should keep the pace with service dominant logic development. Customer oriented or centralized, value co-production or co-creation will be involved into new service strategies in manufacturing. Will the strategies operating be adapted with new logic? Will the new strategy will influence and connect the manufacturers in clusters? These would be examined at follow parts.

![Theoretical framework diagram](image)

This chapter mainly reviewed the theories in cluster, service manufacturing concepts and value co-creation under service dominant logic. To build up an analyze tool box for case study, the linkage between theories and journals should be grounded for integrated analysis. First of all, cluster theories were chosen to define and mapping the pulp and paper cluster scope. Cluster definition and theories varied with scholars, in which Micheal Porter’s cluster theory is most famous and widely used in either business or policy fields. Following, service manufacturing theories covered service concepts, service manufacturing classification, infusion and transition were grouped up for analyze the service offering in this pulp and paper industry, as well as the
companies using services to enhance their competitiveness and customer relationships. These theories will be helpful to format the context in first two parts of analysis. Finally, when value/supply chain theories examined with service dominant logic, the value co-creation model will be helpful to create and mapping this cluster in extent value chain.

4. Case

4.1. Metso Group and Metso Paper

Metso is a global supplier of sustainable technology and services for mining, construction, energy, metal recycling and the pulp and paper industries. Metso sets customer’s success, profitable innovation, personal commitment and professional development as the group values. Metso Group developed the service business by investing service centers and personnel resources globally, developing new ways of operating, making corporate acquisitions that complement the technologies and market presence. As the 2008 annual report presenting, the net sales of services business reached 2.2 billion EUR in 2008 and account 35 % of net sales and for over half of operating profit.

Metso Paper serves pulp, paper, board, and tissue manufacturers worldwide. The company creates long-term customer relationships by offering products and services that cover the entire process life cycle. In the end of 2008, Metso Paper and Fiber technology segment whose legal name is restructured as Metso Paper according to the Metso Group. After the acquisitions such as Kvaerner Pulping, Metso Paper separates paper making business line into fiber, paper and tissue three business lines. Due to the dramatic reduction on the demand of paper, the sales net of Metso Paper has declined in 2008. However the profitability remained at a satisfactory level with increasing net sales in services. Focusing on services business, Metso Paper developed a global service network especially in emerging markets. With a wide range of installed business line over the world, Metso Paper will develop great opportunities to offer services to customers covering rebuild, repair, process optimization, maintenance and spare and wear parts services, etc. Following parts will describe how Metso offering their unique services business to customers in different business lines.

4.1.1. Metso Fiber Business line

Fiber business line is the leading full scope supplier of fiber processing technologies. Its process, product and aftermarket offerings cover all technologies for wood handling, production of chemical and mechanical pulp, elasticizing, pulp drying and baling. Metso fiber business unit offers a full scope of value-added services and specialist support to its customers. These offerings include roll services, spare parts services, mill site services as well as process solutions to boost the lifelong performance of production lines. The services are supplied for all fiber and papermaking process stages, regardless of the original manufacturer.

Our service agreements are built on concrete goals, joint efforts and measurable results. Their
famous quote is “You contribute your knowledge, we contribute ours”.

Metso fiber and paper pulp business line:
1. chemical pulp fiber business line
2. machine fiber line
3. pulp drying

Metso fiber business consists of 20 different legal companies and some of the major services offering within these business lines are following:
1. spare parts services
2. service agreement setup
3. mill studies
4. improvement upgrades

**Services within Service Offerings**

Industrials service is about working close to the customers to know their needs technological requirements. Metso believe in this philosophy. Firstly, Metso operates a dedicated information, sourcing, logistics and specialist service network to facilitate the wear parts management needs of fiber and paper mills. Secondly, Metso’s goal is to safe the client’s greatest possible return on investment in fiber machines, give long life cycle machines and optimize their spares part stocks. ParNet™ Optimization service process is one the spare parts service which is offered by Metso. Therefore, based on this service, a clients can get recommended parts from the stocks. ParNet™ Service is helping customers to reduce the stocks costs; customers gain latest information regarding design and materials of the most important spares parts. As well recommendations of this Service are based on highly professional experts.

Metso Fiber believes in win-win situation for both Metso and its customers. Service agreements setup is one of their services which they call it a profitable Partnership. Metso’s direct the solutions on the firm’s Key performance Indicators and others critical success factors and exchange of knowledge benefit both parties. Service agreements covers:

- Service and maintenance
- Function and operation follow-up
- Spare part management
- Exchange units
- Training
- Process support and development.

Metso Mill's studies provide a full support services to mill maintenance operations. They combine the pulp and papermakers’ know-how with Metso’s expertise, and help to set and achieve even the most demanding targets.

Fiberboard production optimization which focuses on the performance of the mills offers extensive range of tools for production optimization. The analysis and tests result in recommendations to improve the performance of your process and equipment. This service has
three steps:

1. Performances Analysis of the Mills
2. Process and condition tests
3. Service Agreements

Metso is committed to reduce the rising costs of energy from the production line which has become the major industrial problem around the globe. Metso has developed new concepts which address energy issues. LeanE™ is an effective response to an energy problem that has become critical for many mills. Metso’s team of experts ensures a balanced approach to energy optimization, where all measurements and actions are properly weighed against their consequences in other aspects of business.

Metso fiber creates value in their products for their customers to provide better quality and they promise the performance guarantees. Metso has performance checking system service. This performance checking system can be understood into three dimensions:

1. Timetable of the service
2. Interview with employees
3. Measurements

Metso believe that service minded people can be fit into service frame, so they create such environment in the organization consisted of people from different background.

For every organization service delivery is considered very important factor so metso believe that they deliver the whole process system to their customer not just service.

Manufacturing firms face problem as being service provider

Manufacturing firms as being service providing firms are facing problem that they have people from different knowledge and educational background, in order to be service providing firms from manufacturing firms, they have to be service minded people.

Innovation

The relationship between service and innovation is getting stronger in manufacturing based firms. Innovations help become a firm more competitive in the business. “Metso Corporation’s strategic goal is rapid healthy growth. The strategy of organic growth supported by acquisitions is designed to counterbalance the cyclicality of business operations and to increase Metso's earning power”. “Metso strongly believes in own know-how and expertise, they have 1400 people working in their own research and development area in 20 different research centre around the world”. Metso focuses on its customers’ core processes, processes that are of crucial importance for the success of the customer. Another goal of the strategy is to balance Metso's structure. "In the fiber and paper technology business, the main goal will be a radical improvement of profitability”, President and CEO Heikki Hakala. (Tarja Kivelä Nov 10, 1999)

The role of service in the manufacturing firm

The role of service in manufacturing industries is going to spans in future (service manager in Metso Fiber and paper pulp), in metso paper top management is giving more recourses to service
as recognizing the role of service in the coming future.

**Customer Relationship Management**

In order to know the customers' current and future needs and requirements, regular interaction with their customers, seminars, symposium and meetings is held by Metso every year. They also pay frequent visits to their customers.

**Information Service**

IT is playing a key role to keep track the service performances to maintenance supply chain service. A variety of Metso Paper products and services can help customer mills to reduce maintenance costs. The online services of Metso Paper’s spare parts service also increase the efficiency of information management and exchange.

**ePartsbook for easy identification of spare parts**

Generally, Epartsbook™ is one of the main online services which provides efficient services tool for the retrieval of accurate machine line spare parts information through the customer’s own desktop computer. Firstly, this service includes technical specification and spare parts for assembly drawings, circuit diagrams etc. Then the information service provides a basis for successful spare parts procurement and inventory decisions. Moreover, this service can be linked to the customer’s mills maintenance and materials management system. It is to operated by Metso that solution provides the mill’s operating and maintenance personnel with real-time spare parts information and related documentation. Significantly, this service make easy and simplify the maintenance tasks.

**4.1.2. Metso Paper Business line**

Paper business line is the industry’s leading paper and board technology supplier. Through its global network Paper business line is able to provide new installations, rebuilds, process improvements and services required over the entire lifecycle of customers' production processes. Metso Paper Business line is the biggest part of Metso Paper which occupied nearly four fifths of employees globally. Their paper and board making lines were on the top of pyramid and obtain the first for a long time. The net sales were 1,316 million euro in year 2008. (Metso Corporation 2009) In the last quarter of 2008, the demand of paper technology products and services declined strongly. These great changes result in the net sales of Metso Paper decreased while the profitability remained at a satisfactory level.

**Products & Services Offering**

By offering the paper and board process and line globally, Metso Paper supplies the whole process for paper and board making. They offer the cutting-edge technology and expertise for exact process, base paper and board making, coating, calendaring, reeling, winding and wrapping needs. Metso Paper Business line promises the top efficiency and productivity with their concepts including OptiConcept™ (OptiCoat, OptiWind, etc.) and Val™ product family. OptiConcept are designed for both rebuilds and new paper making lines. The Val™ family
complements Metso’s high-quality offering for board machines and medium capacity paper machines.

Metso Paper business line offers their services basic on the processes and lines offering. As basic services for paper and board line, Metso Paper offers maintenance, improvements & upgrades, spare parts and roll services for customer. Compared with tissue machines, paper and board lines are much more complicate with more services. The roll service is a big part services for paper and board lines like the normal maintenance services for personal car. Besides, Metso Paper business line offers mill studies & analyses, trainings in different processes and fields along with paper and boards making process.

“Being close to customer, we know how and have power to serve”

Metso Paper promise customer to deliver high quality by their expertise knowledge in the whole paper and board making process. The “Know-how” of process, machinery, maintenance and automation offer unique benefits for customer to achieve their objectives. By establishing their global service network, Metso can make their knowledge be delivered to customer and have “Power to serve”. “Being close to customers” is always one of faith Metso Paper believes in.

Service center and workshop is the basic component to build Metso’s network. For paper and board lines, roll service is the basic service for customers. Localized service point guaranteed the service quality and efficiency. Metso had built up a global service network by establishing nearly 50 service centers in twenty countries and on all five continents. Basic on the service center network globally, Metso also sets workshops closed to paper and board mills for on-site services. Moreover, Metso Portal and Partner Web will supplement the physic distance to customers by information technology and opened interactive extranet environment as well as the 24*7 calling services. The accomplished global services network either in physic or virtual linked Metso and its customers, suppliers together and developed a whole supply chain partnership.

Being close to customer requires not only accomplished service network, but also core business mapping. Being close customers’ core business is another successful key. For instance, On-site reconditioning tools and methods for speedy servicing and repair of paper and board machinery can maintenance the rolls and cylinders without taking the machine apart and cuts shutdown times. With advanced developed technology and method, Metso Paper can maintain and improve customers’ productivity and efficiency.

Not only the services themselves, the product quality and innovation had been considered as another aspect Metso always concerned. Unlike tissue, paper and board made for printing and packaging is not the end up consumer goods. Metso contribute its R & D resource into these middle products for customers in forms of cooperation and innovation. Metso had built several technology centers with pilot machines and laboratories for cutting edge research on all processes. The Jyväskylä pilot plant in Finland works in close cooperation with Metso Paper’s other Technology centers. The Anjalankoski Fiber Technology center provides fiber pilot process as well as a pilot paper machine and a pilot board machine in the vicinity. Coating and
calendaring test are available at Metso Paper’s surface treatment technology center in Järvenpää with winding technology center as well, the same as printing tests in future printing center in Raisio. (Metso Paper 2007) The research ability keeps on their pursuit in advanced technology and customer values, such as the pilot paper machine 2 keeping braking world records in speed and production. The full process line trial capabilities and accomplished pilot systems can demonstrate the whole process for customer from wood to final paper products. Most importantly, it was the basic guarantee for Metso’s “Know-how”.

**Metso Paper Service Center Karlstad**

Metso Paper had started its business in Värmland for a long time. Metso set a whole operation facility centered in Karlstad where the provincial capital is. There will be found in Karlstad as Fiber, paper and tissue business line, fiber service center and paper service center. Metso Paper Karlstad Service Center is taking charge of the service for paper business line in whole Scandinavia peninsula covered Norway and Sweden. By setting up workshops in Säffle, Borlänge and other place, Metso Paper Karlstad service center had mapped a network in forms of satellite workshops and sub service centers.

Karlstad service center can supply full scope of service agreement. The general manager said: “We trust into sales force with strongly teamwork, using service mind and always put customer into first group”. Karlstad service center had been contributing in working environment safety and on-site services. By arranging reasonable service process and structure, Karlstad service center can guarantee the service will be taken over and delivered through their completed service network.
As the chart shows, general manager is taking over the whole service center management. The internal service processes ensure the customer need can be solved as soon as possible. From customer service in quotations to productions, the process is keeping customer and service staff connected inseparably. Besides, expert group will offer customized services to fit different needs. The quality group ensures the promise and whole group’s value. Supporting by sales network, HR, IT and technology in the background, Karlstad service center is acting as basic component of Metso Paper’s whole global service network for keeping their promise.

Serving the biggest SC line in the world

Stora Enso’s Kvarnsveden mill was founded in 1900 at the Dalälven River, in the town of Borlänge, in central Sweden. In Apr 20, 2004, Metso Paper announced its largest order ever. In the coming year, Metso Paper supplied a new production line for high quality super calendered paper (SC) in Kvarnsveden Mill. The order was the largest in Metso’s and Metso Paper’s history. The new PM 12 line can offer 420,000 tons per year productivity for Stora Enso and became the biggest paper machine in the world by then. (Metso Paper 2008d)

Following, Metso set a new service point in Borlänge where the mill located. Borlänge service point which is a satellite to the Metso Paper Karlstad service center was part of the expanding Metso Paper process services business. This is designed to serve nearby customers at central Sweden in maintaining and developing ongoing operations especially for the coming biggest
machine.

PM 12 started to manufacture in late 2005 with effective construction project. In May 2006, the Borlänge service point was inaugurated for serving officially. By then, Stora Enso outsourced the roll service in Kvarnsveden mill to Metso Paper. With 3000 square meter workshop and 120 tons lifting capacity cranes, this service point had capacity to serve not only local customer but also the whole central Sweden. Since then, Metso Paper’s service can ensure their customer focusing on their own core business for greater customer value.

**Bottleneck Analysis**

Metso Paper business line offers a bundle of mill site services either on-site or online. By strongly know-how and long experience as machine builder, an extensive range of in-depth analyses and studies will improve production line efficiency, runnability and product quality. Bottleneck analysis was a good example.

A board machine is very complex and when considering investments to increase the machine capacity it is hard to determine where to put the focus to gain maximum output. Each unit process of a board machine is thoroughly evaluated in order to define the most critical bottlenecks by this service. The importance of each identified bottleneck is ranked and actions to improve the machine performance are evaluated. Finally, the most interesting investment options are gathered into machine scenarios with different scopes. (Metso Paper 2008)

![Figure 8. The bottlenecks are illustrated in a chart showing machine speed versus basis weight.](Metso Paper 2008)

During the financial crisis time, most paper and board makers are short of capital for new line investment. The potential of production line for increasing the productivity is the needs urgent. Many mills are quite aware of where their major bottlenecks are located in the machine, but the
tricky part is how to relieve them in the best way. It is not hard to come up with investments that improve the capacity. The hard part is to rank how different investments affect the overall capacity and performance of the board machine. This is systematically evaluated and explained in a Bottleneck Analysis, which is one of the main reasons why 27 mills all over the world have performed a Bottleneck Analysis together with Metso Paper. (Metso Paper 2008)

4.1.3. Metso Tissue business line

Metso is a complete supplier of tissue making lines based on deep process knowledge, from stock preparation to reel handling. Tissue business line supplies technology, processes and equipment for the production of tissue paper. Related lifecycle products include maintenance services, process improvements, rebuilds, and new installations. According to Metso Annual Report 2008, (Metso Corporation 2009), the net sale of tissue business line was 164 million euro in 2008. Metso Tissue business line was on the top position in global market.

Products and Services offering

Metso Paper grouped the financial statement with fiber, paper and tissue business line. In overall, services account 35% of net sales in paper and pulp business, the rest 65% is capital equipment and modernizations. Mainly tissue making process and technologies were TAD (Through air dry technology), DCT (Dry crept technology) and NTT (new textured tissue). (Mesto Paper 2008) The tissue machines are based on these technologies as same as their spar and wear parts.

Compared with the other two, tissue machine is much simpler with faster drying process and smaller size. These lead simpler services than paper and board lines. As well, mill site services covered mill studies & analyses, maintenance & performance, improvements & upgrades, roll services. Training includes dust management training, eLearning, roll school, Press & Yankee section training, tissue papermaking training and process chemistry training.

Moreover, being an export oriented company, Metso is trying to help customer on financing. By negotiating with Nordic Investment Bank (NIB) and Swedish Export credit company (AB Svensk Exportkredit, SEK), Metso tried to get long term loans for themselves and customers. The same dialogues were conduct overseas. Metso provides similar product-add services to customers who are short of capitals.

Metso Tissue Technology Center and pilot machines

Metso Paper built Tissue Technology Center (TTC) in Karlstad, Sweden at 1968. (Metso Paper 2008a) As most important role in the industry, Metso focus on R&D very much in forms of investment and technology cooperation with customers. There are two full-sized and flexible tissue pilot machines in this Tissue Technology Center. Besides, a well equipped and organized laboratory and a unique collective body of expertise on tissue machines and manufacturing processes were provided for customers on site testing and upgrades.
Pilot machine can realize the whole production process of tissue making. That means Metso Paper have its own complete “tissue mills” for technology development. Metso TTC makes trials for better tissue and higher productivities. A manager said: “we have developed our technology through our own R&D resources by pilot machines or our own “tissue mill”.”

On the other hand, more importantly, the TTC cooperate with the customers for solutions and new technologies. For example, customers will take their own pulp to TTC Karlstad for production test run. Since the tree and fiber are different all over the world, the end-up product tissue will differ by varied pulp, which means different customer may need different process even customized machine. Tissue maker will get different products through Metso’s tissue making process. Furthermore, as a consumer product with heavy competition, tissue has rather confidential technology. When tissue maker co-develop a new species of tissue with Metso by technologies both provided, tissue maker patent the tissue and Metso patent the machine and process. With this forms of cooperation on pilot machine and laboratory, Metso usually developed a long term relationship with customers. In a long run, long term agreement will make customer to keep buying Metso’s tissue machine and process with excellence services. During the whole test run, Metso promised all the TTC staff works under strict confidentiality.

TTC provides much more than pilot machines and test run. The laboratory can help tissue makers to do any testing during the whole TAD and any other tissue making process Metso have even the customer’s tissue machine was not provided by Metso. As well, training program illustrate the real conditions to customers in TTC.

Serve customer with customer

“Being close to customers who are in consumer industry, that’s one of most important business idea we have found during years”, a senior vice president of Metso Tissue claims.

Compared with other paper products, tissue paper is closer to final consumer. For example, fine paper is made out for printers. The final product will be newspaper and magazines, same as board paper for paper box. Tissue’s whole producing and consuming process is simpler than other papers. At the same time, comparing tens of meters with hundreds of meters, tissue machine is much simpler than paper machine. Simpler machine leads to easier services. That is the reason Metso paper integrated their paper and tissue services into one service facility. Advantages are accompanied by disadvantages in this way.

Metso Tissue business line has their customer all over the world. However, integrated services facility with Metso Paper business line certainly makes some services inefficiency. Mostly, local Metso paper companies are grouped with sales people. With bigger sales volume and more services on paper line, most local facilities are focus on paper and board line not tissue line. Local service facilities are specialized on paper and board line rather than tissue line. No one will be the expert of every line. To a certain extent, this influenced the tissue line’s service quality. Metso paper was planning to disintegrate these two business lines from on service facility. By then, Metso Paper will have three independent service systems according to their business line: fiber, paper and tissue. This service structure will assure all the customers can receive unique and high
level of services promised by Metso Paper.

On the other hand, Metso Tissue business line cooperates with customers to deliver services. Most customers are global companies who have mills all over the world. Some customers have their own way to maintain their internal services. Metso Tissue business line followed the customers’ way to serve them. There is fierce competition in tissue market. Updates of tissues were rather frequently. When new product is carried out, tissue maker usually update the product line all over the world. It took time for them to upgrade the producing process globally in terms of new process and new training program for local staff. Most tissue makers grouped one team to serve their mills all over the world. Meanwhile, Metso Tissue business line will send specialized expert to customer for team grouping and travel around the world for serving local mills for upgrading or optimizing. Instead of setting up local service facility around the world, this service model certainly decrease Metso’s operating cost and make the service deliver efficiency.

“Being close to customer” means much more on the appearance. Either in technology co-development or service co-delivery, Metso Tissue business line was keeping their promise to their customers and developed long term partnership relationships.

**Exploration in China**

Metso is an export-orientated company. Being a Nordic company, Metso’s customers spread all over the world. Especially for tissue business line, the customers are facing to end up consumer and in fierce competition markets, which means that tissue makers can be small and middle size companies. When Metso explored their tissue business in Europe and North America, most customers were rather big tissue maker. The smallest tissue machine Metso can supply was Advantage DCT-100 which can make 100 tons per day.

When Metso people came to China 5 years ago, they saw another totally different business environment. Metso do have few customers who are big companies in China such as HengAn and has sold few big tissue lines in China. However, broader market is not in few big tissue makers. Thousands of small and middle enterprise (SME) tissue makers are using local made tissue machines which are low productive and high pollutions. Most of these tissue makers are private own companies that are short of capital and technologies. They start to make tissue with local made machine which can produce 1 or 2 tons per day no higher than 5. When they earned money few months later and covered the initial investment, same new machine will be purchased and grouped with the previous one. In a long run, hundreds of small machines are grouped in line for hundreds of tons production per day. All of these tissue machines took huge resources for production either in electricity, water and spaces. But most of them cannot afford the initial investment for big tissue machine supplied by Metso.

Since then, Metso start to build smaller tissue machine. Advantage DCT-60 was shipped to China for SMEs. Chinese tissue maker replace their 12 old machines for one from Metso with higher productivity and less resources consuming. Recently, Metso had planned for new machine which produce 40 tons per day with the same technology. Metso is trying to obtain different market segment and have ambitious to lead the whole industry in China. As the tissue line vice present
said: “If we in eyes of big future in China, we have to follow them now. We went into China, grow with them.”

The Energy Square & Metso Tissue

The Energy Square is a project founded in The Paper Province, acting as a facilitator for the commercialization of products and services within Energy Efficiency and sustainable processes in the Pulp and Paper making process. Energy efficiency has been becoming a hot topic over the world especially in pulp and paper industry which is highly energy intensive. The Energy Square was initiated for the companies in The Paper Province to enhance the global competitiveness and to further develop their cutting-edge technologies.

Originally, this idea came from Metso who was playing a main role in this industry. As a market leader, Metso invested and focus on R & D. When they realized the investment from company inside was limited by a quantity of reasons, in a long run, Metso might never get investment outside for technology development. Cooperation will be the best solution. Working with The Paper Province which is the cluster organization and non-profit association, a new platform was needed to get founding and make dialogue with foreign state government or other higher level association more than customers as individualized companies.

Metso tried to start with this platform in tissue business lines. When Metso marketed their tissue business line in China, the local made tissue machine with low productivity in 1-5 tons per day will consume 180 cube meters water to make one ton of tissue. More than that, most waste water was discharged into river without regular sewage treatment process. With higher technology and lower resource consuming, Metso’s tissue machine can promise 6 cube meters of water per one ton of tissue which is 30 times less than theirs. Meanwhile, Metso can bring this technology to China and build these tissue machines in China which results no job opportunities lost in China’s tissue machine industry. At the same time, Metso tried to finance their customers in China with local finance resources. Somehow, there is still long way to go.

Recently, Natur Vårds Verket (Swedish Environmental Protection Agency) and Ministry of Environmental protection of China started a cooperated project for environment protection. Being a part of The Paper Province, Metso tried to make dialogue with Chinese governor in level of high technology cluster for persuading Chinese government to help financing SMEs tissue makers and upgrade their tissue industry. The president of China National Pulp and Paper Research Institute Mr. Cao was on the board of The Energy Square also. The cooperation over countries had been pulled onto another higher level than companies’ business conversations. “It’s not only the economic profit pushing us to market China, and we are not serving only China, but the whole world.” The vice president claimed in the end of interview.

4.2. SOMAS

SOMAS Introduction
SOMAS Instrument AB develops, produces and markets control and on/off-valves from high grade, acid proof stainless steel. SOMAS main customers are in the pulp and paper industry, but they now have a growing market in the chemical, power, bio-fuel, offshore and pharmaceutical sectors, as well as on product tanker, which export their product all over the world.

**SOMAS business concept**

SOMAS is dedicated to R&D, manufacturing and marketing of high quality valves and accessories. They consider customers need from the initial contact and choice of Valve, through purchasing and delivery, to our valves’ are actually in final operation. Their long experience provides a wealth of knowledge that backs up our services, technical advice and consultancy. The training program in SOMAS provides key skills in flow technology, codes and standards, valves, actuators, petitioners and valve sizing. This can enhance the skill level of maintenance personnel, operators, consultants and buyers.

**SOMAS Service offering**

SOMAS products are developed to offer easily. Due to the excellent service, Customers can easily refurbish them and replace wearing components

**SOMAS Information Service**

A number of years ago SOMAS developed software, which makes it easier for the customers to select the correct valve type with the right size. These are the vital part of the process. SOMAS is also open in sharing information to their customers and suppliers. Moreover, it gives cost efficient and long life cycle solution to their customers. Above all, Education and giving specific knowledge to the products is one of the main services, which have become the crucial role of industrial service and SOMAS in order to educate their customers about their product offerings.

**SOMAS Products checking**

It is certain that choosing the right valve requires extensive knowledge about the process. The SOMAS interactive software “The Application Handbook”\(^1\) could easily help customers find the right valves (Products). As well as products recommendations, the customers also receive process information and comments on the various applications. Customers choose the right size of valves (products), the accurate regulation depending on the right flow and minimal variation of the products specifications. This makes the choice of valve critical. Finally, another Somas software tool Somsize is developed to help customers to find the type and size of the product efficiently.

**SOMAS Customer Relationship Management**

SOMAS has always meant good in service to their customers, because they always work close to their customers to understand their latest needs and requirements. They promise short delivery

\(^1\) [http://www.somas.se/somas-valves/somas_en_id197.pdf](http://www.somas.se/somas-valves/somas_en_id197.pdf)
time. Service is the supporting program for the management to improve their products offerings.

SOMAS has created network between big and small companies to link with each other. They communicate directly or indirectly that help SOMAS understand and obtain new products development brief and specifications which will meet customers’ requirement.

The value created by services for customers was the promise that SOMAS keep to customer. With the occupying big warehouse, fast and on time delivery promise, SOMAS can make our customer stock of valve in low status. This saved customer big cost of storage for valves and spare part. The excellent services did help on products sales. While, most of services were free of charge as the phenomenon of the whole industry.

**SOMAS Service Quality**

Ensuring quality at every step is the only way to provide the confidence that every process manager seeks. It is true from the development stage of the product to after delivery.

SOMAS products deal with the most demanding environments and applications of the products they offer. They use only various grades of stainless steel and sometimes titanium. To safeguard quality and reliable delivery their products are machined in their own workshops.

Maintenance ensures their services and product quality in circumstance. For example, when problem happens on the valve, they will go to customer’s place to fix it on time. If problem cannot be solved on site, new valve will be offered to customer with half price and replace it while older one will be taken back to company for other usage. The on time repair would not influence the customers’ productivity.

They use the latest machine tools combined with a high degree of automation. All valves and accessories (products) are subjected to thorough quality checks and every unit performance and pressure are tested before delivery.

**SOMAS Product Development**

Developing valves (products) requires a comprehensive knowledge and technology. In collaboration with a wide variety of industries (small and big manufacturing firms) they have gathered experience of the requirements that apply in different situations. Development is driven by their objective to offer the customers products that are reliable and easy to fit into customers requirements.

Their aim is simply to sustain a strong lead in development and product improvement. All design and development work is done in-house to safeguard under efficiency and control.

**4.3. The Paper Province**

The Paper Province is a nonprofit association for pulp and paper industry and established in 1999.
Leading pulp and paper industry had a discussion within regional government, municipalities and academia in order to create a professional representative organization. The Paper Province was born right away for future growth of the cluster. Since then, this name was used to broadly signify the pulp and paper industry cluster in the region Värmland. The organization intends to link local and national government with industries, marketing the region’s unique competence, and set up a network and platform for cooperation between companies and academia. In year 2007, European Cluster Observatory identified The Paper Province as one of Europe’s 16 Top EU clusters in high innovative regions.

The Paper Province aims to enhance the whole industry’s competence by “cooperation”. By then, member companies had reached the number of 80 with appropriate 9000 employees. Their turnover reached 2 billion euro per year. The Paper Province claims that there were more than 250 companies in the region and clusters from which are SMEs. By coordinating with R & D, consultants, equipment, process suppliers, machinery manufacturers, pulp and paper mills, The Paper Province represents the whole value chain for paper making. Moreover, The Paper Province grouped academia such as Karlstad University which is leading in pulp, paper and packaging research.

The motto of The Paper Province is “Development and results through cooperation” (Mats 2008). The cooperation is aiming to develop human resources, business development, research and innovation, business environment. These combine up the strategies for The Paper Province. The Paper Province was helping the SMEs on researching and financing and tries to cooperate with bigger companies which can supply better research facilities and environment.

The Paper Province is keeping on push the industry and regional economic growth. According to the report by Ramböll management (Mats 2008), the percentage of companies where synergies by The Paper Province contributes to:

<table>
<thead>
<tr>
<th>Concrete growth effects</th>
<th></th>
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<tbody>
<tr>
<td>Increased sales 31%</td>
<td></td>
</tr>
<tr>
<td>Increased number of employees 12%</td>
<td></td>
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<tr>
<td>Lower costs 21%</td>
<td></td>
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<tr>
<td>Strengthening competitiveness</td>
<td></td>
</tr>
<tr>
<td>Improved products and services 35%</td>
<td></td>
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<tr>
<td>New products and services 46%</td>
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<tr>
<td>Cost Benefits 28%</td>
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<tr>
<td>Research and development (R &amp; D)</td>
<td></td>
</tr>
<tr>
<td>Increased R &amp; D cooperation with other companies 18%</td>
<td></td>
</tr>
<tr>
<td>Increased R &amp; D cooperation with universities 29%</td>
<td></td>
</tr>
<tr>
<td>Skills</td>
<td></td>
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<tr>
<td>Facilitates recruitment of the right skills 74%</td>
<td></td>
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Table 3. The Paper Province’s contribution in year 2008

“The poll shows that we truly live up to our motto: Development and results through cooperation, not least in 97% of our member companies provides us with the famous approved for our efforts in areas of skills,” says Mats Williams. (Mats 2008)
The Energy Square

When energy efficiency had been put on the desk for discussion, pulp and paper industry has been already in highly energy intensive. The project Energy Square was launched in 2007 to create a platform for energy technology development. Initially the aim was to reduce the resource consumption in pulp and paper industry which has devoured large volumes of electricity and water. Following this objective, it became a new meeting place for the sector which intended to commercialize the products and services in that direction. The Energy Square will achieve this target by bringing competence, infrastructure and financing to the project and sub member participants.

Being a major exporter industry, pulp and paper industry contribute significantly in Swedish export economy. Especially in clean technology aspect, Swedish technology was on the top of pyramid over the world. The international cooperation in energy efficiency of pulp and paper industry can easily contribute the world. The Energy Square participated in a corporate delegation with the aim of selling Swedish environmental technology in developing countries. An project in “The EU-China Energy and Environment Program” (EEP) involved The Energy Square, Karlstad University, China National Pulp and Paper Research Institute and member companies in The Paper Province. The Energy Square followed the motto of The Paper Province: cooperation.

The Packaging House

The Packaging Greenhouse is a limited liability company owned by The Paper Province. It focuses on industrial research and development with paper for packaging. It started in 2004; The Packaging Greenhouse provides unique research environment and professional training program for companies in this cluster especially for SMEs. The pilot machine, which purchase from Metso Paper, is a multi-layer machine which can produce paper and board from 1 to 3 layers. Most of time, this research resource is available for SMEs to develop their own technologies with small investment. The advance testing and research environment which most SMEs desire for can be realized in The Packaging Greenhouse. Moreover, possessing the pilot machine, the packaging greenhouse can offer customized training program and production trails to paper makers to optimize their process and productivity.

Allied cluster

The cooperation is not limited only inside one cluster or one association. However, The Värmland model enhanced the coordination between companies, academia and governments. The pulp and paper is merely a means to an end. Although The Paper Province intergraded the whole value chain of paper making, as middle products, paper still need to be used as printing or packaging. Besides, the supporting industry for pulp and paper were required such as raw materials, IT and others.

Since information technology became a basic tool for production, pulp and paper industry has been far more reliant on for increasing efficiency and profitability. “Compare Karlstad” clustered 85% of local IT companies’ developing in IT and telecoms. Then, through working with companies,
Karlstad University and the surrounding community, Compare Testlab was built up for independent software testing. The future of for the organization and the regional industry seems to be bright. There is no doubt that the cooperation between clusters will share the bright future.

Therefore, The Packaging Arena is a neutral platform for companies, organizations and researchers from all over the world to develop consumer-driven packaging. The Packaging Arena was initiated in 2004 by The Paper Province, Karlstad University, Broby Grafiska Education and DOTANK, in order to connect IT, package design and flexographic printing, in particular, the pulp and paper industry. TPA connected two main regional industries: pulp and paper, and the graphical industry. Cooperating with industries and academia, projects developed in TPA raise the competitiveness of enterprises, such as Controlled Delamination Material (CDM) with Stora Enso, Packaging Media Lab with service research center in Karlstad University and the private sector.

In packaging media lab, eye tracking system was used to record the test consumers’ eyes movements in front of a store shelf. Combined with other several different research methods like surveys, focus group and in-depth interview, this project provides a unique testing environment for new consumer-oriented package development. Consumer testing at this lab prior to market introduction is therefore a sound and cost-effective investment for testers.

Moreover, The Paper Province created a long time partnership with other entities for different development orientations. Especially in financing and investment, local and national investment agencies include Handelskammaren Värmland (previously INVA, invest in Värmland), Inova in Värmland, ISA (Invest in Sweden agency), VINNOVA (The Swedish Governmental Agency for Innovation systems), Tillväxtverket (Swedish Agency for Economic and Regional Growth), Europe INNOVA, etc. The Paper Province is looking for finance support not only for SMEs but also itself. Furthermore, foreign competitors such as VOITH, Andritz and GL&V are looking for investment through The Paper Province in region Värmland. Cooperating with other media and consultant company such as Ramböll also expands the field of cluster. Ramböll publishes a report to measure the clustering effects and local economic growth annually, which will measure the enhancement and competence for member companies and the whole cluster.
5. Analysis

The empirical investigation on the pulp and paper cluster at region Varmland was conducted for the service manufacturing research. The aim of this research paper is discovering the service phenomenon in manufacturing industries. Reflecting to the research questions in the introduction chapter, the analysis will be conducted to review the case and answer the research questions one by each. The analysis of this case will be illustrated in four aspects as follows:

- Offering the blended products and services
- Keeping the promises to customer by keep the service quality, organizing service delivery and reform the corporate
- Exploring the co-operation model inside and outside the cluster
- Mapping the cluster by extended value chain

These four themes intend to answer the research questions:

1. What services are offered by the manufacturers in this cluster? What role of service is in manufacturers? How services are managed and create value for their customers?

2. What the role of service in this cluster? How the value chain in this cluster formed? What’s the process for value creation through the value chain?

First two themes will answer the first bundle of questions and the rest will be answered by last two themes. The service offering explain by itself. Service management and its value creation in manufacturers are illustrated by their promises keeping and related activities certainly. Co-operation model explained the service mind and logic in practice to stimulate the development of cluster. Extended value chain and cluster mapping demonstrated the value creation process for the whole cluster.

The analysis will illustrate the service manufacturing phenomenon in progress from simply service offering to value creation in whole cluster. Numbers of literatures argued the benefits of advanced service offering in manufacturing as well as the transition from manufacturer to service providers. Majority scholars claimed the value co-creation with customers made a big step forward for industry development. Hereby the analysis will test all the theories in practical as the case study.

5.1. Service offering

The first theme for case analyze is explain the service offering from manufacturers. It was mainly divided into three parts as: blending the goods and services and two services offering with special characteristics.

Blending the goods and services
There is no reasonable way to measure a manufacturer as a service provider by how many services produced or offered. Martin and Horne (1992) proposed a transition model for manufacturers from pure goods manufacturer to pure services provider, in middle with core goods with accompanying services and core services with accompanying goods. Oliva and Kallenberg (2003) suggested manufacturer take services as “add-ons” to measure the offerings. Quantity of literatures suggested manufacturer transform into service provider. Somehow, a certain number of manufacturers provide both goods and services, namely blending the service and goods or provide service as add-ons of goods. The quantitative measurement is still difficult to be illustrated.

While, the most obviously apparent is the financial statement. Metso Group measured their services net sales and turnovers in the annual report. The percentage of service net sales in Metso Paper is 35% in 2008 (Metso Corporation 2009). Due to the specification of pulp and paper industry, most manufacturers provide pure goods and core goods with accompanying services. According to an investigation in Swedish manufacturer, general manufacturing companies provide 28% net sales in net sales and 16% account in pulp and paper industry (Davidsson et al. 2009).

Metso Paper has a highly developed service offering profile. The 35% of net sales came from services did not rise up over night. The big installed base provided Metso Paper an excellent platform to perform their services. Especially in the 4th quarter of 2008, the demand of paper declined over the world directly influenced the sales of Metso paper, board and tissue lines. The service income kept the whole company’s profit at an acceptable level. The contribution of services is relied on their long time investment on service development and technology innovation. With an accomplished series of services offering, Metso Paper can feed customers’ need and solve their problems in all domains.

Back to the basic, Metso Paper’s services are mostly based on the products. The core business of Metso Paper is still manufacturing the fiber, paper and board, and tissue business line. Their services are still designed and organized as the “add-ons” of products. Even though the whole company has a strong service culture and the service account a rather important part of business, the staff and management group in Metso Paper still will not admit Metso Paper is a service provider rather than a machinery manufacturer. The core business haven’t shift from manufacturing to services offering. Meanwhile, the connection between supplier and customers to Metso are more related to supply chain relationships. Service accounts a lot but cannot determine everything and become the new main theme of business.

Compared with bigger company, as a single product line manufacturer, SOMAS is offering simpler services to customers. Comparing with the others, valve is a simple part in the whole paper production line. The main service SOMAS offered is maintenance. In valve suppliers, it is common to offer other services like controlling software and other supporting services for free. These manufacturers could be considered as pure goods providers. SOMAS integrated their spare part supply as service part. Appearing on their financial statement, service accounts only 5% of total sales.
Apparently, the pulp and paper industry is still product-oriented. As a service manager claimed: “We can’t live alone. We are relying on them (sales). The teamwork inside the company is more important than offering most advanced technology or providing the best services. We cannot be separated.” According to Nina’s conclusion (2009), Swedish pulp and paper industry is mainly product-oriented which focusing on developing, manufacturing, and selling products together with related or supporting services (Davidsson et al. 2009).

On the other hand, manufacturers had already seen the potential development of services, especially for Metso. The service income recovered a certain volume of income loss from declined sales and market demand. The service manager of Metso Pulp conveyed: “In capital business part, we did have heroes who made great contribution in the past. But the future belongs to service, new heroes are emerging here.”

Customer-oriented services

All of business people and advertisers claimed their business, products and services are in customer orientation. Generally, the corporate culture in customer orientation is one of most determinations for either service firms or manufacturer who provide services (Parasuraman 1987). The customer orientation would be a key element for corporate culture, business development, new service development, etc.

In this case, pulp and paper industry’s characteristics define their business being customer-oriented as well as the services offered. For instance, Metso paper promotes their customized service agreements for every mill. These agreements provide integrated solutions which are customized for paper mills depend on their own special demands, environments, capital statues and other certain conditions like tailored suit. Metso global service network are following the customers like their tissue business line service team work-styles according to the case description. Small spare part suppliers rely more on their customers who are big mills as equipment purchaser and user. The paper mills have much more buying power which results buyer market and leads the small supplier such as SOMAS being more customer-oriented.

On the other hand, the equipment suppliers also have certain barging power and “rules” in some circumstance, as the service manager from Metso described. Within a highly technology and patent sensitive industry, most of product and technology are unique and confidential since these might easy to copy by competitors. This will directly results in market share changes. Moreover, the relationship between suppliers and customers will be disorganized unless they follow certain rules against customer orientation. “Sometimes, customers might be wrong,” said by a manager in the Paper Province.

Technology-infused services

As a technology intensive industry, pulp and paper industry provides their customer technology-infused services as well as their products. Significantly, Nina (2009) reviewed literatures in advantage to develop and offer services in manufacturers by infusing industry technology and information technology. Using technology to improve the service offering is
considered as an effective business model. As her investigation in pulp and paper industry, manufacturers were promoting and offering IT-related services to improve the whole service quality and portfolio, most importantly, the customer value. These results came out same as my case study in The Paper Province. Equipment suppliers offer IT-related services such as remote monitoring and diagnostic systems, distance control-help solutions, online database and forums, etc. Nina (2009) conclude barriers and limitations to success of IT-related services in manufacturers as aggressive promotion from service provider and less demand with less customer value-added from such services. As well, according to my investigation, certain numbers of IT-related services including monitoring software and distance assistance were offered free to customers. Theses “add-on” services were regard as another basic component of product itself. IT did improve the service experience and customer value in some circumstances. On the other hand, some customers still prefer on-site contact with CSRs rather than distance services. This results in a complex combination of on-site and distance services as well as the consideration of service cost, profit and customer value.

Apparently, the industry technology infusion in manufacturer services is much more than IT-related services. The pulp and paper technology itself certainly define the manufacturer services characteristics in this industry. Increasingly, customers are involved into the original technology development with products and services. Customers were brought into the laboratories and factories of equipment suppliers, directly involved in R&D and manufacturing process. These services transcended traditional manufacturer services such as maintenance and spare parts supply. More technology infusion either in IT or core technology development, more customer value will be created and developed from potential. As a result, a newly portfolio of services offering from manufacturers is keeping on the pace of their development with customers. Metso said, “Maintenance had become history, we offer much more than that. One shall never say our service is maintenance.”
5.2. Keeping promises

![Service Marketing Pyramid](image)

Figure 9. Service Marketing Pyramid, adopted from Grönroos (1990), Kotler (1994), Parasuraman (1996)

“It’s all about promise.” Scholars concluded the spirit of service marketing and management into a short sentence. This sub chapter will analyze how manufacturers manage the services they are offering. Beside organization, employees and customers, technology inside the triangle connect these three entities and formed a pyramid of service marketing. Companies in the pulp and paper cluster keep their promise to customers by controlling the service quality, organizing the service delivery network, and restructure the companies themselves.

It is easy to make promise to customers. Down to the foundation, keeping promises which are made to customers is the key to service successful. Most service literatures and books illustrate how service providers keep the promises to customer. Either in managing service delivery or quality, improving the customer service experience or involved with customer to perform services, the model cannot be copied from service industry directly to manufacturers. In some circumstance, the services are still obtains similar characteristics in both areas. Manufacturers in this pulp and paper cluster kept their service promise by guaranteeing the service quality, managing the service delivery network, consolidating the customer relationships and restructuring the company and corporate cultures.

At first, due to the characteristic of service, service quality cannot easily be measured in quantitative methods. Even though, in product-oriented pulp and paper industry, services are offered as add-ons of products. The service quality mostly relies on the product performance and improvement. How much productivity can be improved and how much energy consumption can be reduced per certain unit of production could be rules of service affections and quality. Somehow, these ways are still uneasy to measure. Service level agreement can certainly solve
these conflicts between manufacturer and their customers. For example, Metso Paper offers a full scope of service level agreement which is customizable for different customer demands. Moreover, long time experience in machinery manufacturing ensured Metso’s “know-how”. Expertise knowledge group and cutting edge technology, which result from highly investment on R&D, can guarantee to solve any problems and questions encountered and raised by customers.

Secondly, accomplished service delivery process affects the promises. This relies on the service delivery network and customer accessibility. As SOMAS present, they can guarantee “ZERO stock” for customer. This promise benefits from their fast logistic network and private own warehouse which can maintain large number of storage. Meanwhile, as Metso Paper promised “Being close to customer” and “power to serve”, their accomplished global sales and service network certainly ensure the close distance between manufacturer and customers. Metso Paper usually set workshop directly into the paper mills for roll services and others. Besides, internet and other communication technology bring customers to suppliers even closer.

Thirdly, consolidated customer relationship ensures the promises. Or the affective relationship between these two is convertible. As a capital-intensive industry, most investment in pulp and paper industry is long term and highly revenue reward in future. As a machinery builder, Metso Paper prefers to have long term relationship with supplier and customers. In this situation, partnership ensured the future business development opportunities. Metso Paper had built partnership along their whole supply chain from upstream machinery and equipment component supplier to downstream subcontractors and maintenance outsourcers. Especially when Metso Paper explored the business in developing country such as China, “We grow with them”. The closely relationship with customers founded the future development.

Finally, the adjusted service-oriented corporate structure and service culture will ensure the manufacturers being professional service providers. The corporate culture definitely influences the services in forms of employee competence and acknowledgement. Manufacturers keep on improving their service culture and organization structure for better customer serving. The structure of Metso Paper Karlstad service center proved this fact. With Metso’ acquisition of Kveaner pulping and SOMAS’s new service manager hiring, these two companies showed their ambition to serve customer better. The service center structure of Metso Paper Service Center Karlstad provided the evidence for service-oriented structuring of department as well.

5.3. Co-operation Model

“Development and results through co-operation”. The motto of the Paper Province guided the whole staff in this NGO to coordinate the cluster. The co-operation was not only the spirit of the pulp and paper cluster, but also influenced the whole Varmland. “Varmland Model” was promoted as a main chapter of Varmland stories.
The Varmland Model illustrates the co-operation as the root of addition equation for growth in Varmland. By coordinate the academia, trade and industry, and public sectors to co-operate with each other, the region can result and benefit in innovation and growth, from which put their focus areas into the formation. The co-operation can be conducted in three dimensions: inner-cluster, regional and domestic, and international co-operation. Each species of co-operation can be easily demonstrated in the Paper Province.

**Inner-cluster co-operation**

The main task for The Paper Province is coordinating the companies in the cluster. After the cluster organization initiated, thousands of projects had been organized and promoted by this NGOs. In the past, most SMEs in this cluster region desired for research resources and wider business development opportunities. The function of the Paper Province solved this problem fundamentally. The inner-cluster co-operation integrated the limited resource in this region and created unlimited opportunities. Especially for SMEs, they can use the others’ research resource and combine with themselves’ for win-win. For example, the ongoing project for Paper Machine water saving performed in The Energy Square integrated the useful research resources in the cluster, which involve Metso Paper and WIPAB which is a typical SME in cluster.

**Regional and Domestic co-operation**

None industry can survive alone. The Paper Province cluster co-operated with local cluster Compare Karlstad for better IT supporting services, as same as The Packaging Arena for downstream industry, which also generated from The Paper Province. Involved in numbers of national cluster program such as RTP (Regional Growth Program, Regionala tillväxtprogram), The Paper Province co-operate with other areas in Sweden and national agencies and funds.

**International co-operation**

As an export-oriented industry, the Varmland pulp and paper cluster has customers all over the world. Due to the distribution and reliability on nature resources, paper mills spread globally. With the rising cost of production in developed countries, more paper mills are built in developing countries. The co-operation in pulp and paper industry had crossed the country boarder and oceans. In the previous case chapter, Metso Tissue line’s exploration in China was a
powerful evidence of their international co-operation. Back to Europe, the Paper Province and cluster members are involved numbers of EU environment and other technology development program co-operate with foreign professionals, for instance, the EU-China environment program.

5.4. Value co-creation mapping the cluster (extended value chain)

By understanding the value creation through value chain in theory, the precondition to understand the value creation process in this cluster had been settled down. Presented in previous theory part, the value creation under good dominant logic was concentrated in producer and delivered through supply/value chain. Hence, understanding the value chain of pulp and paper industry can easily illustrate the value creation process under GDL.

Following chart present the value chain in pulp and paper industry covering production and consuming process.

![Value Chain of Pulp and Paper Industry](figure.png)

Figure 11. Value Chain of Pulp and Paper Industry, source: SAPPI corporate presentation

Despite of other complex relationship and co-operation, simplified value chain in pulp and paper industry followed the producing and consuming process of paper products. From raw materials to final disposal, the main stream of this value chain restricted on the product: paper. From the very beginning, forests and sugar cane was embedded with less value-in-use and exchange for downstream customers. By turning into pulp in mechanical and chemical pulping process, paper
mills can produce the middle products as paper, board or tissue. Normal or fine paper and board will be sent to secondary manufacturer or customers to convert into secondary products such as printed documents, books, and paper packagers, bags or boxes. Consumed by final end users, most of paper can be recycled back to paper mills for further production. The value was added and embedded during the paper production and consuming process. Products were delivered to downstream customers with added value from upstream suppliers.

![Figure 12. Cluster entities and facilities](image)

As the pulp and paper industry agglomerated, more and more players will be involved into this cluster. Centralized in machinery manufacturers and paper mills, finances, organizations, educations, services, media, and so many other players are all involved and contributing the regional cluster development. According to Sölvell (2009), a cluster will be a dynamic structure where all actors in the cluster are connected to each other. It is easy to illustrate this phenomenon in theory and models as previous chapter shows the dynamic structure in a cluster. However, in practical, most clusters prefer to frame and map themselves rather than draw a dynamic “chaos”. By mapping the cluster, governor and companies can easily position themselves in the cluster and manage the linkage and relationships with each others. Most importantly, the value co-creation model appeared by itself.
Following figure present the mapping of the Paper Province cluster:

Based on previous found and combined with the case study for this research, the Swedish pulp and paper cluster in region Varmland is still product-oriented (Davidsson et al. 2009), and the relationship of manufacturers are supply/value chain based linkage. As this result, the cluster structure can be described as the mix of value chain and value co-creation model under service dominant logic. Somehow, the central of this cluster are still machinery manufacturers and paper mills. The main connection is the value chain of product but more dynamic connected to the other actors in the cluster.
As we can see from this chart, machinery manufacturers and paper mills are the core of this extended value chain horizontally. Dynamically, they are the core component of the whole cluster by connecting all the other entities. Focusing on the value chain horizontally, Uniwood and upstream machinery supplier delivered the rough materials and mechanic components to the core. Upstream producers and clusters became the followers for further value co-creation and integration. Vertically, the government and the Paper Province being a NGO support in policies and regional development stimulations which are most important determine factors. Their administration and coordination bring benefits to companies all over the cluster. As well, supporting industries and companies such as logistics enjoy the dynamic cluster structure for their core or extend business to serve machinery builders and paper mills as their customers.

Definitely, there are much more than this cross. As we have seen, investors are brought in by the Paper Province. This is significantly more effective for companies being individuals to find money. Being an integrated entity, companies in this cluster can find more ways to invest their R&D and other development project rather than bank loans and capital market financing. Especially for SMEs, more financing methods will accelerate their growth. As well, we can never ignore the strength from academia and other organizations. Their research and promotion ability would not only helpful for the manufacturers but also for other related SMEs.

This extended value chain was built up for mapping this cluster briefly but still bit rough. The relationships and connections between entities inside the cluster are mainly grouped and follow the value chain. As supplement, supporting and coordination are still rather weighty. The cluster mapping is useful for either regional management in macroscopic or individual company development in microscopic.
6. Discussion

The aim of this thesis was to explore the role of service in this pulp and paper cluster in region Varmland and verifying the linkage between entities for cluster mapping. The investigation and case study in The Paper Province had been presented and analyzed in previous chapters. There were four elements for this analysis: the service offered by manufacturer within the cluster, marketing and managing the services by keeping promises, developing a dynamic model to stimulate co-operation, and mapping the cluster as extended value chain. This paper would summarize the initial results based on previous research, literature reviews and own investigation in The Paper Province as following three outcomes:

- The Paper Province cluster is a product-oriented manufacturing cluster with impressive service infusion.
- The cooperation model in region Varmland stimulated the development of cluster and companies covered.
- The connection between each entities in the cluster is value chain based, service related dynamic structure. The main theme of cluster is good dominant logic.

This case study was strictly limited in the Swedish pulp and paper cluster in region Varmland. Somehow, the characteristic of this manufacturing cluster could be broadly defined and compared with other manufacturing industries and areas. These initial results briefly defined the role that service is acting significantly in this pulp and paper cluster. The characteristics of this role were given in the following results.

First of all, by investigating the service offering and related service management, with previous research, this paper would ground this manufacturing cluster is a product-oriented industry cluster. Apparently, increasingly service income presents the affection of service in manufacturing companies. Few core companies in this cluster have relative higher percentage on service income. Whilst, the industry average is lower than normal standard in Sweden and Nordic. The classification and offering of services declared the role of service in this industry mainly were “add-on”. On the other hand, the innovations and development of service offered by manufacturers delight the role and future of service in this industry. The transition of this industry from pure manufacturers to service providers is on its way. Due to the resources and original characteristics of pulp and paper industry, The Paper Province cluster would not become pure service provider industry. And the service will light and spark this cluster, certainly.

Secondly, the cooperation model which was created in region Varmland that deeply stimulated the development of cluster, more importantly, the service concept and applications in this industry. Even though the service mind or service logic implementation in this industry is not rather extraordinary, apparently, the cooperation model did reflect the potential of service development and value co-creation between customers and other business partners. Moreover, the function of services provided by the organization and governments emerged with cooperation model and regional economic development results. Thus, it enhances the position of
service in this cluster.

At last, although we had admitted the importance of service in this cluster, there is no excuse to deny the core value chain linkage which is manufacturing business. Generally, a regional industry linked all the companies with supply chain and supporting departments or services. Somehow, this cluster with impressive service manufacturing infusion could be mapped by an extended value chain which can highlight the functions and role of service. More importantly, the reasonable cluster mapping will benefit the co-operations as well as the cluster management. Government and cluster organization would group up the limited and unlimited resources that the cluster can reach to, and promote related policies for regional economic and industry development. As well, the companies inside or outside this cluster could enjoy the benefits of being in the cluster and doing business with the cluster. Apparently, the cluster mapping and cluster service management can certainly influence the future of region Varmland.

Besides the investigation and the initial results, there still are few arguments and ungrounded or undeveloped viewpoints. Martin and Horne (1992) suggest the transition model for manufacturers is becoming service provider ultimately. Somehow, the investigation in this cluster shows that the chances to become service provider companies is limited, neither the cluster, definitely. As the interviewee conveys, they would never give up their original business since their market position and other factors determines their long term development strategy. Unlike ABB or IBM, their original business might easily be copied and taken over by third countries where would be key competitors in their future. Striping up these businesses and transforming into service providers is their ideal development strategy. Pulp and paper industry and its technologies will be possessed and monopolies by western countries in a long time. As well, this is not a denying of this possibility. And it is valuable for future discussion.

There is another interesting topic. Initially, I attempt to discover the linkage between entities in this cluster measured by service. In another word, I tried to use service as a core line to mapping this cluster. This measuring might obey the cluster theory systems which broadly accepted by governors and scholars, especially applied in this traditional manufacturing cluster. As the results come out, according to the interviewees’ viewpoints and cluster development and performance facts, I distinguished the differences between The Paper Province cluster and London financial circle. The research on manufacturing cluster and service cluster will be varied. And that would be another possibility for future study.
7. References


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