



**SCHOOL OF ECONOMICS
AND MANAGEMENT**
Lund University

Master Thesis Spring 2003

M2M

- implications on organisations, offerings and relations

Tutor: Matts Kärreman
Examiner: Lars Bengtsson

Authors: Alexander Falk
 Ragnar Kämpe
 Anders Torkelsson

Summary

- Title:** M2M – implications on organisations, offerings and relations
- Authors:** Alexander Falk, Ragnar Kämpe, Anders Torkelsson
- Tutor:** Matts Kärreman
- Course:** Master Thesis in Strategic Management, 10 credits
- Date:** Course seminar in Strategic Management 06-06-2003
- Key words:** M2M, machine-to-machine, remote monitoring, value chain, transaction costs
- Problem:** Machine-to-machine (M2M) communication is a phase in the digital revolution connecting computing devices with each other bringing along new business opportunities for companies. Although being a fast growing field it has not been researched to any greater extent, particularly not within the academical literature. Consequently, information on how M2M can affect organisations seems strongly needed. This thesis uses three perspectives, derived from already recognised business benefits of M2M, as an aid to select proper theoretical tools to investigate the phenomenon.
- Purpose:** The purpose of this thesis is to gain knowledge of how an M2M adoption affects a firm's organisation, customer offerings and customer relations. The purpose is *not* to discuss in explicit monetary terms but rather on a conceptual level.
- Methodology:** A key word in the methodology used in this thesis is understanding. It is an explorative case study on the phenomenon of M2M, focusing on understanding it from three perspectives. The methodological approach used is abductive and the empirical observations are based on a qualitative study of six companies that use or have previously used M2M. The data collected was later analysed with tools collected from four different theoretical categories; industrial organisation, contractual theory, network theory and transactional marketing.
- Conclusions:** In terms of the value chain, it has been found that service and firm infrastructure are the activities mostly affected by an M2M implementation. Furthermore, it seems as M2M offers considerable opportunities for strengthening the customer bonds and lowering the transaction costs within firm-customer relations. It also appears as M2M provides significant possibilities for enhancing the customer offerings which may lead to differentiation advantage.

Preface

The authors have had many interesting discussions during the creation of this thesis. Although fruitful and constructive, some of the most important inputs were given by other individuals.

We would like to thank some of the people who have provided us with valuable inputs. First and foremost we would like to thank our tutor Matts Kärreman. Without your insightful comments the quality of this thesis would not have been the same. We doubtlessly saved numerous hours by applying your advice in our struggle.

Another source of invaluable discussions and suggestions is Peter Svensson at Lund School of Economics and Management. Your suggestions on literature within the marketing field have indeed been of great value.

Our sincere appreciation is also addressed to the representatives of the investigated companies: Nicklas Froborg (Alfa Laval AB), Fredrik Sederholm (Otis AB), Mikael Sandgren (PM-Luft AB), Patrik Olsson (Thermia AB), Jens-Erik Rasmussen (AB Tetra Pak) and Stefan Blixt (Xerox AB).

Lastly, we would like to thank Sir Bernard Cross for your useful help, not merely within the academic field, but also as a friend and good listener.

Lund, 12th of June, 2003

Anders, Alexander & Ragnar

Table of contents

1	Introduction	9
1.1	Background.....	9
1.2	Problem discussion.....	13
1.3	Purpose.....	14
1.4	Delimitations	14
1.5	Target audience	14
1.6	Structure.....	15
2.	Methodological considerations	16
2.1	Approach	16
2.2	Choice of theory	17
2.3	Procedure and data collection.....	18
2.4	The interviews.....	20
2.5	The thesis' trustworthiness and criticism of sources.....	21
3.	Perspectives on M2M	24
3.1	Porter's value chain	24
3.2	The concept of efficiency	27
3.3	The three levels of product-model.....	28
3.4	The eight dimensions of quality	31
3.5	The network theory.....	33
3.6	Transaction cost theory	38
3.7	Theoretical framework.....	40
4.	Empirical observations	43
4.1	Alfa Laval AB.....	44
4.2	Otis AB	49
4.3	PM-Luft AB.....	52
4.4	AB Tetra Pak.....	56
4.5	Thermia AB.....	61
4.6	Xerox AB.....	65
5	Analysis	67
5.1	Value chain analysis.....	67
5.2	Three levels of product-model analysis	71
5.3	Eight dimensions of quality analysis	74
5.4	Network theory analysis.....	77
5.5	Transaction cost analysis	83
5.6	Perspective-oriented discussion.....	87
6	Emerging insights	89
6.1	How does M2M affect the three perspectives?.....	90
6.2	General discussion.....	92
6.3	Theoretical contribution	93
6.4	Suggestions for future research – hypotheses	94
7	Bibliography	95

Figures and tables

Figure 1.1	Illustration of the three perspectives in the firm-customer context	14
Figure 1.2	Structure of the thesis	15
Figure 3.1	Porter's generic value chain	25
Figure 3.2	Three levels of product-model	29
Figure 3.3	Illustration of the perspectives on M2M in the firm-customer context	41
Table 3.1	Possible questions to be analysed with each model, theory or concept within each perspective	42
Figure 5.1	The organisational implications of M2M usage	70

1 Introduction

Being a new and relatively unexplored area of research an important aim of the first chapter is to introduce to the reader the phenomenon of M2M. First, the background of the area is presented. This is followed by several examples of M2M in practice, facilitating the reader to better understand the following problem discussion. This, in turn ends with the thesis' purpose, delimitations and target audience. At the end of this chapter an outline of the thesis' chapters is presented.

1.1 Background

“Telematics and M2M are the fourth phase in the digital revolution, interconnecting the millions of embedded computing devices with each other and with backbone computing systems to allow automation of manual tasks and tailoring of service to better meet customer needs.”¹

To most people, machine-to-machine (M2M) communication is a fuzzy concept. Being poorly defined and rather unpenetrated by research, many people do not know its meaning, let alone the potential gains for a firm that implements it. It is the authors' impression that many look at it as the latest IT fad, blessing no one but the consultants that make a profit on it. This being said, it is believed that the potential of M2M communication is huge. For example, the Japanese mobile operator NTT DoCoMo estimates that at 2010, two thirds of its customers will not be humans but machines. Furthermore, forecasts show that there will be five millions of communication modules installed in different types of machines in Sweden within the next five years.²

Not much is written on machine-to-machine communication. Indeed, to the authors' knowledge, only one book is written on the matter in Sweden. In addition to this, most large consulting agencies, particularly those with an IT focus, have picked up the concept. However, due to the scarce amount of research on M2M's business implications, not much can be said about M2M, neither in terms of actual gains nor problems.

What is known, then? To begin with, there is a confusion of ideas concerning the definition of M2M. It is also a fact that only a limited amount of literature has been written on M2M and its business implications. Another fact, however, is that the concept is becoming increasingly interesting to companies worldwide.

Paradoxically perhaps, it was this confusion over what the M2M contained and the implications it could have on enterprising that made the authors interested. Having been suggested this topic of research by professor Allan T Malm at Lund School of Economics and Management, when commencing the background research it stood clear that this in large was an academically unexplored territory.

As with most new technological solutions, the enthusiasm of the advocates has no limits. Neither has the potential, however, as is indicated by the introductory quotation. Clearly, a more sober picture is needed.

¹ www.arcgroup.com (2003)

² www.m2mportalen.com (2003)

Confusion on M2M

In order to understand the overall context of this thesis, it is necessary to get acquainted with M2M and the conceptual confusion surrounding its terminology. Being a conceptual umbrella it has come to include more than just machine-to-machine communication. Starting with the shortening itself, it is not even obvious that M2M refers to machine-to-machine. Indeed, “made-to-manage”, “mark-to-market” and “model-to-model” are just a few examples of other suggestions – some people even relate to a pop group. Even when referring to the “correct” meaning, M2M may be translated into “mobile-to-machine”³ or “man-to-machine”⁴.

What is more confusing, however, is how the definition of machine-to-machine differs. To mention a few, “m2mportalen.com”, a Swedish web portal solely dedicated to machine-to-machine communication, describes M2M as “based on that at least one end of the communication connection is a machine.”⁵ This description is followed by a list of components and activities common in M2M solutions.

Furthermore, Pär Ström, the author of the one Swedish book on M2M, defines it as follows: “M2M means communication ‘product-to-product’, ‘product-to-man’ or ‘man-to-product’, with at least one part involved being a non-computer”, thus indicating that the term ‘machine’ is inappropriate. Ström argues that the term is already out of date since there are even containers communicating⁶, which obviously have very little in common with machines.

Moreover, M2M in vehicles is often referred to as “telematics” which also is the vocabulary adopted by Ström. In a case study of the Swedish M2M industry, M2M is said to consist of telematics and telemetry, where the former refers to remote control of machines while the latter refers to monitoring and gathering of data.⁷ Hence, not even telematics is a consistent term.

Many consultants, however, seem to use telematics synonymously with M2M. According to Accenture, telematics refers to “wireless, two-way communications between a vehicle, or a piece of equipment, and its environment”⁸, which appears to be consistent with the prevalent mainstream meaning of M2M. The well renowned M2M consultant ARC Group use “telematics” as a general term for the automatic remote transfer of data and sees “telemetry” as the part of telematics that handles the sending of measurement data.⁹ Thus ARC Group’s definition differs from Accenture’s in that the former does not consider wireless communication a prerequisite.

What makes Accenture even more interesting is that it uses different definitions of telematics. In addition to the mentioned, it argues that “telematics [is the] ability to wirelessly provide information to, or extract information from, vehicles and industrial equipment, such as generators, pumps, and heating and cooling systems.”¹⁰ Thus, in the second definition, the consultant adds an industrial twist to the term, which clearly indicates a confusion of the concept.

Certainly, the terminology is obsolete at its best. It is however more likely that “M2M” has never been accurate but instead gained ground thanks to the dashing aura of the abbreviation in combination with a need for a conceptual umbrella. As indicated by the discussion above, a new

³ www.nokia.com (2003)

⁴ Ström, P (2002) *Prylarna snackar*

⁵ www.m2mportalen.com (2003), freely translated.

⁶ An interesting example of this is present in Barcelona, where containers alert as they need to be emptied.

⁷ Kviselius, N Z *Swedish M2M Industry Case Study*

⁸ www.accenture.com (2003)

⁹ Cederquist, L (2001) in *Contact*

¹⁰ www.accenture.com (2003)

vocabulary seems needed to facilitate constructive discussions on the matter, although the purpose of this thesis falls short of such an objective.

M2M in practice

Lacking a widely accepted definition it might be enlightening to discuss a few examples of what is considered to be covered by the M2M concept.

- Example one: Service

One can imagine a copying machine manufacturer utilizing M2M to redesign the service process in such a fundamental way that the company receives information about malfunction before the customer notices it.¹¹

Microprocessors placed in the copying machines programmed with ‘artificial intelligence’ constantly perform surveillance of the most vital parts of the machines’ operation parameters, such as share of bad copies or paper jam.

If problems arise more often ‘than usual’ for this particular machine, the machine will automatically call the manufacturer’s service centre using the regular phone line. The service centre operator sends the information to the service engineer’s field laptop and the engineer contacts the customer to set an appointment for service. The next step in the redesign of work is that the service operator is eliminated and the machine contacts the most appropriate service engineer directly. The engineer may perform additional diagnosis remotely and consequently has maximum preparation for the nature of the repair.¹²

- Example two: Vending machines

One can also imagine a vending machine remotely alerting when soft drinks need to be refilled. The most obvious advantage is that one never has to guess when to refill and thus M2M can lower the visits by more than 30% according to actual tests. Moreover, the average storage utilization increases by more than 50%, indicating that the risk of running empty is lowered. In addition, each visit can be made shorter thanks to the prior information of what needs to be refilled.¹³

- Example three: Fleet management

Other fields in which M2M is considered to have great potential are transportation and logistics. The demand for information has increased as lean production and JIT are constantly gaining ground. Taking carriers as an example, M2M enables companies to track vehicles and cargo; thus generating information that can be used internally and as a service offered to customers. Hence, increased productivity and lowered costs are considered the main potential advantages of M2M within fleet management.¹⁴

¹¹ CIO Magazin (1993) *Reengineering customer service*

¹² Willoch, B-E (1995) *Business Process Reengineering – En praktisk introduktion och vägledning*

¹³ Ström, P (2002) *Prylarna snackar*

¹⁴ Ibid

- Example four: Metering

The preliminary invoicing of electricity practised in most countries brings along several disadvantages to power companies and their customers. The companies have poor knowledge of individual electricity consumption development and customers consequently run the risk of being charged an accumulated lump sum in case of increased consumption. M2M facilitates more efficient reading of electricity meters, benefiting both companies and customers. Furthermore, through tailored agreements power companies can cut customers' consumption during excessive peak usage, thus significantly lowering the companies' costs.¹⁵

Although the mentioned fields are among the most exploited to this date, the potential gains in other areas such as security and surveillance, in-vehicle applications, telemedicine, public traffic services are considered enormous.¹⁶

M2M in this thesis

Obviously, there is no clearcut definition of M2M. Yet the authors need to adopt a recognised definition as a basis for this thesis in order to facilitate an examination on the matter. It will also provide the reader with a conceptual compass assumed needed when orienteering through the thesis. The definition adopted by the authors was mentioned earlier and reads as follows:

"M2M means communication 'product-to-product', 'product-to-man' or 'man-to-product', with at least one part involved being a non-computer"¹⁷

The definition is believed to suit this thesis well, since it covers most of what is widely known as M2M at the same time as it highlights that for instance regular e-mail communication is not covered by the M2M concept. At this stage it might also be appropriate to state how the term M2M is used throughout the thesis. It will be referred to as "M2M", "M2M system", "M2M solution", "M2M technology", "M2M concept" or simply "the phenomenon". Even though the terms to some extent imply different meanings, they are rather used to make the thesis more pleasurable and varying from a linguistic point of view.

¹⁵ Ström, P (2002) *Prylarna snackar*

¹⁶ www.nokia.com (2003)

¹⁷ Ström, P (2002) *Prylarna snackar*, freely translated.

1.2 Problem discussion

Despite extensive search for information on M2M, little has been found. Indeed, the authors have confronted consultants on the subject but these have not been able to provide much guidance, and theoretical literature and reports are scarce. As mentioned there is only one Swedish book written on the matter, but, more surprisingly, not many books have been published internationally either. In fact, the authors have found only one major report on M2M and it was published in December 2002 by an M2M consultant, charging GBP 1.995 a copy¹⁸. If the advocates are right in just a fraction of what they claim, there are large sums of money at stake for companies across many industries. Consequently, information is desperately needed.

Obviously, there are many potentially interesting issues to investigate. Is the adoption of M2M a strategic decision that should be carefully evaluated by the top management? Or does it have the character of a day-to-day decision routinely dealt with during the regular Monday morning meeting? What demands does M2M raise on organisations? In what ways can M2M enhance the customer offerings? Will customer relations improve owing to M2M? Can M2M generate competitive advantage? Who should, and who should not adopt M2M? And what determines the scale of impact on the business? Just to mention a few potential questions to explore.

A major concern of the authors when deciding to explore M2M was that the array of interesting issues seemed far too vast to comprehend in one thesis. Consequently, the next question was on what grounds it would be possible to discriminate certain issues in favour of others? Clearly, some perspectives providing such guidance was needed.

In his book, Per Ström identifies eight potential business benefits, derived from M2M: Lower costs; new or better services; increased efficiency; strengthened customer relations; usage of the connection to sell goods or services; new business models; offering of advertising space; and possibility to collect valuable data.¹⁹ When deciding on what perspectives on M2M to study, this was the one benchmark available. Consequently, the authors aimed at finding perspectives that could hold as many of these eight business benefits as possible without losing focus. The three perspectives that were finally decided upon are organisational implications, customer offerings and customer relations.

The first perspective holds the benefit claiming that M2M can lower costs. Assuming that lower costs originate from organisational changes, the authors thus found it relevant to examine the organisational implications of M2M. The second perspective arose from the benefits of new or improved services, new packaging and the possibility to collect valuable data. These indicate that the customer offerings are affected and thus it seems relevant to examine in what sense offerings might be enhanced. The third perspective holds the potential benefit of strengthened customer relations as it aims to explore how these relations are affected by an M2M implementation. Thus, whereas *organisational implications* highlights internal effects and *customer offering* sheds light upon what is offered to the customer, *customer relations* takes into account how the ongoing relationship is affected by an M2M system implementation – as illustrated below.

¹⁸ www.arcgroup.com (2003)

¹⁹ Ström, P (2002) *Prylarna snackar*

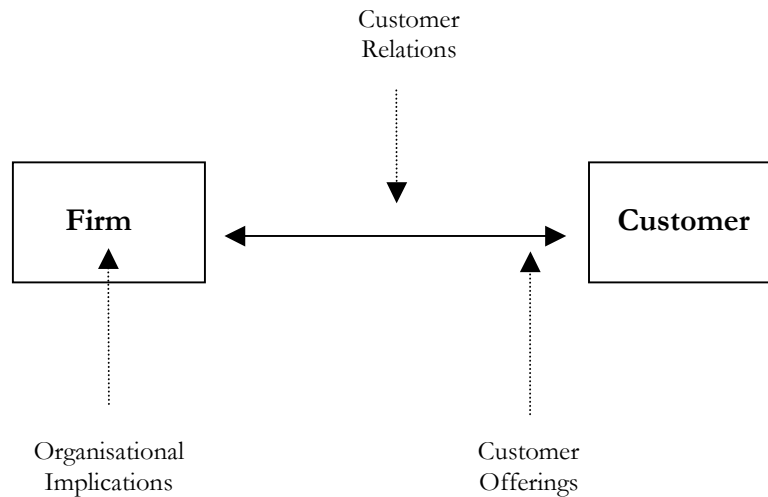


Figure 1.1 Illustration of the three perspectives in the firm-customer context.

1.3 Purpose

The purpose of this thesis is to gain knowledge of how an M2M adoption affects a firm's organisation, customer offerings and customer relations. The purpose is *not* to discuss in explicit monetary terms but rather on a conceptual level.

1.4 Delimitations

Having established the scene of action in the problem discussion and the depth of the thesis in the purpose, here the delimitations will be presented.

Firstly, the geographical delimitation is set to Sweden. Aiming for a larger geographical area would be too great a job and as the authors are most familiar with the Swedish market it seems logical to adopt this delimitation.

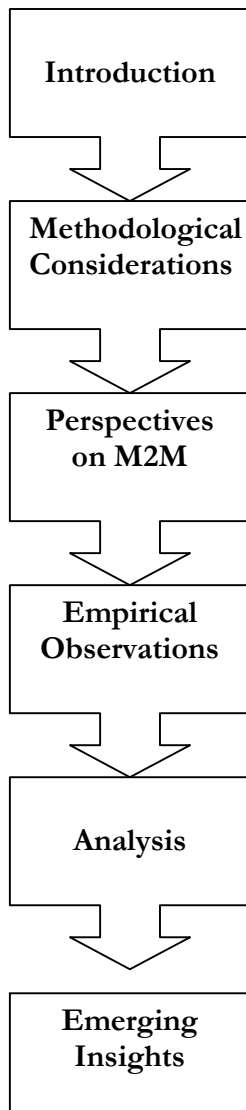
Secondly, the investigated companies must have or have had an M2M system running. This delimitation sorts out M2M consultants and companies with plans to implement a system.

Thirdly, the M2M system must facilitate a premium price to be charged. Thus, companies using the system merely to lower internal costs is not included in the study. For instance, one might assume that for most vending machine companies M2M does not facilitate a higher price to be charged.

1.5 Target audience

The primary target audiences of this thesis are the students and faculty members at Lund University. However, since M2M is a new and rather unexplored area – both academically and businesswise – the hope is that practitioners too find this thesis interesting.

1.6 Structure



The introductory chapter outlined the background, problem discussion with the three perspectives and purpose of this thesis. It also gave an account of the confusion on the M2M terminology while exemplifying its areas of usage. In the second chapter, the reader will gain knowledge on the methodology used when collecting information and the consequences this may have on the results.

The third chapter, Perspectives on M2M, will provide a set of tools to analyse the information with respect to the purpose. The chapter also relates these tools to the M2M context. In the fourth chapter the empirical observations of the investigated companies are presented, using the three perspectives as a structure for each company.

The analysis in chapter five fuses theories and concepts with empirical observations, thus lets patterns from the investigated companies stand out. At the end of the chapter these patterns are to be related to the three perspectives. Chapter six presents emerging insights on how M2M affects firms from the three perspectives and also includes a general discussion on additional findings not explicitly covered by the perspectives. The chapter ends with suggestions for future research. Finally, the bibliography is presented.

Figure 1.2 Structure of the thesis

2. Methodological considerations

In this chapter the reader will learn about what information has been collected and how it has been processed by the authors. These methodological approaches will be presented along with criticism of the data collection. This will facilitate for the reader to better evaluate reliability, validity and perhaps even the degree of generalisation. Altogether, the authors hope that the information presented in this chapter will provide the reader with tools to determine how well the results match the purpose of the thesis.

2.1 Approach

The historically prevalent approach to study a phenomenon is to use either an inductive or a deductive research approach. One may say that the former emanates from empirical observations and generates concepts in terms of hypotheses or theories, and that the latter's point of departure is on the conceptual level, i.e. conceptual formulations in terms of existing theories and hypotheses.²⁰

As the topic of this thesis is relatively unexplored and thus difficult to predict, neither of these traditional approaches are suited. Instead, as the authors started off with theoretical models, generated empirical data and then found new theories to use, the abductive approach was found more appropriate. This approach may be considered a combination of the inductive and deductive approaches, as both theoretical and empirical issues may be analysed. The appropriateness of using an abductive approach should be even more prominent when studying a phenomenon as is the case in this thesis. Being tied to pre-determined theoretical reasonings clearly would constrain the level of understanding. For instance, the abductive approach is apparent in chapter six, where the potential of competitive advantage is discussed, although the concept is not presented in Perspectives on M2M. This analysis would not have been possible to perform using another approach.

Furthermore, this thesis is a case study as defined by Yin:

“A case study investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used.”²¹

A case study may have different motives, for example to describe or explore. The focus of this thesis is on the latter – to explore three different perspectives on the phenomenon of M2M. Indeed, an explorative case study seemed to be the most plausible way of realising the purpose of this thesis, as a case study allows a deep understanding of the unit of analysis – in this thesis the phenomenon of M2M.

Most qualitative research is in the form of a case study, and accordingly a qualitative method has been used in this thesis.

²⁰ Backman, J (1998) *Rapporter och uppsatser*

²¹ Ibid

2.2 Choice of theory

The main purpose of the theories and models used is to provide tools on which to interpret and draw conclusions from the empirical observations. As the authors found, no theory alone is adequate for doing this. In fact, not even one theoretical area is alone sufficient to explore the purpose of the thesis. Consequently, the authors had to use several different theoretical categories. Each and every theory or framework has thus been incorporated to serve specific areas and purposes. However, this has not restrained the authors from employing the theories in other aspects than initially intended, since interesting connections have constantly been recognised. Indeed, this way of working is in line with the abductive approach being used.

Naturally, the three perspectives have been starting points of the theory search, and the aim has been to find tools to explore these areas. The authors aspired not to have any limitations as of what areas of theory may be appropriate. As a result, a rather vast amount of literature has been considered, and basic textbooks covering broad theoretical areas have been used as starting points in this search. As relevant reasonings were found, the authors penetrated these particular fields in a more in-depth manner. Below, these areas are argued relevant for the thesis' purpose.

The first category of theory – industrial organisation – is described by Michael E Porter as “a systematic and relatively rigorous [approach to industry analysis] backed by empirical tests.”²² This theoretical basis is of use for this thesis as it offers a systematic and structured view. Within this systematic way of analysing industries and firms, Porter's generic view of the firm as a value chain allows a study and comparison of *organisational implications*, no matter what the organisational chart may look like.

Furthermore, contractual theory may be used within two perspectives. It may partly be used to study *organisational implications*, as it offers a cost perspective and thus complements the way the value chain is intended to be used. More importantly, however, it may also be used to examine how the *customer relations* are affected by an M2M implementation. Doing this, the transaction cost theory is applied to illustrate how these costs may be affected.

Studying *customer relations*, the network theory assumes a rather different approach from the contractual view. Indeed, this theoretical area offers both a larger perspective on the *customer relations*, and more importantly may be used to analyse how relations are strengthened or weakened.

The fourth group of theory used is the transactional marketing. As its focus is on profitable transactions rather than relations, it was found appropriate to study the implications an M2M implementation has on *customer offerings*. Indeed, as this phenomenon is a relatively new field of study, the question as of whether it can generate profit appears to be of particular interest.

To summarise, the authors have employed theories and models that originate from four different categories of theory. All of the specific theories and models are in turn academically recognised.

²² Porter, M E (1981) *The contributions of Industrial Organizations to Strategic Management*

2.3 Procedure and data collection

Choice of study objects

Naturally, when conducting a case study the selection of cases to investigate is a delicate task, not the least in terms of how many cases to include. Having formulated a clear purpose and defined the boundaries, the authors commenced a search for companies to study. This undertaking may be divided into four main areas:

- Internet

Specific M2M sites were examined, but also different search engines such as “Google” were used.

- M2M providers

The companies providing the technological M2M structure often have lists of reference projects on their homepages. These were studied.

- Consultants

Consultants with knowledge and experience of the M2M field were contacted for suggestions on appropriate objects of study.

- Companies with comparable M2M implementations

As was found, those firms with M2M implementations installed, often have extensive knowledge about other companies with similar systems in their line of business.

Telephone and e-mail were used to contact the companies, and altogether some 50 companies were cursorily examined. Six of these 50 companies met the boundaries, and were therefore approached by the authors. Since no company rejected the request of being interviewed for this thesis, the empirical observations constitutes of six cases.

As argued above, the difficult task of deciding on the number of cases to study appeared to be easily managed. Indeed, the thesis’ delimitations were the most important constraints as all companies contacted agreed to be interviewed. The final list of case study objects is: Alfa Laval AB, Otis AB, PM-Luft AB, Thermia AB, AB Tetra Pak and Xerox AB. Next, these companies will be further discussed as the collection of primary data is presented.

Collection of primary data

After the initial contact with the companies had been made, it was clear to the authors that the relevant areas to be examined often could be related to one or few key employees within each company. One difficulty was to find commercially oriented persons to interview, as it was often assumed that the thesis’ focus was on technological issues. The final interviewees, however, were all commercially well-informed. There were no difficulties accessing these key employees and get their approval to be interviewed. The collection of primary data has been achieved by interviewing company representatives face to face or by telephone.

In order to give the reader the opportunity to form an opinion regarding the appropriateness of the interviewees chosen, the different interviewees within each organisation are presented below.

- Alfa Laval AB

At Alfa Laval, Nicklas Froberg was interviewed. His formal position is Regional Marketing Manager (Parts & Service division, Eastern Europe), and he has worked in the company since November 2002. In terms of M2M, Froberg is involved in Alfa-Lavals re-launch of M2M. The interview was approximately one hour and was conducted face-to-face at Alfa Laval in Lund.

- Otis AB

The interviewee at Otis was the company's Chief Executive Officer Fredrik Sederholm. He has worked for Otis since 1985 and he claims to be both technologically and commercially oriented. The interview was conducted over telephone and lasted approximately one hour

- PM-Luft AB

At PM-Luft Mikael Sandgren, Regional Manager Stockholm, was interviewed. He has been with the company since 1994 and is currently the product manager of the M2M-based products. In terms of the company's M2M usage, Sandgren claims to be both technologically and commercially oriented. The interview was held face-to-face in Stockholm and lasted for approximately one and a half hour.

- Thermia AB

The interviewee at Thermia was Patrik Olsson, Product Manager of regulation systems. He has worked for the company for ten years and claims to be familiar with both technological and commercial aspects of Thermia's M2M usage. The interview was conducted over telephone and was approximately one hour.

- AB Tetra Pak

AB Tetra Pak's representative was Jens-Erik Rasmussen, Service Manager for the nordic countries. Rasmussen has worked for Tetra Pak for six years and he has been involved in its M2M system since the start of the project. He is primarily commercially oriented. The interview was held face-to-face in Lund and lasted for approximately two hours.

- Xerox AB

The interviewee at Xerox AB was the Product Performance Manager Stefan Blixt. As far as M2M goes, he is responsible for the company's latest M2M investments, and he is currently working with commercially oriented issues. However, in terms of the M2M system interesting for this thesis, Blixt was involved on a more technological level. The interview was held over telephone and lasted approximately 40 minutes.

All interviews were conducted in Swedish except for Tetra Pak's where the questions were posed in Swedish and the answers were given in English.

Collection of secondary data

Secondary sources have been used partly to complete the primary data. However, what is stated in the empirical observations are based solely on the interviews except from where noted and from the introductory boxes containing company facts. Secondary data was also used to prepare interviews, thus facilitating more relevant questions, and to gain background information on the area of M2M.

The authors commenced the search process with a broad research within the field of M2M. A wide variety of publications was considered, although it soon became obvious that the Internet

was the most rewarding source. The reason for this is that the phenomenon of M2M is relatively fresh and unexplored, thus relevant and up-to-date information is difficult to find elsewhere.

A rather extensive Internet search was carried out, both through ordinary search engines (e.g. Google) and more specialised databases. Examples of the latter are M2M-portalen and ELIN²³ at Lund University. Whenever something relevant was found, references have been investigated. Thus, in spite of the limited amount of data that has been found on M2M, a rather extensive search process has been performed.

The main sources of secondary data appeared to be the investigated companies' homepages, company and product brochures, Pär Ström's book "Prylarna snackar" (in which some of the investigated companies are described) and theses on the matter.

Considering the scarce amount of data available on the matter, the authors have not had any explicit limits regarding what to accept and what to disregard. However, more recent data has been given priority to, as have data from more well-reputed sources. Though emphasis has been on business-oriented sources, also those of more technological nature have been considered.

2.4 The interviews

There are two main approaches that can be used when conducting interviews; the structured and the unstructured one.²⁴ As the understanding of the phenomenon of M2M is key to answering the thesis' purpose, the unstructured interview seemed as the better choice. However, considering the three areas of focus – the three perspectives – and the fact that the interviews were conducted under time constraints, the interviews had to be rather structured.

The authors did not follow the structure blindly since interviews imply some unforeseen information. However, it is important that the interview covers the areas covered in the questionnaire²⁵, and indeed this was the aim during every interview situation. Even though the questions were tailored to each interview, a generic questionnaire is found in Appendix 1.²⁶

Subsequent to each interview, the interviewee was asked if approving to be approached by the authors some time after the interview for supplementary questions, if necessary for clarifying or deepen the knowledge on specific issues. None of the interviewees rejected being approached as mentioned. However, with a few exceptions this opportunity was not used by the authors.

The authors chose to record all interviews using a dictaphone, since the benefits of recording were perceived to clearly outweigh the potential downside. For instance, as the interviews were rather structured and spontaneous answers were not considered an end in itself, the potential restraining effects recording may have on the interviewees were limited. Using a dictaphone also implied less need for taking notes, which resulted in a deeper commitment to the interviewee. None of the interviewees had any objections towards using a dictaphone.

²³ ELIN stands for Electronic Library Information Navigator and is a database covering a large amount of journals within several different subjects.

²⁴ Silverman, D (1993) *Interpreting Qualitative Data*

²⁵ Holme, I M & Solvang, B K (1997) *Forskningsmetodik – Om kvalitativa och kvantitativa metoder*

²⁶ It should be emphasised that not all of these questions were posed at each interview. In particular, the interview of Xerox was structured differently, as the company had experienced an unsuccessful M2M implementation, thus contrasting the other five companies. It should also be noted that this questionnaire is the English translation of the Swedish version that was used.

There are potential weaknesses connected to both face-to-face interviews and those conducted over telephone. Consequently, as half of this thesis' interviews have been conducted in each of these manners, the authors find it appropriate to discuss the issue.

Eriksson and Wiedersheim-Paul argues that great potential pitfalls connected to face-to-face interviews are that the interviewer and interviewee may affect each other (which could have effects on the result) and that the lack of anonymity may hinder sensitive questions being asked.²⁷ As far as the authors perceive, neither of these potential disadvantages were apparent during the interview situations.

Considering the telephone interviews, however, the pattern was somewhat different. Eriksson and Wiedersheim-Paul call attention to the fact that it is more difficult to discuss complicated issues in such interviews. Indeed, the authors did experience this shortcoming, not the least when more complicated M2M systems were explained. However, as complementary questions were approved after the interview, the authors do not perceive this a disadvantage to the thesis.

2.5 The thesis' trustworthiness and criticism of sources

Validity and reliability

Validity and reliability are generally more associated with the quantitative approach. Notwithstanding, the terms are also relevant when using a qualitative method. The reliability is determined by how the observations are carried out and how thoroughly the information is processed. The validity is dependent of what is studied and if this is elucidated in the question at issue.²⁸

By using multiple sources of primary data, it is the authors' aim to keep the reliability and the validity high. It could be damaging to the validity if the interviewees had not been appropriate. Indeed it did exist such a risk, as the interviewee must be familiar with the company's M2M system as well as the areas included in the three perspectives. In spite of these potential risks, the interviewees appeared to have adequate knowledge within all relevant areas. However, considering the limited insight the authors have had in the respective organisations prior to selecting the persons to interview, it should not be excluded that more appropriate interviewees exist. Given the time frame, however, it is difficult to see how the method for choosing interviewees could have been altered.

Acquiring valid information in qualitative studies is in general much less of a problem in compared to quantitative studies.²⁹ In an interview situation there is usually no problem determining whether information is valid or not, and indeed the authors did not experience such a difficulty.

Furthermore, the fact that there was no limitation as to returning with possible questions to the interviewees could be argued to have a positive effect on the reliability. This is the case since minor confusions regarding the answers were settled this way. Another example of the authors' aim for high reliability is that each interview was recorded.

²⁷ Eriksson, L T & Wiedersheim-Paul, F (1997) *Att utreda, forska och rapportera*.

²⁸ Holme, I M & Solvang, B K (1997) *Forskningsmetodik – Om kvalitativa och kvantitativa metoder*

²⁹ Ibid

In order to improve the reliability and validity of the empirical observations the compiled information were sent to each interviewee for validation. This measure will decrease the risk that the authors have misinterpreted the information provided by the interviewees.

The extensive search process (explained in section 2.3) implies that a relatively large share of the companies falling into the thesis' delimitations were targeted. Given this, the fact that none of the companies rejected being interviewed might implicate that the degree of generalisation is relatively large.

Criticism of the choice of theory

This vast array of theoretical areas may seem unfocused. However, the perspectives are consciously wide, holding many different theoretical categories. Due to the scarce amount of research on M2M, the unpredictability of results was high and consequently a too narrow theoretical framework would not have been appropriate. The authors appreciate the problem of not being able to handle all theoretical areas in depth, but the compensations were considered to outweigh the drawbacks.

Criticism of the sources

Since the interviewees have been selected on the basis of their knowledge in the areas investigated (through their position within the various organisations), the authors are confident that the best possible information has been retrieved from each and every company. A majority of the interviewees have worked for their companies for some time and this should indicate that they have accumulated a large amount of information, thus serving as a good sources of information in that aspect.

One exception is identified in Alfa Laval. The interviewee had only been working for the company for some six months. As the company's system was introduced at the end of 2002, some "facts" about the system may be predictions rather than experiences. The authors appreciate the limiting effect this might have on the usefulness of the information provided, but opted for settling with the interviewee – partly due to the fact that the empirical observations, when sent to the companies for validation, were processed and validated by senior management.

The secondary sources used in the initial research and purpose developing phase consisted mainly of online material. The information on the Internet changes fast and it is difficult to determine the reliability and accuracy of these sources. It is, however, of less importance in the phase mentioned that the sources are perfectly reliable and accurate.

The secondary sources used in later phases of the thesis have principally been used for furnishing the perspectives on M2M. The sources have mainly been conventional literature within business administration.

Alternative method

Since the interviews have been rather structured one might assume that a quantitative method would have been appropriate. However, due to the complexity of the subject, this method would not have been satisfactory regarding fulfilling the purpose of the thesis. Indeed, it would have been almost impossible to obtain the necessary information using a quantitative method as the M2M systems are used differently within each investigated company.

One might also argue that an in-depth study of one company would have painted a more clear picture of the phenomenon of M2M. Indeed, this would have facilitated an even deeper understanding of how the system is used within the chosen company. However, the use of multiple sources (the six investigated companies) should increase the validity of the results and degree of generalisation.

3. Perspectives on M2M

This chapter is dedicated to present the models, theories and concepts used in this thesis. These analytical tools are not organised according to the three perspectives but presented in a straightforward way one after another. Each is related to the context of which it is put facilitating the reader to understand their potential contributions. At the end, a theoretical framework is presented, aimed at bringing the perspectives on M2M together.

3.1 Porter's value chain

Introduction

To be able to study what parts of different companies that are affected by an M2M implementation, a generic organisational framework is needed, or in other words, a model that can describe any firm, no matter what its organisational chart may look like. This systematic approach is offered by Micheal E Porter's framework of the firm – the value chain. Being generic and assuming a sufficiently disaggregated view of the firm, yet not being too complex, it should be a useful tool for the analysis.

The value chain

Originating from the Industrial field of economics, the school of strategy that is advocated by Porter is often referred to as the Positioning School. Traditionally, the Industrial Economics has assumed an industry focus, and Porter's way of strategy analysis may be seen as dealing with the issue of how to position the firm in its industry.³⁰ The value chain, however, is an approach of understanding how to implement the strategic imperatives generated by the industry analysis on the firm-level. Porter describes the value chain's advantages the following way:

"[The value chain provides] a systematic way of examining all the activities a firm performs and how they interact is necessary for analysing the sources of competitive advantage."³¹

According to the value chain framework, the firm consists of nine generic activities, five of which are called *primary activities*, and the remaining *support activities*. Porter defines value as "the amount buyers are willing to pay for what a firm provides them"³², and the value chain displays total value. As is shown in figure 3.1, the total value consists of the nine value activities and the *margin*.

The main objective for using Porter's value chain in the M2M context of this thesis is to facilitate analysis within the organisational implications perspective. The hope is to be able to answer questions such as: Is M2M to be seen as a primary activity or a support activity or perhaps both? Is the cost structure a determinant factor on what activities are affected the most by an M2M implementation?

³⁰ Mintzberg, H et al (1998) *Strategy safari*

³¹ Porter, M E (1985) *Competitive advantage*

³² Ibid

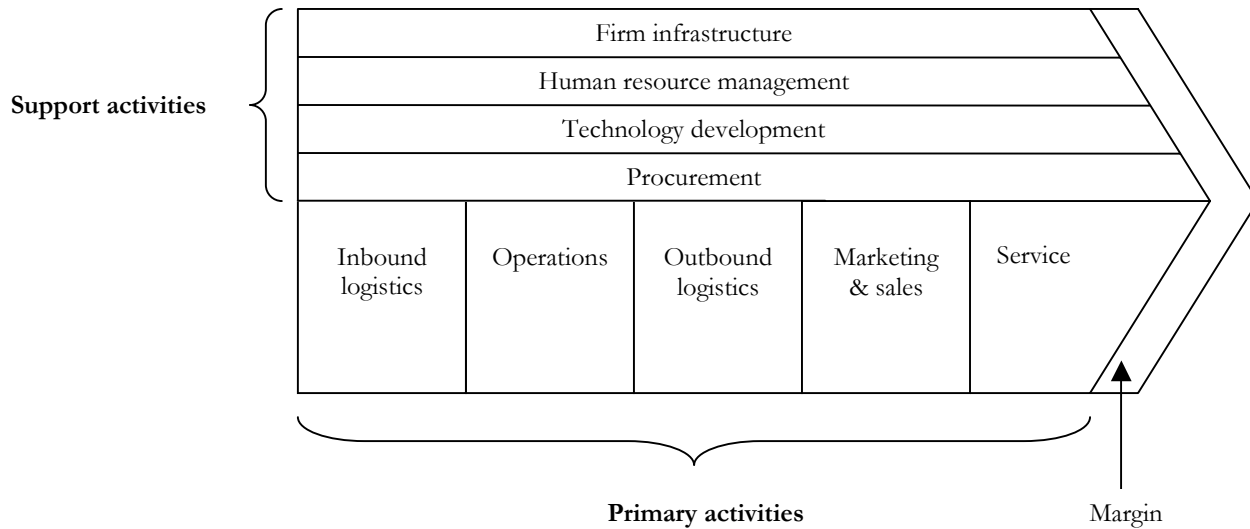


Figure 3.1 Porter's generic value chain.

Primary activities

The category of activities labelled primary activities consists of five main areas: Inbound logistics, operations, outbound logistics, marketing and sales, and service. Although the importance of each primary activity is both firm specific and industry specific, each is to some extent present in any firm. Contrasting the support activities, the primary activities are concerned with the actual creation and delivery of the product or service. Next, these areas will be presented in more detail.

- Inbound logistics

This term is concerned with the activities of receiving, storing and distributing the inputs to the product or service. For example, activities of stock control, materials handling and return to suppliers fall into this area.

- Operations

The inputs handled in the inbound logistics are here transformed into final products or services. Thus, assembling, packaging, equipment maintenance and testing are examples of activities within this area.

- Outbound logistics

After having been transformed in the operations, the actual products or services need to be stored and distributed to the customers. The concept is rather straightforward in the case of tangible products (warehousing, transport etc), but when it comes to services, outbound logistics may rather be concerned with bringing customers to the services.

- Marketing & sales

By activities such as administrating sales, channel relations, advertising and selling, customers are made aware of the product or service and are provided the means to buy it. This is what the area of "Marketing & sales" is about.

- Service

This area is concerned with the activities that enhance or maintain the value of the product or service, such as installation, repair and product adjustment.

Support activities

Apart from the five primary activities, the value chain also includes four support activities; firm infrastructure, human resource management, technology development and procurement. These help to make the primary activities more efficient, and they may support one, a few or all of the primary activities. The exception is firm infrastructure, which always supports the entire value chain. Beginning with this activity, the concepts of the support activities are presented below.

- Firm infrastructure

As stated above, this support activity transcends all primary activities. It deals with issues of planning, general and information management, accounting, finance and quality control.

- Human resource management

This area is concerned with the treating of the human resources. For example recruiting, training and compensation are important aspects within this activity.

- Technology development

Activities such as research and development or process development fall into this supporting area. Consequently, this area is fundamental to the innovation capacity of the firm.

- Procurement

Procurement refers to the process with which inputs are obtained; not to the inputs themselves. Thus, procurement may take place in many parts of the organisation.

3.2 The concept of efficiency

Introduction

Studying the effects of something (in this case an M2M implementation) it is natural to discuss changes in terms of enhancements and reductions of efficiency. However, there are different views of what “efficiency” means. Considering this in combination with the term being rather extensively used in the analysis, the authors believe some clarification of “efficiency” would benefit the thesis.

The concept of efficiency

Henry Mintzberg (1983) argues the following: “Efficiency in practice does not really mean the best benefit for the cost; it means the greatest measurable benefit for the measurable cost. In other words, efficiency means demonstrated efficiency, proven efficiency, above all calculated efficiency.” Since the aim of this thesis is not to measure improvements in monetary terms, but rather study them in a qualitative manner, obviously Mintzberg’s view on how to measure efficiency gains is inappropriate for the analysis. Instead, this thesis use the definition of Oxford’s dictionary:

“(of people:) able to work well and without wasting time or resources; (of tools, machines, systems etc) producing a satisfactory result without wasting time or resources.”³³

Compared to Mintzberg’s view of “efficiency”, the definition used in this thesis is less strict.

The contribution of using this definition lies in that it does not require calculations. Rather, it allows the analysis to use the concept of efficiency on a conceptual level, holding improvements such as lead time and waste.

³³ Crowther, J (editor) (1995) Oxford dictionary

3.3 The three levels of product-model

Introduction

In order to examine the ways in which an M2M implementation may enhance the product and facilitate new means of offering the product to the customer, the authors have chosen the three levels of product-model advocated by Philip Kotler as a framework.

It is crucial to the success of M2M that companies actually manage to market their products. Thus an analysis of the three levels of product model can provide some essential knowledge. Since the model comprises not only the product itself but everything that adds value throughout the process of consumption, the authors believe it facilitates an in-depth examination of how the customer will perceive the offer. What elements of a product can be enhanced by an M2M implementation? Where is the potential for improvements most significant?

The product concept

A product could be defined as “anything that is offered to a market for attention, acquisition, use or consumption and that might satisfy a want or a need”³⁴. It is important to recognise that products not only include tangible goods but also services, persons, places, organisations, ideas or mixes of these entities.

Service could be defined as “the application of human and mechanical efforts to people or objects in order to provide intangible benefits to customers”³⁵. A service does not result in ownership because the essence of a service is intangible, but it still meets the definition of a product.

All products possess a certain amount of intangibility and therefore distinguishing companies on the basis of whether they market services or goods has limited utility. A more useful way of distinguishing products is to speak in terms of tangibles and intangibles.³⁶

As industries mature and competition increases it becomes increasingly important to focus on developments within the intangible part of the product rather than developments of the tangible product.³⁷ According to Levitt (1981), competition is not about what companies produce in their factories but between “what they add to their factory output in the form of packaging, services, advertising, customer advice, financing, delivery arrangements, warehousing, and other things that people value”³⁸. Service is said to play a crucial role in differentiating a company’s offerings.³⁹

³⁴ Kotler et al (1999) *Principles of Marketing*

³⁵ Dibb et al (2001) *Marketing Concepts and Strategies*

³⁶ Levitt, T (1981) “Marketing intangible products and product intangibles”, *Harvard Business Review*

³⁷ Lovelock, C (1995) “Competing on Service”, *Planning Review*

³⁸ Levitt, T (1969) *The Marketing Mode, Pathways to corporate growth*

³⁹ Anderson, J (1995) “Capturing the Value of Supplementary Services”, *Harvard Business Review*

The three levels of product-model

According to classic marketing literature each product can be divided into at least three sub-levels - core product, actual product and augmented product.

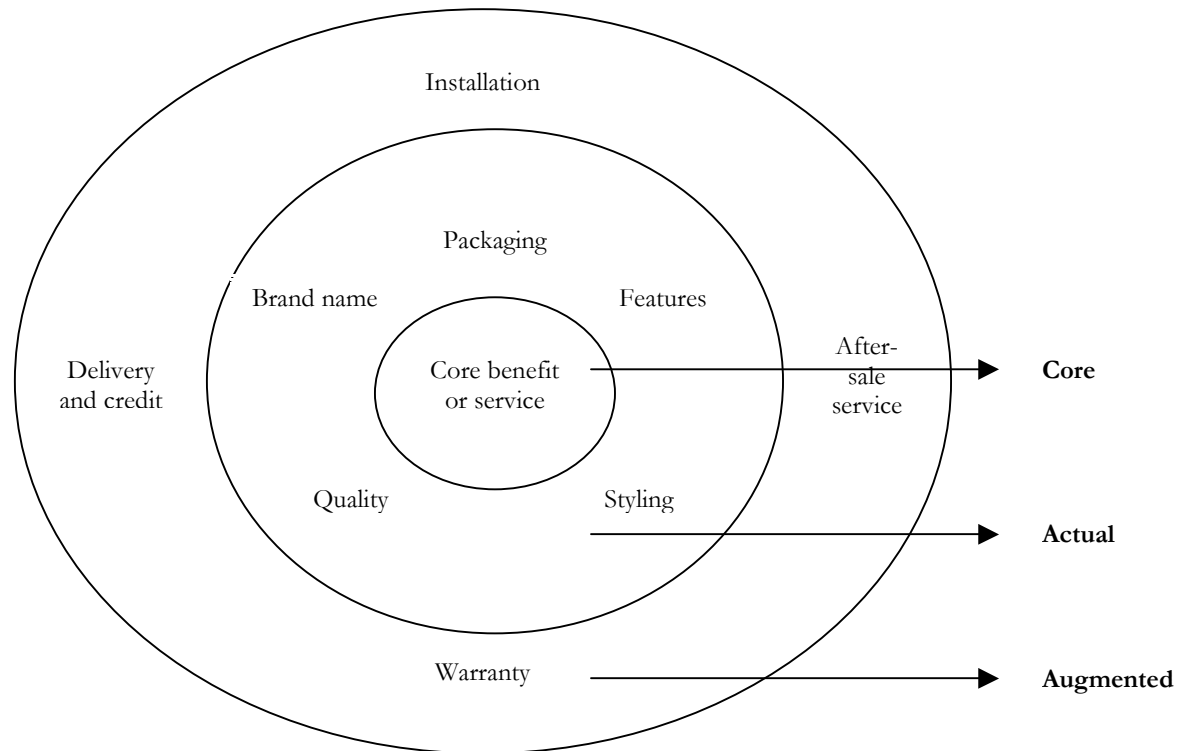


Figure 3.2 Three levels of product-model

Core product

At the centre of the model one finds the core product, i.e. the level of a product that provides the perceived or real core benefit⁴⁰. If a customer for instance buys shampoo the core product would be clean hair and if it buys a drilling-machine it would be a hole in the wall.

Actual product

Outside the core product is the actual product of which the definition is “a composite of the features and capabilities offered in a product”⁴¹. The actual product level is said to have five characteristics – features, quality, styling, brand name and packaging⁴².

- Features

Said to be a *competitive tool* for differentiating products, the concept of features is perhaps best explained by first looking at a product at its most basic level, the “stripped down” product. To

⁴⁰ Dibb et al (2001) *Marketing Concepts and Strategies*

⁴¹ Ibid

⁴² Kotler et al (1999) *Principles of Marketing*

this, the company adds features, thus creating a more advanced product. Preferably, this adds more value and consequently allows the company to charge higher prices. Being the first company to introduce a feature is a very effective way to beat the competition.⁴³

- Quality

Kotler's reasoning on this dimension is in part derived from David A Garvin's framework of product and service quality. As this framework will be presented in detail in section 3.4, this part of the actual product will not be discussed here.

- Packaging

Some products have to be packaged before delivery and although the primary function of the package used to be protection, many factors have made packaging an important and powerful marketing tool. Packaging is mainly concerned with the proper design of the product's wrapper.⁴⁴

- Brand

It is well-established that consumers view the brand as an essential part of a product and consequently a developed brand adds value to a company's product line.⁴⁵

- Styling

The term "style" simply describes the appearance of the product and is not to be confused with the broader term "design", which also relates to the product's performance. Style is solely connected with the appearance. Thus, a good designer considers not only the style but also other aspects, such as user friendliness and safety.⁴⁶

Augmented product

The third level is called the augmented product and holds additional benefits including customer service, warranty, delivery and credit, installation and after sales support.⁴⁷ One can say that the augmented product is the totality of benefits that the buyer receives or experiences when obtaining the physical product⁴⁸, and it is mainly at this level the companies of today differentiate their products⁴⁹. It is clear that additional elements, beyond the core and actual product, have profound impact on the value that is perceived by the customer⁵⁰.

In respect to what has been stated above – what should be the focus of a company? As Kotler argues, any augmentation costs money and the key issue is how much more customers are prepared to pay for the development. If the benefit does not cover the extra cost imposed by the development, an augmentation should not take place. When developing the product in these three levels, one should therefore always remain customer-centered and focused on value adding.

⁴³ Kotler et al (1999) *Principles of Marketing*

⁴⁴ Ibid

⁴⁵ Ibid

⁴⁶ Ibid

⁴⁷ Dibb et al (2001) *Marketing Concepts and Strategies*

⁴⁸ Avlonitis, G (2000) in Blois, K. Ed. (2000) *The Oxford Textbook of Marketing*

⁴⁹ Palmer, A (2000) *Principles of Marketing*

⁵⁰ Lovelock, C (1995) "Competing on Service", *Planning Review*

3.4 The eight dimensions of quality

Introduction

This perspective on M2M is David A Garvin's framework for product and service quality analysis. Even though it is more than fifteen years since the publication, the framework is still being referred to.⁵¹

Historically, Garvin argues, companies regarded quality as "merely something that could hurt a company if ignored."⁵² The trend, however, is that quality may be used not only to protect customers from annoyances but also as a strategic tool for competitive advantage. Garvin further argues that there are eight critical dimensions of quality that should be considered when analysing the quality aspect of a product or service: *Performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality.*

The main objective of using Garvin's framework is to allow an analysis of the potential of M2M to improve quality. Assumed central in the customer offerings perspective, quality deserves to be closely examined, answering questions such as: Does M2M increase quality? What quality dimensions are affected by M2M and why?

The eight dimensions of quality

- Performance

Performance has to do with the operating characteristics of the product or service, which obviously is an important quality aspect. However, it should not be confused with *performance classes*. Whereas the former is about functional requirements from a more objective perspective, the latter refers to performance based on taste. For example, few people would regard a 100-watt light bulb having superior quality to a 60-watt light bulb – they merely belong to different performance classes.

- Features

To many customers, an important quality dimension is how well the product or service may be tailored to their needs or desires. This is what "features" is about. Thus, the feature dimension of quality may be derived from the number of options available to the customer. Or, as Garvin argues, "choice is quality"⁵³.

- Reliability

The reliability of a product or service is particularly important to durable goods (goods that are not consumed instantly). Often, unreliability equals downtime and maintenance costs, and thus this dimension is an even more important quality aspect in settings characterised by high such costs.

⁵¹ Notable example: Kotler (1999)

⁵² Garvin, D A (1987) "Competing on the eight dimensions of quality", *Harvard Business review*

⁵³ Ibid

- Conformance

This dimension of quality deals with the degree to which product or service specifications are met. In service businesses relevant specifications often circle around accuracy, punctuality and unanticipated delays.

- Durability

Garvin defines durability as “the amount of use one gets from a product before it breaks down and replacement is preferable to continued repair.”⁵⁴ Thus, this quality dimension has similarities to *reliability* in that the products showing high reliability often also show high durability. However, this is not always the case.

- Serviceability

As stated above, reliability and durability of products and services are important dimensions of quality. However, if something does break down or malfunctions, the responsiveness (time to repair) – for example – is an important quality aspect. This is what *serviceability* is about – the speed, courtesy, competence and ease of repair.

- Aesthetics

This dimension of quality is rather subjective, dealing with how a product looks, feels, sounds, tastes or smells. Although a subject to individual preferences, Garvin argues, it must not be overlooked as it may impact the overall quality.

- Perceived quality

As in the case with *aesthetics*, this last dimension of quality is subjective. The perceived quality is connected to the notion that today’s products have the same quality as yesterday’s. For example, one tends to believe that a firm’s new product has the same reliability as its established products, even though this needs to be tested. Here, a key variable is the company’s reputation.

To conclude, Garvin also emphasises that a firm’s quality strategy often includes trade-offs. Only a few companies have managed to excel in all dimensions of quality (e.g. Rolex watches), and these charge high prices accordingly. For most companies, however, aiming for perfection in all eight dimensions is unreasonable. In fact, often improvements in one quality aspect is possible only at the expense of another.

⁵⁴ Garvin, D A (1987) “Competing on the eight dimensions of quality”, *Harvard Business review*

3.5 The network theory

Introduction

In the early 1980's, flexibility and adaption resting on the ability of the employees and businesses to continually build new relations, became new success factors to companies worldwide. A new paradigm focusing on networks began to be visible within organisational research. The network research intensified during the 1990's and it recognised knowledge as the most critical resource to society.⁵⁵

No firm acts totally independent of its surrounding world. Indeed, it is impossible for any operation to solely produce everything. Thus, in order to survive firms must always interact and build relations to others. The fundamental theory that deals with the consequences of this is the network theory. It does not, however, exist any dominant school of thought within this area, making it difficult to discuss analyses in terms of being more or less correct.⁵⁶ Furthermore, as the network consists of relations, the unit of analysis within network theory is the relation.⁵⁷

The increasing importance of relationship management is due to technological development, enhanced sophistication in customer demands and increased competition. This force companies to differentiate themselves through superior relationship management.⁵⁸ Relationship marketing, for instance, is gaining ground on behalf of traditional transaction-marketing.⁵⁹ Though emerging from different schools, network theory and relationship marketing have a lot in common. They share the recognition of long-term relationships as a determinant factor of companies' success. According to Brodie et al, the network approach of network theory used in this thesis can be seen as a subcategory to relationship marketing, thus implying that the schools to a large extent overlap each other.⁶⁰

The focus of this thesis is not on the firm's network in a larger sense, but rather on a more fundamental level of network theory – the relations between the firm and its customers. Having put this thesis' unit of analysis in a larger context, next the network approach will be presented.

The network approach

Networks recognise the coexistence of both competition, i.e. market control, and cooperation, i.e. administrative control⁶¹. Network theory portrays organisations as actors within a complex array of dynamic long-term relationships. These relationships may be vertical, such as between purchaser, provider and end user, or horizontal, such as between different suppliers. The network approach brings along a focus on business networks and exchange relationships. Exchange relationships are business relationships between autonomous business units built from a history of exchange episodes. In short, it is a help to understand interaction between firms in organisational networks. According to Johansson et al (1987) it is a basic assumption in the network model that the individual firm is dependent on resources controlled by other firms.

⁵⁵ Nygaard, C & Bengtsson, L (2002) *Strategizing – en kontextuell organisationsteori*

⁵⁶ Ibid

⁵⁷ Ibid

⁵⁸ Salmond, D (ed) (1988) *Business Buying Behavior. A Conference Summary*

⁵⁹ Grönroos, C (1990) *Service Management*

⁶⁰ Gould B (1998) "Relationship Marketing – But Why: Management Research & Thinking", *The Antidote*

⁶¹ Thorelli, H B (1986) "Networks: Between markets and hierarchies", *Strategic Management Journal*

Moreover, the network approach has a primary goal to describe and explain - not to prescribe.⁶² It is useful in the context of this thesis since it provides insights in the customer relations perspective, taking into account the effects on bonds between parties, and facilitates discussions on what elements of a relationship is mostly affected by an M2M implementation.

Following the network approach, Håkansson (1990) identifies three main reasons why relationships ought to be important, cited below:

1. Interactions with companies that have knowledge in other areas can generate technical questions and new knowledge to solve them.
2. The evaluation and acceptance of a new technology or product is dependent on support from several actors.
3. Companies often have to supplement their resources with those of others.

At first, it might be useful to sort out what researchers mean by the term *relation*. A relation is said to consist of a number of *episodes* and within industrial marketing, episodes are often called transactions⁶³. One single transaction, i.e. purchase, would therefore not represent a relation if the parties have had no prior or subsequent interaction.⁶⁴ Indeed, it can be the start of a relation, but it is the repeated interaction that constitutes a relation. When buying services, the nature of the service determines whether or not it is a relationship. If one signs a contract, a continuous type of relation is established, whereas discrete services form a relation only when the second purchase is made.⁶⁵

It is however important to point out that the definition above, buying the service twice, is only a minimum requirement for a relation. This definition does, for instance, not take the reasons for the repurchase under consideration. The customer might not even have a choice but to make a repurchase. Therefore one can not state for sure that a repurchase alone implies a relation.⁶⁶

Bonds

In a transactional context, a supplier merely delivers the product as a one-off event and does not think in terms of building relations. The product price is in this case of great importance to customer behaviour since a similar product to a lower price could easily break the relation.⁶⁷ However, if the supplier manages to build closer relations to customers, these are tied not only through low prices but also through other factors and within the network approach these exit barriers are referred to as *bonds*⁶⁸. In order to keep the business network effective, actors must compete to some extent. There is, however, also a demand for co-operation as actors have to create bonds to build long-term relationships. Through these bonds, they get to know what the

⁶² Easton, G (1992) "Industrial Networks: a Review" from Axelsson, B & Easton, G (Eds.) (1992) *Industrial Networks: A New View of Reality*

⁶³ Liljander, V & Strandvik, T (1995), "The Nature of Customer Relationships in Services", *Advances in Services Marketing and Management*

⁶⁴ Webster, F E Jr. (1992) "The Changing Role of Marketing in the Corporation," *Journal of Marketing*

⁶⁵ Liljander, V & Strandvik, T (1995), "The Nature of Customer Relationships in Services", *Advances in Services Marketing and Management*

⁶⁶ Ibid

⁶⁷ Grönroos, C (1990) *Service Management*

⁶⁸ Wilson, D T & Mummalaneni V (1986) "Bonding and Commitment in Buyer-Seller Relationships: A Preliminary Conceptualisation," *Industrial Marketing and Purchasing*

interacting partner is capable of doing.⁶⁹ For instance, if an industrial seller provides a complex solution which includes design, equipment and installation, the activities would develop the relation due to stronger *technological bonds*.⁷⁰ Even if there are no other bonds involved in this relation, it would still be a difficult task for competitors to break the relation. Thus, customers tend to be less price-sensitive as they are engaged in relationships.⁷¹

Bonds have been divided into higher level bonds, comprising trust and commitment, and lower level bonds, for example, technological and social bonds.⁷²

Higher level bonds

- Trust

A central concept in this approach is trust in the other party.⁷³ In business exchanges within the industrial market it is considered very important that a party feels that the counterpart is set to fulfil its promises and obligations.⁷⁴ In fact, it is even a precondition for increased commitment.⁷⁵ Over time, after the customer has experienced the product and found it trustworthy, trust can be gained.

- Commitment

The concept of commitment is used within industrial market contexts in the network approach and is thus suitable for analyses in business-to-business markets. It refers to the process of adaptation and is a consequence of “parties’ intentions to act and positive attitudes towards each other”.⁷⁶

According to Håkansson (1993), the notion of mutual commitment is central because it represents a deviation from the transaction oriented view of exchange in the market. In the industrial context, mutual commitment can lead to bonds. However, a relationship may be strong although neither of the parties are committed to the relation. Thus, bonds and commitment are said to be two independent variables, each of which makes its own unique contribution to the strength of the relationship.⁷⁷

⁶⁹ Hammarkvist et al (1982) *Marknadsföring för konkurrenskraft*

⁷⁰ Håkansson, H (1982) *International Marketing and Purchasing of Industrial Goods*

⁷¹ Grönroos, C (1990) *Service Management*

⁷² Möller, K & David T W (1988) “Interaction Perspective in Business Marketing: An Exploratory Contingency Framework”, *Institute for the study of business markets report*

⁷³ Liljander, V & Strandvik, T (1995), “The Nature of Customer Relationships in Services”, *Advances in Services Marketing and Management*

⁷⁴ Swan et al (1985), “How Industrial Salespeople Gain Customer Trust”, *Industrial Marketing Management*

⁷⁵ Miettälä, A & Möller, K (1990), “Interaction Perspective into Professional Business Services: A Conceptual Analysis” in Fiocca and Snehota, (eds) *Research Developments in International Industrial Marketing and Purchasing*

⁷⁶ Liljander, V & Strandvik, T (1995), “The Nature of Customer Relationships in Services”, *Advances in Services Marketing and Management*

⁷⁷ Ibid

Lower level bonds

Six different categories of (lower) bonds in the industrial market have been outlined within the network approach – social bonds, technological bonds, knowledge bonds, planning bonds, legal bonds and economic bonds – which all will be described below.⁷⁸

- Social bonds

To a great extent, inter-organisational interaction is performed through personal contact, which obviously brings along social elements to the relation.⁷⁹ When the customer and for instance the service personnel know each other, contact is smooth and there is a mutual trust – one can say that social bonds exist.⁸⁰ These bonds complement legal bonds since contracts are sometimes very difficult to construct.⁸¹

- Technological bonds

Companies engage in technological bonds as they adapt to each other in a technical way. One example might be a customer building its production plant based on the purchase of a specific product from a certain supplier, or vice versa, the supplier adapts its products to the customer's production plant.⁸² Some products require authorised service personnel or spare-parts from a specific company which also implies an adaptation.⁸³

- Knowledge bonds

As a supplier learn the preferences and demands of a customer, it develops a knowledge which is proved to raise switching costs for both parties. Moreover, the mutual knowledge about strengths and weaknesses over time affects companies, for instance through research and development demanded by a specific customer, thus inducing stronger bonds which reduce the perceived uncertainty for the parties involved.⁸⁴

- Planning bonds

This bond refers to a company's ability to fit new relations into its time table. Generally, companies within a network have strong needs to coordinate their actions. Deliveries have to be made as coordinated as possible, facilitating a minimised capital tie-up and preventing downtime in production due to long periods of waiting. Administratively, this implies a great degree of coordinated routines.⁸⁵

- Legal bonds

As soon as a contract of any kind exists, e.g. long-term co-operation agreements or ownership influences, a legal bonds is present. These bonds can often be seen as a complement or insurance

⁷⁸ Håkansson, H (1982) *International Marketing and Purchasing of Industrial Goods*

⁷⁹ Hammarkvist et al (1982) *Marknadsföring för konkurrenskraft*

⁸⁰ Håkansson, H (1982) *International Marketing and Purchasing of Industrial Goods*

⁸¹ Hammarkvist et al (1982) *Marknadsföring för konkurrenskraft*

⁸² Ibid

⁸³ Håkansson, H (1982) *International Marketing and Purchasing of Industrial Goods*

⁸⁴ Hammarkvist et al (1982) *Marknadsföring för konkurrenskraft*

⁸⁵ Ibid

to other bonds. In some cases, for instance acquisitions, it might be the foundation of other bonds.⁸⁶

- Economic bonds

Once a purchase has been made, the customer may find itself with no economically justifiable choice but to continue to buy from the same supplier.⁸⁷ The reason might for instance be that the initial purchase has induced price reductions, which then have a constraining effect on customer behaviour.⁸⁸

The presence of bonds and their contribution to efficiency creates a need for long term relations. As a company creates and develops its bonds, uncertainty is reduced and stability is increased. Often, businesses relations have persisted for decades and as a consequence the parties have clear expectations on how counterparties will react in almost every situation.⁸⁹

Stable relations, however, do not in any way imply they are static. Rather, Hammarkvist argues stable relations are even a precondition for change and recognises a few important advantages stability in relations brings along. Firstly, it generates closeness to suppliers and customers which exposes demands and possibilities. Secondly, it provides security in that it reduces the uncertainty always present in technological development. Thirdly, the relations, i.e. the network, provide information a company could not have gathered alone. Fourthly, relations create a drive for development since close relations by no means equal less demanding relations. Indeed, according to Hammarkvist, demands are higher when companies have close relations.⁹⁰

Maintain or even strengthen customers bonds obviously demands a resource commitment. The degree of customisation becomes an intricate question - a high degree might be expensive to the seller, thus making it impossible to maintain prices at competitive levels. Leading manufacturers can have a profound advantage since they are sometimes able to influence customers' decisions rather than adapting to preferences, and still achieve strong bonds.⁹¹

⁸⁶ Hammarkvist et al (1982) *Marknadsföring för konkurrenskraft*

⁸⁷ Ibid

⁸⁸ Håkansson, H (1982) *International Marketing and Purchasing of Industrial Goods*

⁸⁹ Hammarkvist et al (1982) *Marknadsföring för konkurrenskraft*

⁹⁰ Ibid

⁹¹ Ibid

3.6 Transaction cost theory

Introduction

“A transaction cost analysis approach uses differences in transaction costs to explain the advantages associated with certain governance structures. The firm and the market are identified as the primary structural alternatives for organizing economic activity.”⁹²

Oliver E Williamson, often referred to as the father of the transaction cost theory, defines a *transaction* as “when a good or service is transferred across a technologically separable interface.”⁹³ As the opening quotation indicates, transaction cost analysis aims to make the choice of optimal governance structure easier. The objective is minimal transaction costs and the two main alternatives are to use the firm or to use the market. Thus, the main objective of the transaction cost theory in the context of M2M is to provide insights within the customer relations perspective. For instance, in what ways can M2M be a tool for lowering transaction costs? Does the potential seem significant? This is to be investigated through a study of the shift in transaction costs implied by an M2M adoption. Hence, the focus is on how transaction costs arise.

How do transaction costs arise?

Classical micro economical theory treats transactions as being clear in the sense that both parties know what they are buying respectively selling. Most transactions, however, are much more complex than this. According to the transaction cost theory, what complicates transactions is the confluence of two distinct set of factors; opportunism and bounded rationality.⁹⁴

Having the opportunity, decision-makers will probably take actions that serve their own interests, even though this implies disloyalty towards the opposite part. At least this is an assumption within the transaction cost theory.⁹⁵ The theory has been criticised for having this presumption and as a consequence Williamson has argued that the mere possibility of the opposite part acting opportunistic justifies the assumption.⁹⁶

People are boundedly rational since they are incapable of designing perfect contracts. Had it been possible, opportunism would not exist as every possible contingency that may arise is regulated in the contract. Due to lack of information, however, people are not able to design perfect contracts.⁹⁷

Transaction costs do not only arise from the human nature, but also from three non-human characteristics; uncertainty, frequency of transactions and asset specificity.⁹⁸

⁹² Standifird, S S & Marshall, S R (2000) “The Transaction Cost Advantage of Guanxi - Based Business Practices”, *Journal of World Business*

⁹³ Williamson, O E (1975) *Markets and Hierarchies, Analysis and Antitrust implications: A study in the economics of internal organization*

⁹⁴ Baron, J N & Kreps, D M (1999) *Strategic Human Resources – Frameworks for General Managers*

⁹⁵ Williamson, O E (1985) *The economic institutions of capitalism*

⁹⁶ Nygaard, C & Bengtsson, L (2002) *Strategizing – en kontextuell organisationsteori*

⁹⁷ Ibid

⁹⁸ Ibid

Uncertainty may be derived from the bounded rationality of human nature. It leads to transaction costs through the need of planning, adjustments, monitoring and search for information.⁹⁹ Direct transaction costs, then, may include communication, negotiation and coordination costs. Moreover, uncertainty also implies opportunity transaction costs, such as mal-adaptation or failure to adapt to unforeseen situations.¹⁰⁰

Direct transaction costs linked to people's bounded rationality may arise both ex ante and ex post. Examples of the former may be costs of screening and selecting partners, and the latter costs of measuring a partner's performance.¹⁰¹ Hence, transaction costs increase with uncertainty.

Another source of transaction costs is the frequency of transactions. This refers to the number of identical transactions that may be organised within the same contractual settlement. As the transactions become familiar to both parties, the need for planning, monitoring and adjustments of the contracts decrease. Hence, the higher degree of identical transactions, the lower are the transaction costs.¹⁰² In addition to transactional experience, Williamson argues that reputation and trust may strengthen the relation between firms and lower their transaction costs.¹⁰³

The third non-human character that affects transaction costs is the asset specificity. According to Nygaard and Bengtsson (2002) it is the most important non-human source of transaction costs. Asset specificity deals with the extent to which an asset is less valuable if it was to be used in other settings than the proposed. A higher degree of asset specificity makes it more likely that co-operation continues, as a discontinuance implies costs. Williamson discusses six different types of asset specificities; location specificity, human specificity, physical specificity, dedicated specificity, brand specificity and occasional specificity.¹⁰⁴

If the ability to use an asset for some reason is connected to where it is placed, the asset is location specific. A machine, for example, that needs electricity to function cannot be used in any setting. Human specificity exists if an employee possesses unique knowledge in a work process, and an asset is physically specific if it may be used only in a certain production process.¹⁰⁵

When an asset is procured merely to be used in a specific relation, thus is tied to a specific transaction, it has dedicated specificity. This may for example arise if a firm has developed a tool that can be used only in transactions with a certain partner. Brand specificity refers for instance to a situation where an asset has a brand name printed on it and thus cannot be used in other settings. Occasional specificity implies that the asset can only be used at a certain location and a certain point of time.¹⁰⁶

⁹⁹ Nygaard, C & Bengtsson, L (2002) *Strategizing – en kontextuell organisationsteori*

¹⁰⁰ Standifird, S S & Marshall, S R (2000) "The Transaction Cost Advantage of Guanxi -Based Business Practices", *Journal of World Business*

¹⁰¹ Ibid

¹⁰² Nygaard, C & Bengtsson, L (2002) *Strategizing – en kontextuell organisationsteori*

¹⁰³ Williamson, O E (1983) "Organisational innovation: the transaction cost approach", *Entrepreneurship*

¹⁰⁴ Nygaard, C & Bengtsson, L (2002) *Strategizing – en kontextuell organisationsteori*

¹⁰⁵ Ibid

¹⁰⁶ Ibid

3.7 Theoretical framework

Introduction

Having presented several different models, theories and concepts – tools for the analysis – in this section these are to be brought together and given greater meaning. Each tool highlights important aspects of the phenomenon of M2M, although with different nuances. By developing a theoretical framework, the authors wish to put these tools in the context of this thesis. Thus, the aim of this framework is to understand how the separate theoretical building bricks may assist the exploration of the three perspectives.

Naturally, some tools have a more obvious connection to a certain perspective than others. However, as pointed out in the methodological considerations chapter, the authors wish not to be constrained by this in the analysis, but to be able to use the tools wherever they seem useful.

Posed and argued in favour of in the introductory chapter, the three perspectives are *organisational implications*, *customer offerings* and *customer relations*.

Developing a theoretical framework

Studying the *organisational implications* of an M2M implementation the two main building bricks are the value chain and the concept of efficiency. The value chain offers a generic organisational chart as a structure for analysis, and “efficiency” is a frequently used and central term in the analysis of this perspective. The value chain may seem as a rather blunt tool for this kind of an analysis. This, however, is its advantage. As M2M is a new and unexplored area of research and there is a great uncertainty on what patterns will be observed, it is the authors belief that a rough framework allowing for a rather liberal interpretation is best suited. The value chain also offers a more strategic dimension to this thesis. If it is possible to discuss M2M in terms of being a primary or a support activity, the value chain should be an interesting tool from a strategic perspective.

Moreover, as the analytical level of the transaction cost theory is the organisation¹⁰⁷, this theory should also provide understandings on the organisational implications of an M2M adoption. Although this theory is primarily used to explore how customer relations are affected it offers a valuable cost dimension to the organisational perspective. Indeed, if firm-customer transaction costs can be lowered with M2M, this should have implications on both customer relations and organisations. It may be difficult, however, to draw the line between these two perspectives, i.e. to decide what is an organisational implication and what is a customer relations-effect.

Within the *customer offerings* perspective the three levels of product-model provides the means to study how a company's products can be enhanced and differentiated by M2M. The eight dimensions of quality framework further penetrates the *actual* product level. As was the case with the organisational implications perspective these tools are held consciously wide to allow for a vast variety of findings.

The transaction cost theory may also be useful within this perspective. If these costs are lowered and the customer relations are affected, assumably this have implications on the customer

¹⁰⁷ Nygaard, C & Bengtsson, L (2002) *Strategizing – en kontextuell organisationsteori*

offerings. The same reasoning goes for the network theory; a changed network position should have implications on how the company offers its products to its customers.

The two main theoretical tools used to explore the *customer relations* are the network theory and the transaction cost theory. The former is primarily used to understand if and how the customer bonds have been affected. The transaction cost theory, on the other hand, allows a cost-review of the firm-customer relations. These two theories indeed have a lot in common. For instance, both highlight the importance of reducing uncertainty to increase efficiency in the customer relations. Furthermore, the asset specificity has a lot in common with the technological bonds, both shedding light upon similar lock-in effects. However, as the analytical level of the network theory is the relation¹⁰⁸ whereas it is the organisation within the transaction cost theory¹⁰⁹ the theories should complement each other nicely.

Although these two theories are most central to explore the effects on customer relations, all presented tools may be used within the customer relations perspective. For instance, the value chain may assist the understanding of which customers are more likely to embrace an M2M system. What do these customers' value chains look like? Assumably, there is greater potential of altered customer relations in settings where customers are more likely to embrace M2M. The same reasoning can be applied on the three levels of product-model and the eight dimensions of quality framework; is there a greater potential for M2M where customers have certain demands on augmentation or quality?

Below, the presented analytical tools are illustrated in the context of this thesis. Although these analytical tools are placed in distinctly separate boxes, as is argued above, it does not imply they can not be used within other perspectives.

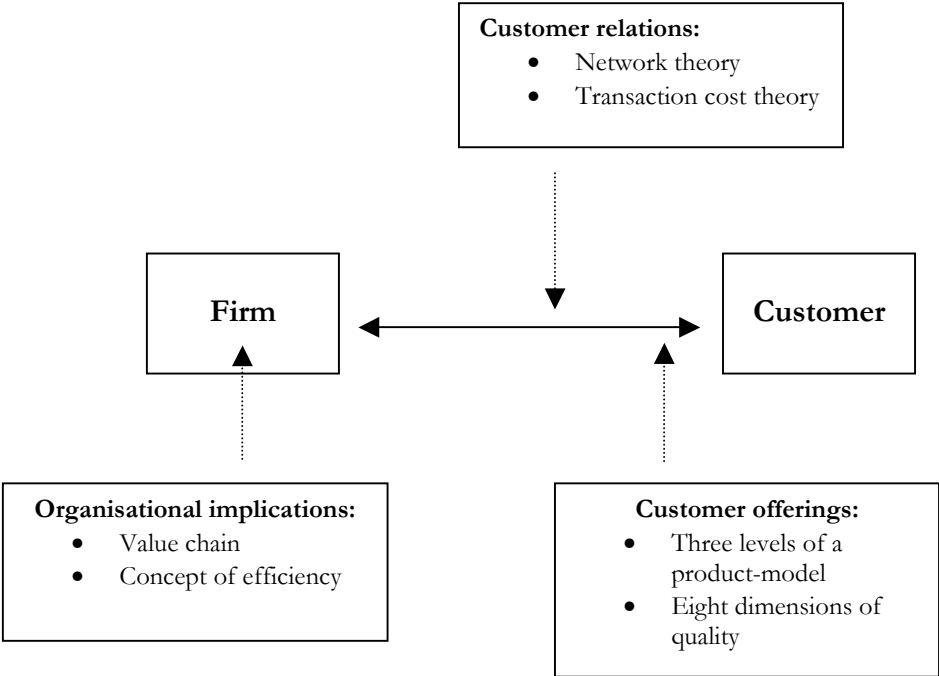


Figure.3.3 Illustration of the perspectives on M2M in the firm-customer context.

¹⁰⁸ Nygaard, C & Bengtsson, L (2002) *Strategizing – en kontextuell organisationsteori*

¹⁰⁹ Ibid

The table below summarises the theoretical framework by posing potential questions each model, theory or concept that may answer within each perspective. These questions should be viewed as suggestions, highlighting the many potential fields of application the different tools imply.

Perspectives Models, theories and concepts	Organisational implications	Customer offerings	Customer relations
The value chain	How have the organisations' activities been affected?		Do the compositions of customers' value chains affect the potential of adopting M2M?
The concept of efficiency	How have the affected organisational activities become more or less efficient?		Have the customer relations become more or less efficient?
The three levels of product-model		In what ways have products been enhanced?	What customer demands on the products and on the products' quality imply the greatest /least potential for M2M to alter the customer relation?
The eight dimensions of quality		How have the products quality been affected?	
The network theory		What implications do strengthened/weakened customer bonds have on customer offerings?	In what ways have the customer relations been strengthened or weakened?
The transaction cost theory	What are the organisational implications from a cost-perspective?	How have new transaction cost structures affected pricing?	How have the transaction costs in the firm-customer relations changed?

Table 3.1 Possible questions to be analysed with each model, theory or concept within each perspective

4. Empirical observations

In this chapter, the six investigated companies will be introduced to the reader. In order to provide a solid foundation for the analysis chapter, the cases are extensively covered. Moreover, each case is partly structured according to the three perspectives and opens with a box of basic facts. This is believed to increase the transparency of the observations.

Introduction

In order to make the reading of the empirical observations chapter more fruitful, some information is believed to be needed. Firstly, with M2M being a relatively unexplored area, the authors have found it relevant to cover the information on the investigated companies' implementations extensively. Secondly, each case is mainly structured according to the three perspectives explained earlier, as far as this has been possible. This structure is used to make the chapter more transparent and easier to follow. Thirdly, none of the information regarding the companies is the authors' views, but information gained from the company representatives, or, when stated, complementary secondary sources.

4.1 Alfa Laval AB

Alfa Laval AB in short

- Interviewee: Nicklas Froberg, Regional Marketing Manager Parts & Service (East & Central Europe).
- Company founded 1883
- Number of employees 2002: 9100
- Net sales 2002: 4,2 BSEK
- Product Range:
 - Alfa Laval is the leading provider of plate heat exchangers, centrifugal separators and sanitary flow equipment.
- Main Divisions
 - Process Technology Division: “Offers solutions that help customers optimize their processes”.
 - Equipment Division: “Offers a range of products and services to customers with a well-defined and regular product-based equipment need”
- Machine to Machine:
 - Within the Process Technology Division M2M is adopted as a tool enabling condition-based maintenance (Cosmos)
 - M2M was initially launched in the middle of the 1990’s.

(Sources: www.alfalaval.se; www.ad.se; and interview with Nicklas Froberg, Alfa Laval AB, 030507)

M2M in Alfa Laval

The M2M system Alfa Laval uses is called Cosmos¹¹⁰. It was developed by Alfa Laval in co-operation with Tetra Pak and Vikon Vibrationskonsult and is described as an on-line condition monitoring system. Alfa Laval uses it to detect faults or – rather – would-be-faults on its separators and decanters.

Alfa Laval introduced Cosmos in the mid 90’s. That system, however, looked a bit different from today’s Cosmos system. For example, in the beginning a modem was used as communication device, whereas now the machines equipped with the Cosmos system are constantly connected to the Internet via a computer. Furthermore, earlier the company *sold* the system to the customers whereas nowadays, it is integrated in certain service agreements. At present, there are some 20 Cosmos systems installed. This year another six are expected to be implemented and in 2004 Alfa Laval hopes to install an additional 20.

Looking at the after-sales function, the old view of Parts & Services is that money is made on spare parts. Although this is still true, more effort is put to tie the customer to the company and Cosmos is considered an important part of this trend.

The main reasons Alfa Laval developed Cosmos were to cut costs internally; offer better services; gain information on how customers use Alfa Laval’s products; differentiate the company’s products from its competitors’ and position itself as an innovative company. Perhaps the most important reason, however, was according to the company to tie the customer, although new customers were not expected to be attracted due to the M2M implementation. Furthermore, the industry today wants “monthly fixed costs for service”¹¹¹, which is made possible through Cosmos.

¹¹⁰ *Cosmos* stands for Condition Status Monitoring System

¹¹¹ Nicklas Froberg, Alfa Laval AB, interview 030507, freely translated

What is Cosmos?

Avoiding a long-winded technical description of the system, a number of sensors are put on each machine. These sensors, then, measure the vibration signals and thus describe the rotational, frictional and shock forces at work within the machine. When the signals reach a certain threshold value, operators are alerted by a graphical display, composed of four different colour-combinations, that tells them the seriousness of the problem. Service engineers or trained operators may perform a more advanced analysis of the situation by examining the current and historical data that is stored within the system.¹¹²

Most of the common faults may be detected, such as damage to individual bearings, misalignments, slack or belt tension, motor problems, wrongly assembled parts or wrong type of oil.¹¹³

According to Alfa Laval, the system shows greatest advantages when the production process cannot be interrupted, the machine is in a remote location, there is a high level of wear and tear and when there are neither skilled operators nor a maintenance department on site. These variables apply for many of Alfa Laval's customers. In addition to this, a breakdown in the production process is often expensive to the customer, and according to Alfa Laval Cosmos allows is to service whatever is in need of service when it suits the customer. For example, if the customer interrupts the production process in order to adjust or clean something, Alfa Laval may take the opportunity to replace the parts that are becoming worn out. Thus, the customer only has to interrupt the production process when it needs to itself.

"We say to the customers: 'Stop the production when it suits you!' Probably, they have planned interruption when they'll clean the machinery or something, and as they do this, we take the opportunity to, for example, change ball bearings on the machines."¹¹⁴

Organisational Implications

Alfa Laval believes that the function most affected by the Cosmos system is service/after-sale. The hope is to make it more efficient in terms of both cutting down on service meetings, and shortening the time spent at each service occasion. The former is to be achieved through the facilitation of condition-based maintenance, i.e. service when it is needed rather than with pre-determined intervals. Furthermore, since the service personnel know what kind of a fault has occurred, they may be able to bring the right tools and replacement parts which, according to Alfa Laval, shortens the service visits. In addition to this, as a threshold value is reached, an SMS¹¹⁵ is sent to the nearest service technician who then contacts the customer.

The stock-keeping storage has not become more efficient, though the company has such expectations on the future. For example, as Cosmos allows Alfa Laval to understand when service will be necessary, it may see too that the correct spare parts are at hand at the right service centre.

Due to the relative newness of the Cosmos system, the marketing function has not yet been affected, and the same goes for the sales function. In the near future, however, both functions will be affected. New customer benefits may be used as sales arguments and sales personnel are

¹¹² Information brochure "Cosmos – on-line condition monitoring system"

¹¹³ Ibid

¹¹⁴ Nicklas Froborg, Alfa Laval AB, interview 030507, freely translated

¹¹⁵ Short Message Service

still to be educated on the system. The importance of personnel education is emphasised as important to succeed with this type of a project. Alfa Laval experienced this in the mid 90's when it first launched Cosmos – some of the difficulties then were due to poor understanding of the system. Another key issue is to be able to fully trust the underlying technology:

“Perhaps, we launched it a bit too hard – without having the sufficient technical backup – during the mid 90’s. The sales personnel got cold feet – they didn’t want to sell it to the customers, because they couldn’t trust the technology to work all the time. This time, our goal is to stand on a solid ground both technologically and knowledge wise before launching this product.”¹¹⁶

Cosmos generates and stores information on how Alfa Laval's products function. According to the company, this information is direct feedback to the research and development department. With each new model, the machine runs for a few weeks with the Cosmos system attached. This generates the sufficient information to make a footprint of a well-functioning machine to benchmark against.

The purchasing department is expected to be only marginally affected by the Cosmos system, since – as is pointed out by the company – the system is only a small part of a large company. In terms of human resources, a few persons have been employed due to the system.

Alfa Laval believes that planning and budgeting have become easier with the Cosmos system. As more customers adopt it, the system is expected to play an increasingly important role in the future planning and budgeting process.

Customer offerings

The essence of Alfa Laval's M2M usage is not that it should be marketed and sold itself. Instead, the system provides means to construct contracts in ways that were impossible to achieve before M2M.

“[With the M2M-based service agreement] we guarantee up-time. If our product doesn’t work, and the customer has to interrupt its production process, well, then we have to pay a penalty fee. So it’s in our interest that the system always runs.”¹¹⁷

It might be enlightening to start with an overall look on Alfa Laval's portfolio of service-contracts. There are four types of service-contracts currently available to customers buying separators and decanters from Alfa Laval. The company has graded its agreements from one star to four stars where the latter is the most comprehensive of the four.

The One Star Performance Agreement is a basic service set out to meet the preferences of the less demanding customers. This agreement includes service visits on a regular basis as well as technical telephone-support.¹¹⁸

The Two Star Performance Agreement is obviously the next stage in the service hierarchy and is characterised by an increased level of breakdown-support and also help on issues like adjustments and process scheduling.¹¹⁹ This stage is also the first in which Cosmos is available, if only as an

¹¹⁶ Nicklas Froborg, Alfa Laval AB, interview 030507, freely translated

¹¹⁷ Ibid

¹¹⁸ Nonstop Performance, Advertising leaflet, Alfa Laval

¹¹⁹ Ibid

optional feature. Within the Three Star Performance Agreement there is an increased level of integration of service and maintenance with the customer's overall production programme.

The peak in Alfa Laval's service-portfolio is the Four Star Service Agreement. Cosmos is always included and consequently customers can be guaranteed non-stop performance.¹²⁰ In case of an unplanned breakdown Alfa Laval is liable to all the supplier's damages and loss of income due to the failure. Alfa Laval states that without Cosmos it would not have been able to offer this guarantee.

All four agreements are offered to all customers although the difference in prices between the stages is described as significant. Hence, the Four Star Agreement is most valuable to industries where breakdowns are costly and thus uptime¹²¹ very important, for example breweries and biochemical companies. According to Alfa Laval, this facilitates different prices to different segments of customers buying exactly similar contracts.

"Many see what the service costs to provide and adds a desired margin [...] and gets the price to offer the customer. That's insane! Instead, look at the customer and his process, what does a one-day breakdown cost? Millions? Well, suddenly we're talking money!"¹²²

Cosmos is not only offered to new buyers but to any customer with a separator or a decanter. Should existing owners want to adopt Cosmos Alfa Laval only provides it after a complete audit of the machinery.

"Alfa Laval needs much information about the customers' equipment before entering service agreements [that involves an M2M system] – the machines may have been working for years before we enter and guarantee uptime. Because of this insecurity, we have to carry out lots of audits where we control the condition of their machines and update them if needed."¹²³

In large, customers are said to have welcomed Cosmos. Those that have not still think of it as good but are according to Alfa Laval disappointed with the backup-support. For this reason it is considered very important to connect Cosmos to service-agreements. One main customer-benefit the sales force use as a mean of persuasion is that the customer is expected to save money through less failures and more optimised processes.

The information extracted from the machinery is not for sale – it is solely used by Alfa Laval. The company states that it markets a solution not information itself. It is "all about selling a value"¹²⁴.

According to Alfa Laval, the internal use of the information also becomes valuable to customers in improved product quality. Since a separator is a highly complex machine engaged in extreme speeds, one defect part can cause a chain-reaction of failures. Thanks to condition-based maintenance such failures can be avoided, thus significantly reducing the risk of a costly breakdown and consequently prolonging the life span of the separator, the company states.

Reliability is improved by Cosmos and Alfa Laval also states that it minimises the customer-effort involved in reporting failures and waiting for repairs. Overall the company strongly thinks that

¹²⁰ Nonstop Performance, Advertising leaflet, Alfa Laval (2002)

¹²¹ The term "uptime" is synonymous with the time a device is functioning properly

¹²² Nicklas Froborg, Alfa Laval AB, interview 030507, freely translated

¹²³ Ibid

¹²⁴ Ibid

the M2M-system improves the perceived quality and strengthens the image of Alfa Laval as an innovative company.

Customer relations

Alfa Laval sees Cosmos as a powerful tool to differentiate itself as a high-end manufacturer against the competitors. The system is believed to have brought with it a more professional way to make service-contracts, which the company considers to signal improved professionalism. It allows the focus to be shifted from “fire-fighting to pro-activeness”¹²⁵, thus increasing the trust customers have for their supplier, according to Alfa Laval.

The company sees the new concept as an opportunity to engage customers in long-time relationships although this objective has not yet been effectively communicated throughout the organisation. One example, according to Alfa Laval, is that parts of the sales force do not appreciate the long-term benefits of a relationship but see the short-term benefits of having traditional service engagements in which expensive service fees can be charged. In this respect, the company regards goal congruence as poor and better internal communication is considered a must.

Alfa Laval states that it does not fear ties to the customer to be weakened in any way with its M2M usage. Fewer service-interactions are compensated by meetings specified in the service-contracts. During these meetings the parties discuss and evaluate their ongoing relationship.

When having an agreement, Alfa Laval states, customers will most certainly dismiss competitors trying to win them over. Although that also was the case before M2M, Cosmos has provided a tool for constructing new contracts, thus allowing a better customisation, according to Alfa Laval. The company further states that the contracts involving M2M are generally longer, thus “brick-wall”¹²⁶ customers even more. Cosmos is believed to make the renewal of the contracts a formality, enabling “longer and more expensive contracts”¹²⁷.

¹²⁵ Nicklas Froborg, Alfa Laval AB, interview 030507, freely translated

¹²⁶ Ibid

¹²⁷ Ibid

4.2 Otis AB

Otis AB in short

- Interviewee: Fredrik Sederholm, CEO Otis AB.
- Company founded 1969
- Number of employees: 330
- Net sales 2002: 318 MKR
- Main areas:
 - o The company's main products are lifts and escalators which it sells and installs. Above this, Otis AB offers service on lifts and escalators.
- Machine to Machine:
 - o Remote Elevator Monitoring (REM) is an M2M system that lowers the risk of having a breakdown by alerting a fault centre as something malfunctions.
 - o Otis AB began using M2M technology in the middle of the 1980's.

(Sources: www.otis.se; www.ad.se; and interview with Fredrik Sederholm, Otis AB, 030516)

M2M in Otis

In Sweden Otis is the second largest company within its industry – worldwide it is the largest. Although smaller than Kone, the company is 15 years ahead when it comes to M2M usage. Indeed, Otis was one of the first companies in Sweden to make a profit of the technological solution as it pioneered the area in the middle of the 1980's.¹²⁸

The REM¹²⁹ system radically reduces the risk of having a breakdown, as the elevator constantly is in touch with OTISLINE, the fault centre, through a modem connection. In case of a sudden power failure or overload, the REM system also allows the passenger to use an installed phone to communicate with the fault centre.¹³⁰

REM is offered as a part of Otis' most expensive service agreement. Some 85% of the customers that buy a lift also sign any of the five standard service agreements. Though the system may also be installed in old lifts, in Sweden only five percent of the customers has signed the most exclusive REM-based contract. Abroad, however, this number is much higher. Sweden's low share is due mainly to the fact that its inhabitants are thriftier than elsewhere, partly because a large customer share is state-owned, according to Otis. Another explanation of the company suggests, Swedish customers usually have short time horizons, thus contrasting the REM system, as its aim is to keep the lifts as good as new throughout the building's life.

The two main reasons that Otis developed the REM system were to lower internal costs and increase customer loyalty thus believed tying the customer to the company. Other reasons, although not deemed as important, were to gain information on how the customers use the lifts and to offer better services. In spite of the many potential upsides with M2M, the company did not expect to attract new customers due to the implementation.

¹²⁸ Fredrik Sederholm, Otis AB, interview 030516

¹²⁹ REM stands for Remote Elevator Monitoring

¹³⁰ www.otis.se (2003)

Organisational implications

As only a few of Otis' customers are covered by REM based agreements, the usage of M2M is not believed to have had any major implications on the organisation as a whole. However, some patterns are possible to perceive, and the REM system has had the largest impact on the company's fault centre and service organisation. Around 15% of the net sales come from pure service contracts. Adding the revenue from repairs, half of the turnover is covered. Thus, the service part is a major source of revenue to the company.¹³¹

The service organisation, then, has been affected in that there are both fewer and shorter service visits with the REM-based systems. The service technician knows what kind of a problem is at hand before visiting the customer. As the alerts are received in the fault centre, this too has been noticeably affected, the company states.

The personnel have not had any difficulties adopting to the REM system, according to Otis, and the company states it has not been forced to employ more people to handle it.

Customer offerings

Otis offers the system to all its lifts and to all customers. Should a customer want to adopt the system in an already owned lift, it can be easily arranged. There are five different service agreements but REM is included only in the most exclusive contract. Thus, the other four agreements are not affected by M2M.

The first agreement only provides the minimum amount of service necessary to keep the lift safe. Otis' second agreement includes a predetermined number of visits and the third also includes some repair. The remaining two agreements both include all service and repair, but as mentioned it is only the fifth agreement that includes surveillance – REM. It guarantees slightly more than 99% up-time.

Since REM is a high-end service it is a lot more expensive. Furthermore, in spite of an enhanced service-level no new customer segments are targeted according to Otis.

To date, it has been difficult to sell REM in Sweden. Otis believes that this is due to considerably lower costs of service on lifts, and the company further states that this is due to different customer profiles in Sweden. With sixty percent of the property holdings being owned by municipal real-estate companies, prices have been cut through bidding procedures. According to Otis this lowers the demand for more extensive service agreements. The company's view is that its customers neither possess money nor interest in such sophisticated services. It also recognises the fact that Swedish authorities do not have any regulations on the services of lifts as a major reason for the low demand.

Thus, the upside to the customer of the fifth service agreement is limited and customers have asked whether it is reasonable that they should pay for something that to a large extent benefits Otis. Because REM does not lower the customers' costs, the company finds it important to market the *value* of it to the customers. As stated above, only five percent of Otis' customers use REM which is very low compared to Otis in the rest of Europe. In Denmark, for instance, more than sixty percent of the customers use REM. Despite a disappointing level of implementation Otis still believes that the remote monitoring strengthens the brand-name and positions the

¹³¹ Fredrik Sederholm, Otis AB, interview 030516

company as an innovative manufacturer. In addition, Otis expects an increase in demand as the price of REM is reduced and starts to challenge emergency-telephone solutions.

Through REM Otis extracts statistical information from the products which is used for planning of maintenance visits and necessary measures to be taken. Customers can also obtain the information.

REM does not prolong the life-span of the lift, nor does it affect the length of warranties. However, it enables the lift to run smoothly with a minimum of failures. Should a breakdown occur, the customers do not have to call the helpdesk and have long waiting periods for maintenance or spare-parts.¹³²

Customer relations

Otis believes that, from a customer point-of-view, the benefit of REM is that it through preventive maintenance reduces the risk of a breakdown. In event of a breakdown Otis almost always recognises the failure before the customer does.

As REM was first introduced, customers could not choose to switch service-provider. Otis had made it impossible through the use of an emergency telephone connected to its own helpdesk, thus locking in its customers. The complaints were however massive, forcing the company to allow customers to change service-provider. Even so, Otis still believes REM ties the customer to the company, which also was a main objective with the system.

The condition-based maintenance decreases the number of service visits and also cuts them shorter thanks to remote trouble-shooting. The lesser amount of visits is not believed to weaken the customer ties.

“We don’t believe fewer visits weaken our ties to the customer. The service personnel doesn’t meet the customer very often anyway - it isn’t the customer who’s stuck in the lift.”¹³³

¹³² Fredrik Sederholm, Otis AB, interview 030516

¹³³ Fredrik Sederholm, Otis AB, interview 030516, freely translated

4.3 PM-Luft AB

PM-Luft in short

- Interviewee: Mikael Sandgren, Regional Manager (Stockholm), Product Manager (the GOLD-systems).
- Company founded 1952
- Number of employees 2002: 450
- Net sales 2001: 485 MSEK
- Product Range:
 - o PM-Luft offers a complete product range of air treatment units.
- Field of Applications
 - o Examples of customers are private houses, kindergartens, schools, offices, hospitals and industrial establishments.
- Main Areas
 - o PM-Luft develops, manufactures, markets and offers products and services focusing on ventilation.
 - o It is among the largest manufacturers of air treatment units for indoors-climate in Scandinavia.
- Machine to Machine:
 - o The air treatment units GOLDen EYE and GOLDen GATE have micro processor-based communication systems installed that allows them to be remotely supervised.
 - o M2M was initially launched in 1998.

(Sources: www.pm-luft.se; www.ad.se; and interview with Mikael Sandgren, PM-Luft AB, 030424)

M2M in PM-Luft

According to the company, PM-Luft is at the front of technological development and innovation within its main areas. Not surprisingly then, the company has led the development of M2M-based systems within its industry. Worldwide, it was the first company in its industry to adopt this type of an M2M-system. In Sweden, it is still the only participant.¹³⁴

Two products are offered with M2M technology; GOLDen EYE and GOLDen GATE. The latter is the main product offered at present and it is the development of the former. Both products have technology installed that allows them to be remotely supervised. There are no service agreements connected to either system, but for GOLDen EYE the M2M technology has facilitated PM-Luft to create four optional additional packages that alarm when something is malfunctioning. With the most basic package, the customer is only alerted by e-mail. In addition to the e-mail, the second package also alarms by sending an SMS to a chosen cell phone. The third package allows the customer to check the unit status over the Internet, and with the fourth package it is also possible to change certain settings over the Internet. The customer pays for these packages through monthly subscription fees.¹³⁵

Cutting internal costs was not a primary objective for PM-Luft to adopt the M2M technology, although this turned out to be a “positive side-effect”¹³⁶. Rather, the focus of the GOLD-systems was on boosting revenues, both through increased new sales and through the subscription fees.

The sales of the GOLD-systems are considered successful – today they account for 25% of PM-Luft’s net sales in Sweden. The sales of the GOLD-systems increased with 7% last year, which could be compared to an industry decline of 10%.

¹³⁴ Mikael Sandgren, PM-Luft AB, interview 030424

¹³⁵ ”GOLDen EYE”, product brochure (2001)

¹³⁶ Mikael Sandgren, PM-Luft AB, interview 030424, freely translated

Although no specific service agreements have been generated by the GOLD-systems, offering better service was an important reason for PM-Luft to adopt the M2M technology. The system can according to PM-Luft lower customers' service costs by up to 30% since many problems can be resolved remotely, which is cheaper to the customer.

Another important reason for PM-Luft to adopt M2M was to improve its customer relations. The industry is characterised by a low degree of service agreements between manufacturers and customers, and PM-Luft too has had problems acquiring these often lucrative contracts. Indeed, only some four percent of the company's customers are tied to it by service agreements. With a company goal of 50%, PM-Luft hopes that improved customer relations leads to more customers signing service agreements.

Although the company believes that many positive effects have arisen from the M2M usage, it has not facilitated PM-Luft to take on new customer segments.

Organisational implications

Within PM-Luft the service function is said to be mostly affected by the usage of the GOLD systems. For example, when customers contact PM-Luft on account of something not functioning properly, in only 10% of the cases the faults originate from an actual product malfunctioning.

"The service function is spared from the unimportant things as the customer now is able to handle more itself."¹³⁷

From the customer perspective, PM-Luft imagines the service the company offers with its GOLD systems is much more efficient than before. With GOLD, as soon as something breaks down an alarm is sent.

"[The M2M system] is efficient in the sense that one immediately sees when something malfunctions. Otherwise it takes hours before someone notices the bad air."¹³⁸

Both the marketing and the sales functions have been affected by the M2M implementation, although indirectly. The fact that the GOLD systems may lower the customer's costs by 30% is considered a good sales argument. As for the marketing function, PM-Luft believes that the GOLD systems have been important for its positioning as an innovative company, and it has put lots of resources into marketing the systems. As service is expected to become even more important in the future, however, the company believes that the service function needs to market itself more intensely.

The information generated by the GOLD systems is stored for five years. Owing to this, PM-Luft states, some of its products' handling and batch faults have been detected and corrected. In terms of planning and budgeting, however, the M2M system has not had any noticeable impact.

PM-Luft believes that the GOLD project has had an important impact on the staff's motivation – they feel that they work for a company that is considered innovative and respected.

¹³⁷ Mikael Sandgren, PM-Luft AB, interview 030424, freely translated

¹³⁸ Ibid

Customer offerings

As described in the introduction, PM-Luft offers four optional packages of addition for the GOLDen EYE. These are particularly recommended when a customer acts within a demanding environment, i.e. an environment that puts a lot of pressure on the products. As these settings result in many alerts, being able to adjust parameters itself may save the customer money.

PM-Luft believes that it is important to “get customers into the system [of service agreements]”¹³⁹, and emphasises the importance of tying the customer to the company. To obtain this, PM-Luft has some special offerings, for example reduced costs for five-years agreements, which are said to result in a larger share of longer contracts than prior to M2M.

Because of technological limitations, the M2M technology is offered only to the two GOLD-products. There are, however, no restrictions on which customers may buy it.

PM-Luft has noticed that customers with large systems tend to be particularly negative towards the subscription payment. These customers have difficulties understanding that the cost-saving effects may outweigh the unease of having “yet another system”¹⁴⁰. In response to this, PM-Luft composed new offering-packages that de-emphasised the subscription part.

Furthermore, PM-Luft is not of the opinion that its M2M usage changes the lifetime of its products. It does, however, consider its products more reliable now, since malfunctions may be discovered as they occur rather than later.

It is the company’s belief that the customers using the M2M-based systems perceive a higher service quality. Firstly, PM-Luft does not have to visit these customers as often, since most problems may be solved remotely. Secondly, since repair should be done when it is actually needed – not when the calendar says it needs to be done – the customer does not consider the service occasion a waste of time, according to the company. Thirdly, it is believed to be important for the customer that it has a fresh air supplier at the front of the development.

“PM-Luft was first in the world [to put M2M in its line of business] and is still the market leader. Reputation is important, and so it’s important to show that we use new technologies.”¹⁴¹

Customer relations

At first, PM-Luft experienced several teething problems with its GOLD-systems. As the company managed to solve these, however, it found that the customer ties actually became stronger.

PM-Luft is of the opinion that the M2M usage has strengthened its customer relations. Particularly, the ties to the more technologically oriented customers are claimed to have become stronger, since these better understand the system’s advantages.

Before, PM-Luft states, as the service technicians corrected minor faults, customers got upset because of the high service charges. Failures were often user-related and today such problems can be taken care of remotely, which the company considers very positive. Since the customer can

¹³⁹ Mikael Sandgren, PM-Luft AB, interview 030424, freely translated

¹⁴⁰ Ibid

¹⁴¹ Ibid

now be certain that the defect is serious once the service personnel arrive, service visits are not considered unnecessary by the customers to the same extent as before. However, PM-Luft does not consider this decreased level of customer interaction a threat to its customer relations since the service personnel is not seen to be interacting in a relation-enhancing way– they merely repair the product.

As already discussed, the optional packages of addition that are offered to the GOLDen EYE product is (partly) paid through a monthly subscription fee. The lock-up period is two years and agreements are automatically renewed.

4.4 AB Tetra Pak

Tetra Pak in short

- Interviewee: Jens-Erik Rasmussen, Nordic Service Manager.
- Company founded 1952
- Number of employees 2002: 3 900 (in Sweden)
- Net sales 2002: 8,9 BSEK (in Sweden)
- Product Range:
 - o One of the world's largest suppliers of packaging systems for milk, fruit juices and drinks, and many other products.
- Main Divisions
 - o Carton Chilled, Carton Ambient, PET., Processing
- Machine to Machine:
 - o Tetra Pak uses a condition-based maintenance system (Cosmos) for its separators and decanters. With the system the machines communicate their status to a computer, and they may also be remotely supervised.
 - o Launched in 1998.

(Sources: www.tetrapak.se; www.ad.se; and interview Jens-Erik Rasmussen, AB Tetra Pak, 030430)

M2M in Tetra Pak

The M2M system Tetra Pak uses, named Cosmos¹⁴², was developed in co-operation with Alfa Laval and Vikon Vibrationskonsult (Vikon). It is a condition based monitoring system for separators and decanters and it is capable to tell if there is a problem, the seriousness of it and which component is not functioning properly. The system may be attached both to new and old machines. In a larger context, Cosmos is a tool used in Tetra Pak's maintenance concept – Tetra PlantCare. Consequently, Cosmos is a sales argument that Tetra Pak uses when acquiring PlantCare contracts. Before it started using the M2M technology, Tetra Pak did maintenance based on running hours. As stated, now it is based on condition.

A number of vibration measuring instruments are attached to the separator or decanter. The measured values are converted into a risk factor number that tells the condition of the machine. If the risk factor is within the range 1-50 a computer placed on site shows a green light and the machine is in good condition. Thus no action needs to be taken. With a risk factor between 51-80 the green light turns partly yellow, which indicates that the machine's condition is acceptable but attention needs to be paid. As the number exceeds beyond 81 a yellow and red signal indicates that the machine no longer is in an acceptable condition, thus problem analysis and remedy are needed immediately. Above 100, the machine's condition is critical and needs to be stopped. Examples of typical problems Cosmos may detect are: bearing damage, misalignment, motor problems, wrong assembly, gear problems and oil problems.

It is the provider of Cosmos' technological solution, Vikon, that carries out the vibration calculations. As a machine is installed at the customer's plant, it takes three months to adjust the product to work well with the Cosmos system.

It was too inefficient for Tetra Pak to monitor each machine all the time, so presently it checks them once a day by connecting through a modem. Tetra Pak is normally able to advise the customer three to four weeks before its machine needs to be serviced. Still, the formal

¹⁴² Cosmos stands for Condition Status Monitoring System

responsibility of monitoring the system is the customer's. The customer's operator may be sent an SMS as the status of a machine changes. This alert, however, does not contain a diagnosis of the problem. In addition to this Vikon checks the machines once a week in case Tetra Pak or the customer have missed something or misunderstood signals. This weekly check, however, is expected to end as Tetra Pak accumulate experience in how the system works. If demanded, Tetra Pak may also have specialist support from Vikon.

When deciding on adopting the M2M technology, Tetra Pak had a number of expectations. With the system it wanted to lower internal costs, offer new services, offer better services and tie the customer to the company. Furthermore, Tetra Pak thought that if it did not adopt this technology a competitor would, and the company wanted to position itself away from competitors as a more innovative company. However, the goal was neither to take on new customer segments nor generating information about how customers use its machines.

Statistics demonstrate that Tetra Pak has only had one breakdown on a Cosmos supervised machine. Hence, Tetra Pak regards Cosmos as an important part in increasing the reliability of the its products.

Organisational implications

According to Tetra Pak, the use of M2M technology has made the service activities easier to plan. There are less unscheduled calls from the customers with the Cosmos system installed on their machines. Hence, not as much service personnel are needed on standby and so these resources are claimed to be allocated more efficiently. Planning is easier for the spare parts manufacturer too, since they know well in advance what parts will be needed and where. This has also reduced the time spent on service meetings.

The effects of the usage of the Cosmos system on the stock keeping have been threefold. It has been reduced at a service line level, since the company may plan its work in a better way. However, since Tetra Pak now has an obligation to commence service within six hours from a breakdown, some specific spare parts are needed to be kept in stock. However, it is not clear to Tetra Pak to what extent this is a consequence of the M2M usage.

Prior to M2M Tetra Pak changed several parts of the machines when performing services. Now it has greater knowledge about which parts to change and when. Thus, specific parts are procured rather than complete service kits.

According to Tetra Pak, the marketing function has not been affected in any significant way, apart from the fact that the new concept needs to be marketed. The company does not use the M2M technology to collect information – statistical data was collected even before the Cosmos system.

Despite technological problems within the Cosmos project, Tetra Pak's claims its employees have not had any problems adopting to the new technology. However, it has increased the workload on the service managers, since the machines monitored by the system need to be checked on-line every day.

As stated above, Tetra Pak believes that the M2M usage has made it easier to plan and coordinate the service activities. In addition to this, the revenue side of the budgeting is said to be

more easily managed since many contracts now have a fixed price during a three-year period. Considering the costs, however, these are still said to be as difficult as before to foresee.

The company claims that the purchasing function of input material has become more efficient in that it now may act more pro-actively. Knowing what specific parts will be needed in advance facilitates this function to have them ready when needed.

“Now, for the first time, we get direct information if we’ve done something wrong. If one of the parts that we’ve put in doing service does not work properly, immediately when we’re starting up, Cosmos will tell us what is wrong. So now we get direct feedback on how we’ve done.”¹⁴³

Customer offerings

Few customers adopt service agreements as they buy a machine – a pattern that is particularly distinct in Sweden. Generally the products come with a warranty covering the first one to two years of use, which is one reason for customers to wait signing service contracts. Moreover, it is only feasible to use the system in some 30% of the installed machines, partly due to the fact that it is considered economically sound to adopt it only if the customer has got more than two machines.

At present, it is impossible for Tetra Pak to offer the M2M technology to every product and every customer. Cosmos is however not offered as a tool to the customer. Rather, the customer buys a contract that includes the system. If a machine is inexpensive to perform maintenance upon, M2M is according to Tetra Pak not yet considered an option.

“It wasn’t actually because it was a demand from our customers more than we could see that there were other possibilities. Now it has turned into a demand.”¹⁴⁴

Tetra Pak considers Cosmos to be an important tool not only in terms of operating but also because being first with such a concept indicates that the company is innovative and walks in the front line of new technology. The price is aimed to be just a little below too expensive thus indicating a luxurious service. Yet all customers have been “very positive”¹⁴⁵ towards the concept and perceive a higher service quality, according to the company. However, premium-based pricing does not automatically imply higher income for Tetra Pak since its lucrative sale of service visits declines.

“It is a little less income to us than with normal service [...] but it brick-walls the business towards our competitors.”¹⁴⁶

If the customer’s equipment is monitored by the Cosmos system, it may take out an insurance that covers the costs of repairing above 10 000 DKR. Furthermore, Cosmos also enables the customer to take out an insurance covering its entire production loss in case of a failure. This option too is exclusive for Cosmos-monitored systems, but up to date no customers have taken on this insurance, in spite being offered “a very good price”¹⁴⁷. However, as many of Tetra Pak’s customers use production processes that are very costly to disrupt, the company believes it to be an interesting potential sales argument.

¹⁴³ Jens-Erik Rasmussen, AB Tetra Pak, interview 030430, freely translated

¹⁴⁴ Ibid

¹⁴⁵ Ibid

¹⁴⁶ Ibid

¹⁴⁷ Ibid

Contrasting to before the M2M implementation, the company now offers a fixed price for the products and services. The customer knows its exact cost of maintenance for the period the contract is running, which typically is three years. However, Tetra Pak finds it difficult to decide at what level this fixed price should be, but it is the company's belief that this arrangement is an important benefit to the customer.

Compared to ordinary service agreements, the contracts that use Cosmos are 10-15% more expensive. However, as service normally takes place in between the scheduled visits as well, Tetra Pak claims that customers' service costs actually decrease with these contracts.

The breakdown service is often costly to the customer since many parts usually have to be replaced due to chain-effects, i.e. one central part breaks down which damages other parts. Avoiding such effects, Tetra Pak states, does not improve the life span of the machinery as a whole, but keeps the need for spare-parts at an absolute minimum. Apart from not having to perform fault detection, the planned service is also foreseeable to a higher extent. According to Tetra Pak, this is more convenient for the customer.

Before Cosmos there were three minor routine services and one major service performed annually – now only two is needed. As mentioned above, Tetra Pak believes that the customer perceives the service quality as higher. However, it also states that the perceived product quality was already considered very high prior to the implementation and is thus not improved by Cosmos.

Customer relations

Tetra Pak claims that the M2M system is of great importance for developing and strengthening customer relations. To begin with, the company rarely has to meet upset and angry customers since unplanned breakdowns can effectively be avoided. This was certainly not the case prior to the M2M implementation. Then, customers often complained about long waiting periods and extensive failure recovery periods, which close to never arise with today's Cosmos-products.

"Now, we have more talks with the people!"¹⁴⁸

Furthermore, as company-representatives meet up on a regular basis, the topics of discussion are more related to enhancements of the product and the production-processes and less related to price and quality issues of service and maintenance. Tetra Pak claims that Customers with Cosmos are not as likely to perceive the service as expensive as are other customers. They pay a fixed price and do not have viewpoints on when or how often maintenance should be carried out.

"With our key customers we have quarterly meetings, and much of these meetings used to be about pricing of spare parts and pricing of services and so on. This has ceased for these machines [that are covered by a service agreement with M2M] because there is nothing to discuss – we discuss it every three years when we have to make a new contract."¹⁴⁹

The user interface is designed to be interpreted by the local operator. Thus, when in doubt, the operator contacts service personnel at Tetra Pak, which results in a stable frequency of contacts

¹⁴⁸ Jens-Erik Rasmussen, AB Tetra Pak, interview 030430, freely translated

¹⁴⁹ Ibid

between the companies. In fact the service personnel at Tetra Pak in many cases have a more frequent contact with the customers' operators than have their own maintenance managers.¹⁵⁰

According to Tetra Pak no competitor can supply the exact set of products that Tetra Pak supplies, and since the products are highly specialised no competitor can provide the necessary service. Should a customer however want to change supplier, Tetra Pak believes the customer would have to perform a lot of the work itself.

Cosmos has also made it possible to make new contracts. Even though Tetra Pak covers the lions' share of the separator market in the Nordic countries it had never had a single service-contract on separator service prior to the M2M-implementation. The length of the contracts is limited to a maximum of four years but is often re-negotiated every three years. In spite of a built-in price clause, longer contracts are considered leading to increased uncertainty since the company to a greater extent would be susceptible to unforeseen events.

¹⁵⁰ Jens-Erik Rasmussen, AB Tetra Pak, interview 030430

4.5 Thermia AB

Thermia in short

- Interviewee: Patrik Olsson, Product manager, regulation systems and “Thermia Online”.
- Company founded: 1923
- Number of employees 2002: 300 in Sweden and Finland
- Net sales 2002: 400 MSEK
- Product Range:
 - o Thermia offers heating devices, e.g. heat pumps, exhaust air heat pumps, pellet systems, water heaters and furnaces.
- Main Areas
 - o Development, production, marketing and installation of heating products.
- Machine to Machine:
 - o The heat pump “Diplomat” is equipped with an M2M solution which enables remote monitoring, remote control and fault detection.
 - o M2M was initially launched in 1998.

(Sources: www.thermia.se; www.ad.se; and interview with Patrik Olsson, Thermia AB, 030506)

M2M in Thermia

Thermia only offers M2M technology in one of their products, a heat pump named “Diplomat”. Diplomat currently accounts for twenty percent of net sales, and is soon projected to account for forty percent of net sales.

Via a PC connected to the web and a GSM module, Thermia Diplomat may be monitored and adjusted remotely through a newly developed user-interface called “Thermia Online”. The end-customer, hereafter referred to as *the customer*, may for instance increase or decrease the temperature and retrieve current or historical process information. An optional GSM module enables Diplomat to send an alarm via SMS and the problem at hand will be displayed on the customer’s cell phone.¹⁵¹

Thermia’s M2M system is structured into three levels of access.

1. The customer is able to monitor and change certain measurements such as the temperature for water and air.
2. Level two is not to be accessed by the customer but by the retailer. The purpose of this arrangement is to enable the retailer to make money on after-sales services. All retailers have access to their customers’ M2M-products. The second level gives the retailers a more sophisticated view of the machines whereby they can read measurements and change settings that are considered too complicated for the customer. Retailers too can choose to receive an alarm in case of a failure thus facilitating a quick response to customers with service contracts even before the customers are aware of the problem.
3. The third level is the administrative level which only Thermia can access. Through this level, Thermia has access to all the M2M-products and is consequently able to perform remote troubleshooting, extract detailed information or even repair products.

¹⁵¹ ”Diplomat”, product brochure (2002)

The reasons for implementing M2M were to cut warranty-related service costs, to increase the market share and to differentiate away from the competitors. Thermia did not expect to attract new customers due to the M2M implementation, nor did it expect to prolong the period of warranty.

Organisational implications

According to Thermia, Diplomat saves money for the company. Historically, most problems during the period of warranty have been mishandling failures which Thermia is not obliged to take as warranty repairs. It is however considered an act of goodwill to conveniently solve the customers' problems even though this is not the company's formal responsibility. These costs have accounted for a "very large"¹⁵² share of Thermia's warranty-repair costs, but is now said to be considerably lowered due to the possibility to access products remotely, which often solves the problems. Instead of having to guide customers over telephone through complicated user-menus, the helpdesk can now solve the problems without having to interact with the customer which is said to improve the quality of the support.¹⁵³

The information extracted from the products is logged and Thermia states that this facilitates the information to be used for development. Pumps can for instance be installed in places impossible to simulate in a laboratory-environment and data can be analysed continually. According to Thermia, the opportunity to test the product on different sites and analyse its behaviour is considered a very useful tool in the development process.

"By having the machines connected for, say, a year we can collect data on how the pumps react on variations in temperature, for example at locations with a different climate than in Sweden. This is impossible to simulate in a lab."¹⁵⁴

The internal quality control have not been improved, but the perceived quality is said to be improved through feedback. Altering the access level on specific pump settings to prevent the customer from making inaccurate adjustments because of lack of knowledge is one example of how the feed-back have improved product performance.

Employees appreciate the company walking in the front-line of technology development. Moreover, Thermia does not sell to the customers themselves but to its network of independent retailers and the retailers have also given positive feedback on the M2M-system, which will be further specified below.

Customer offerings

Diplomat is considered a premium product in its field and being very expensive it is not believed to be an option for customers mainly concerned about the price. Thermia states its products are consistently more expensive than are their competitors' products, with Diplomat being a lot more expensive. The company nonetheless states that M2M may lower the customers' costs because they are able to lower the house temperature remotely when needed.

¹⁵² Patrik Olsson, Thermia AB, interview 030506, freely translated

¹⁵³ Patrik Olsson, Thermia AB, interview 030506

¹⁵⁴ Patrik Olsson, Thermia AB, interview 030506, freely translated

There are no technical delimitations to use M2M on other products, but the company wants to keep Diplomat a premium product since “it [M2M] helps to maintain the price difference towards standard products”¹⁵⁵. Moreover, the extraction of information and statistics will enable the company to market the information as an optional additional service.

Thermia believes that much of the industry focus has been on the efficiency of the products, which has consequently been improved considerably. The potential of further improvements has - according to the company - diminished, leaving the companies having to seek new areas of differentiation. M2M is said to have provided Thermia with a profitable sidetrack, allowing the company to attract customers through new kinds of offerings. Today, Thermia claims, mechanical improvements catch less attraction than do improvements like Thermia Online.

Thus, Diplomat is considered a powerful argument for the sales force. It is even recognised that many customers buy the products thanks to the availability of Thermia Online even though they never actually use it. Thermia states that most of the system is yet inactive, leaving great potential for further developments.

Some customers are not satisfied with the implementation of M2M. The dissatisfaction is however left to little attention since it is mainly due to customers who want the product exactly like they are used to, Thermia claims.

The company has gone into great lengths to assure that the user interface is user friendly. Drawing on past experiences Thermia considers simple handling routines for the customers a must. Prior to Thermia Online was namely a system called Thermia Supervision, which failed due to too many complicated features, and, according to the company, this led to poor user friendliness. The handling routines were, according to the company, also too difficult, resulting in customers unwittingly changing settings. High rates of user related errors incurred large support-costs to Thermia and made the customers annoyed.

As mentioned, Thermia Diplomat is sold through authorised retailers who also have the exclusive right to perform service on the products. M2M has allowed the retailers to offer longer service contracts. Thermia recognises the considerable service margins but the company claims that it is outside its line of business and refers the company’s objective to create value in all parts of the value chain.

“What is good for the customer is good for the dealer, and ultimately benefits us.”¹⁵⁶

The company does not believe it has a service organisation of the magnitude necessary for customer service anyway. Thermia’s service organisation is aimed at assisting the retailers and consists of seven people.

Other companies within the same line of business have started to implement M2M as well but none of them have come as far as Thermia, Indeed, the company states it is at the front of technological development.

¹⁵⁵ Patrik Olsson, Thermia AB, interview 030506, freely translated

¹⁵⁶ Ibid

Customer relations

Thermia claims the M2M solution ties the customer to the retailer, allowing the retailer to engage in lucrative service contracts with the customers. As the customer buys an M2M product it is automatically bound to a two-year prepaid subscription, which ensures that the customer will contact the retailer after two years in order to prolong the contract. With M2M face to face interaction with customers has decreased, even though this is not considered a problem. Since the contact was mostly due to warranty repair it was not seen as a desired contact, and consequently Thermia does not consider the service personnel as means to build relations.

Furthermore, as described above, the M2M system facilitates for the customer to monitor and change certain measurements such as the temperature for water and air via Thermia's home page. The company states that this leads to an increased frequency of visits on its web site, and that consequently more information about the company will reach the customer.

4.6 Xerox AB

Xerox AB in short

- Interviewee: Stefan Blixt, Product Performance Manager and head of a new M2M project.
- Company founded 1982
- Number of employees 2002: 550
- Net sales 1999: 1 BSEK
- Product Range:
 - Copy machines.
- Machine to Machine:
 - Xerox adopted an M2M system during the 1990's; copying machines alerted the service division if they did not function properly. The project turned out unsatisfactory and was abandoned.

(Sources: www.xerox.se; www.ad.se; and interview with Stefan Blixt, Xerox AB, 030508)

Background

Since almost a decade, Xerox has launched several different M2M projects. In the beginning of the 1990's the company adopted a system that alerted its service organisation as something was malfunctioning. For different reasons, this project turned out unsuccessfully. In 1998, the company launched a new and more technologically sophisticated system called RDT¹⁵⁷. This project worked well, but was terminated two years ago due to changes in demand. At present, Xerox has just launched a new system (called sixth sense) on which it has high expectations. The focus of this thesis is on the former unsuccessful system.

The unsuccessful M2M system

With the M2M system a copying machine that functioned inappropriately showed a problem-specific code on a display. Had the same code appeared for a certain number of times, a device on the machine sent an alarm to a computer at Xerox's service division. A person read off the message and alerted a service technician, who then knew what customer had what kind of a problem.

The aim of the project was for Xerox to pro-actively repair the copying machines – before the customers considered the malfunctioning to be of disturbance. Apart from offering better service, Xerox wanted to lower costs internally through increased efficiency within its service organisation. Taking on new customers was not an objective with the project. Rather, another aim was to tie the customer to the company.

Once implemented, the M2M system showed a number of shortcomings. Firstly, Xerox found it difficult to decide on proper threshold values for when the service division was to be alerted. As explained above, the machines were supposed to alert when a problem code had appeared a specific number of times, and these values were difficult to find. Secondly, when there actually was a serious problem, most of the times the customer had already alerted Xerox. In addition to this, the modem connection was not totally reliable. Thirdly, often the machine alerted problems even though the customer considered it functioning well.

¹⁵⁷ RDT stands for Remote Diagnostic Tool.

The M2M application was offered to a certain copying machine, and many customers had chosen this product because of its M2M system. Xerox states that as the system did not work properly, some of these customers were disappointed. However, as the system was offered as a free feature (only a subscription fee was the extra cost) the discontent was bearable – it was still possible to contact Xerox the traditional way.¹⁵⁸

Xerox believes that technological constraints overturned the M2M project. Had there been a two-way communication system available, where problems were possible to solve remotely, the company believes that the project would have been more successful. Indeed, short after the failure, Xerox launched the RDT system which had the desired functions, and this project turned out well. Still, with the technology that was available to the first system, Xerox believes that nothing could have been done differently to had gained another outcome.

As the M2M system was not functioning properly, both the sales people and the service technicians lost faith in it, according to Xerox. As the RDT system was launched shortly after, some customers' confidence had been somewhat damaged, resulting in difficulties in selling the new system.

“Perhaps the most difficult problem was to get the sales personnel to sell the new RDT system. Remembering the old system, they did not think this would work either.”¹⁵⁹

Xerox did not perform any customer analysis before launching the first M2M system. However, the company believes that the hypothetical results would not have changed anything, as it claims that the shortcomings were on a technological level.

¹⁵⁸ Stefan Blixt, Xerox AB, interview 030508

¹⁵⁹ Stefan Blixt, Xerox AB, interview 030508, freely translated

5 Analysis

In this chapter the empirical observations are fused together with the models, theories and concepts presented in chapter three. First a more rough analysis is carried out matching each theory and model with the empirical observations. The aim of this is to let observed patterns stand out. This is followed by a discussion around the analytical findings. In this discussion the authors return to the three perspectives and use them as a structure, thus bridging the gap between the rough analysis and the conclusions presented in chapter six.

5.1 Value chain analysis

Introduction

Assuming a rather broad approach, the purpose of this analysis is to show the organisational effects that the M2M implementations have had on the studied companies. Using the value chain as a structure, each activity will be presented along with the findings of the studied cases.

Primary activities

- Inbound logistics

The inbound logistic activity has in general not been affected by the M2M implementation. There is however one exception – Tetra Pak. The company considers the purchasing of parts function has become more efficient through pro-activity. With M2M Tetra Pak is more informed about what parts to order, thus may have them available when needed, which also has efficiency enhancing implications on warehousing. An interesting parenthesis is that Tetra Pak's spare part manufacturers too find it easier to plan, knowing earlier what parts will be needed.

Before Cosmos Tetra Pak usually purchased complete service kits. As the company now does not change everything when servicing, but merely the parts that need to be changed, it does not have to buy the same amount of spare parts.

- Operations

Nor this activity has been largely affected by the M2M usage. However, here too there are exceptions. For example, in PM-Luft defects have been reduced in two ways, owing to the fact that its M2M system generates information on the products. The company has both enjoyed a reduction in product handling faults and batch faults, as the latter may be detected instantly on installation.

Tetra Pak has also experienced some efficiency enhancing effects within this activity. When testing the installed products, the company now instantly sees whether something is not functioning properly. In Thermia, minor product defects have been reduced thanks to the M2M usage.

- Outbound logistics

The M2M usage has not had any effects on outbound logistics. For instance, the order processing systems work as before, and none of the companies have shortened their product delivery time.

- Marketing & sales

Most of the investigated companies claim that brand reputation was an important reason to adopt M2M. For example, one of the main reasons for Alfa-Laval was the possibility to differentiate the product and position itself as an innovative company.

Moreover, the information generated by the M2M system is not for sale, but is used for marketing purposes. The information is valuable for demonstrating to the customer the extra value received when purchasing the advanced service packages.

One of the main reasons to implement M2M has been to tie the customer to the company. However, a shift in focus from short-term gains towards long-term effects poses challenges on the marketing and sales departments. Indeed, many of the investigated companies have had difficulties in marketing the system and, for example, parts of Alfa-Laval's sales force do not appreciate the long-term benefits of a relationship. Rather, they advocate the short-term gains of having traditional service engagements in which expensive service fees can be charged.

None of the companies implemented the M2M system in order to take on new customers.

- Service

The service activity has been relatively largely affected by the M2M implementation. Perhaps the most important effect has been the facilitation of remote product adjustments and repairs. For example, neither PM-Luft nor Thermia have large service organisations, but they both emphasise the importance of M2M in the remote servicing aspect. Much of what used to be handled by the field service personnel may now be solved via computers. Naturally, this has changed the workload and tasks within their service organisations. For example, now there are less turnouts without a fault.

Moreover, the service visits have become more efficient. In Alfa Laval's case they have been shortened, as the right tools can be brought due to the information provided by the system. Otis and Tetra Pak have experienced similar kinds of efficiency improvements within their service organisations.

Furthermore, in Tetra Pak new demands have been put on the availability of spares. As the company promises to start service within six hours from being alerted, obviously a certain stock level is needed. It is not clear, however, if this six hour engagement is due solely to the usage of M2M.

Although having a major impact on some companies, the service function has not been largely affected in all the cases. For example, as Thermia does not offer service contracts to the end-customer, and indeed only has a small service organisation towards its retailers, obviously the M2M usage has not affected the company's service function greatly. A similar pattern is present in PM-Luft. Due to the limited size of the service organisation, no major changes have occurred. However, the company has experienced a reduction of service calls regarding minor faults, as the customer now is able to handle more itself.

Support activities

- Firm infrastructure

In some of the companies, planning has become easier with the M2M implementation – particularly in the cases of Alfa Laval and Tetra Pak, where it is mainly the planning of service activities that has been made more efficient. For example, both Alfa Laval and Tetra Pak may with their M2M systems (both use Cosmos) plan service visits according to their customers' schedules. Not seldom, their customers have sensitive production processes and breakdowns are often costly. Thus, being able to schedule service occasions to when production will be interrupted by the customer (e.g. if another machine needs to be cleaned or serviced) is of great value for the customer, and is facilitated by the M2M system. At Tetra Pak, this advantage is manifested in a reduction of unscheduled customer calls.

Also budgeting has become easier within Tetra Pak. Due to the larger proportion of fixed-cost service contracts facilitated by the M2M system, revenues have become more predictable. Naturally, it is easier to budget with less variation in revenues.

Furthermore, in the case of Alfa Laval, quality management has become more efficient. As its M2M system generates a footprint of how the machine is supposed to function there is a measured value to benchmark against. Tetra Pak has experienced similar improvements within quality management. Cosmos provides instant feedback in case of a malfunction – if service has been done improperly it shows immediately at start-up.

The service personnel's time may be better allocated with the M2M usage. Lead times may be reduced, thus efficiency may be increased, as they know earlier what problem the customer is having. Due to this information management improvement, the service technicians at for example Otis are aware of what problems are present before actually visiting the customer.

As for PM-Luft and Thermia, the M2M system has not had any impact worth mentioning on firm infrastructure. In the case of Thermia this is due to its limited service engagements – advantages from improved planning are thus negligible. PM-Luft has not enjoyed improved planning either, probably also due to its limited service engagements.

- Human resource management

Within this activity not too many organisational implications have been noticed – with a few interesting exceptions. For example, contrasting the other companies, Alfa Laval has had to employ a few persons due to the M2M implementation. All companies have carried out some form of education on the system for the staff that is affected by it on a more pragmatic level.

Furthermore, none of the companies' personnel have had any difficulties adopting to the system with one noticeable exception – Xerox. Coming off with an unsuccessful start, the personnel got somewhat dejected by its shortcomings, making it difficult to launch the following system.

Within Tetra Pak, the M2M system has increased the workload on service managers, who now have to check up on the customers' machines once a day. Lastly, both PM-Luft and Thermia emphasise that being in the front of innovation (i.e. being early with adopting an M2M system) is of importance to the workforce's morale.

- Technology development

Within the cases it seems as the information collected by the M2M systems is not used extensively for product development. However, one interesting exception has been noticed in Thermia. Thermia may with M2M log the heat pumps on different locations, providing the company with information on how the heat pumps react in different settings. This kind of information would have been very difficult to obtain without M2M.

In addition to this, several different kinds of service packages may now be offered, some of which may guarantee uptime. This is present in the cases of Alfa Laval and Otis, where uptime is guaranteed in the most exclusive service contracts.

- Procurement

The procurement activity has not been affected by the M2M implementation in any of the cases. As it seems, there are no new demands that cannot be solved with already existing structures.

Overview of the findings

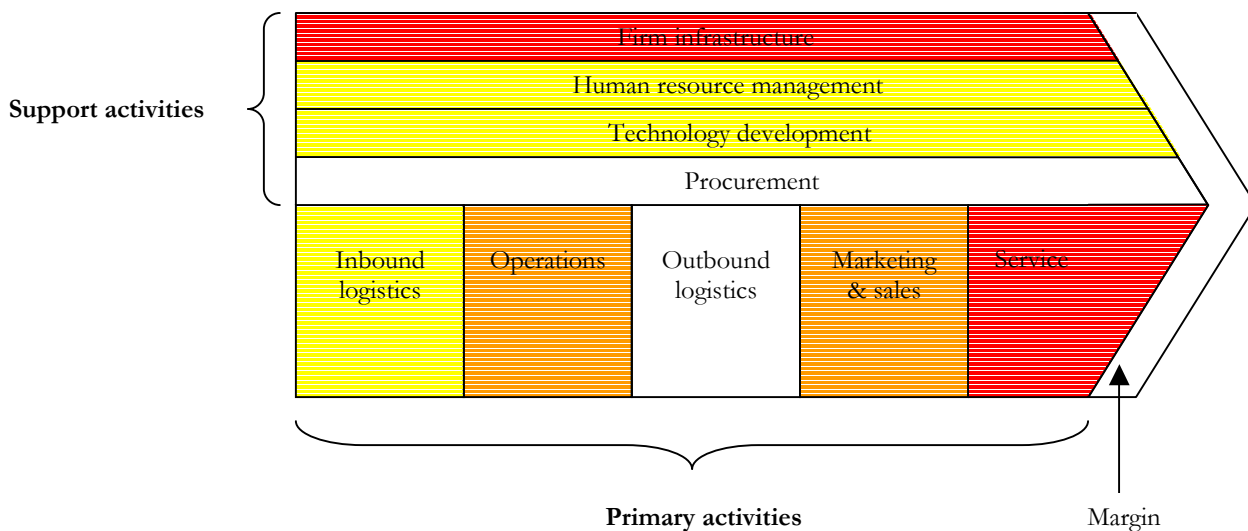
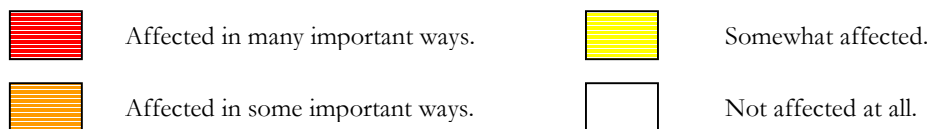


Figure 5.1 The organisational implications of M2M usage.



5.2 Three levels of product-model analysis

Introduction

According to Kotler, a product can be said to have three levels, regardless of whether it is a tangible or an intangible product. As companies in various ways attempt to enhance the product, they consider the trade-off between the company's cost of enhancing and the additional price customers are willing to pay. All of the cases believe they will make money on M2M. But to what extent are the products enhanced?

Being a model that leaves the far-reaching implications undiscussed, the authors believe it is even more important to keep the following discussion concise and relevant.

Core product

The term core product refers to the core benefit a customer perceives from using a product. For instance, in the case of Otis' lifts, it is smooth, vertical transportation and in the case of PM-Luft's ventilation units, it is fresh air. Thus, it is difficult to imagine in what ways M2M could enhance the core product. The lifts do not go smoother or more vertical thanks to M2M, nor do the ventilation units provide cleaner air.

Or do they? One might argue that they do if one considers that the number of breakdowns, or at least the duration of breakdowns, decreases with M2M, thus indicating that the perception of the core product might be enhanced. This is however not what Kotler argues being a core product and such effects are covered later in this model.

The same reasoning goes for the remaining cases and consequently the core product level appears to remaining unaffected by M2M.

Actual product

Surrounding the core product is the actual product which according to Kotler is the composite of features and capabilities offered. Its five characteristics will be analysed next.

- Features

This characteristic can enhance the product in that it gets more advanced, i.e. more capable. And so the question is whether M2M can be considered an additional feature or not. Even though it is often embedded in service agreements, one can imagine that customers perceive the technology as a value-adding feature. In the cases of PM-Luft and Thermia, the M2M system is not necessarily a part of service agreements, thus may be perceived as a feature in a more traditional sense.

Furthermore, within these companies, customers can change their settings remotely and they can, perhaps more interestingly, choose to be alerted when having a failure. The latter goes for Tetra Pak and Alfa Laval as well – the fact that the feature is offered in an agreement should not in any way make it less valuable. Moreover, the M2M systems may also be a platform for developing more product features. Such plans are present in Thermia, where statistics on product use is to be

offered as an extra feature. As for Thermia, it recognised a profitable sidetrack when realising customers wanted such features. Prior to M2M, development within Thermia's field of operation was instead focused on improving product efficiency.

To summarise, one might argue that M2M is a valuable feature to the product.

- Quality

Quality is obviously central to the actual product but it will not be discussed in this model but in section 5.3. The reason is that Kotler's line of argument is based on Garvin's work, thus it would be too much of a repetition to also discuss it here.

- Packaging

Packaging refers to the activity of designing and producing the container for a product. One can assume that packaging does not have the same potential in industrial markets as it does in consumer markets where purchases is more likely to be made on impulse. One can also assume that packaging is not an important part of the investigated companies' product offerings since the products are industrial. In any case it seems unlikely that the marginal effect M2M might have on packaging could be of any value to the customer.

- Brand

As mentioned, consumers view the brand as an essential part of a product and consequently a developed brand adds value to a company's product line. This area is of particular interest, as all companies (except Xerox) claim improved brand reputation to be a main reason for adopting M2M technology, and indeed, they believe that the effect has been such. Thus, according to the cases, brand reputation has been improved by the M2M adoption and usage.

- Styling

The term styling has in Kotler's meaning no connection to performance but is solely associated to the appearance of the product. None of the cases claim the styling of the products has changed due to M2M, apart from the user interface, which in some cases looks different. As long as the interface actually belongs to the physical product and is not only accessed through the Internet, one can however argue that the product's styling has been affected, if only marginally. If affected it seems reasonable to presume that it is of value to the customer. However, the authors have found no strong arguments in favour of an enhanced product owing to better styling.

Augmented product

The third level in the product model offers additional benefits to the customer. It is said to be the level where companies nowadays are most likely to manage to differentiate their products. Kotler argues that there are four main areas where companies can augment their products.

- Installation

The installation of the product seems unaffected by an M2M implementation. Since it does not appear to facilitate the installation of a product, one might ask whether M2M makes the installation more complicated in any sense. Probably it depends on what kind of installation one

examines. When installing a product with M2M already as a feature, little or no additional work will probably be needed and the installation will consequently go unaffected.

Another kind of installation is when a customer wants to adopt M2M in an already owned product. If compatible, the installation can either be relatively simple, like in the case of Otis or Thermia, or rather complicated like in Alfa Laval's case. The former apply more of a "plug and play" system, whereas the latter has to perform a time consuming audit of the machinery before installation.

- Warranty

In Alfa Laval, M2M has implied new customer warranty options. Within its most exclusive service agreement, the company warrants the customer from production losses caused by Alfa Laval's machines malfunctioning. It is not obvious whether this feature belongs to warranty or is a part of after-sale service. However, there should be no doubt about it being an enhancement within the augmented part of the product.

This area of augmentation has not been observed in any other company.

- After-sale service

Many products demand service to some extent in order to function well for a maximum length of time. Assumed to be important to manufacturers since the after sale service ties customers, one can argue that this part of the augmented product is central to the supplier. But what effect, if any, does M2M has on service?

To begin with, Otis, Alfa Laval and Tetra Pak have in some way all been able to guarantee or increase the customers' uptime through new service agreements facilitated by M2M. For instance, in Otis' case customers are not affected as much by downtime as are Alfa Laval's customers, since a lift breakdown is far less costly than a separator breakdown. A breakdown in Otis' lifts might force people to take the stairs whereas a breakdown in a product that is central to a production plant may stop the entire production. Thus, in industrial production, as in the cases of Alfa Laval and Tetra Pak, such contracts seem extremely valuable to customers since breakdowns can be very costly. Thus one can argue that M2M enhances the augmented product more in these settings.

Thermia does not provide any service apart from warranty related repairs but yet one can argue that the service of its products is enhanced due to M2M. As stated in the empirical observations, Thermia does not sell its products to end-customers. Instead, it is the retailers who offer both products and services to the customers. One can argue that even though Thermia itself does not offer service, M2M enhances the augmented product with respect to service. As Thermia's products include improved service facilitated by M2M, the product will consequently be enhanced regardless of who is the service provider. Hence, the level of service is likely to be enhanced by M2M.

- Delivery and credit

No affects have been observed in this regard.

5.3 Eight dimensions of quality analysis

Introduction

Being an important product characteristic, the question of whether product quality is enhanced or reduced with an M2M system implementation is to be dealt with in this section. Quality is a central part within the actual product in the three levels of product-model, and it may advantageously be viewed in that context. The eight dimensions of quality framework presented in the perspectives on M2M (3.4) will be used for this analysis.

Eight dimensions of quality

- Performance

Undoubtedly, the performance of a product is key when considering quality. According to Garvin, performance is about the operating characteristics of the product, and using this definition M2M has not improved product performance in any of the cases. PM-Luft's air treatment units cannot clean more air per unit of time with the M2M application, and Otis' lifts cannot run faster or lift higher with an M2M system installed.

- Features

Does M2M entail more features to the product? Yes, in two ways. Firstly, it may be considered a feature itself, most commonly as part of service agreements. PM-Luft and Thermia are notable exceptions as M2M is sold to the customer as a part of the product. Secondly, M2M may lead to additional product features. Thermia has such plans, where information on how the product is used is to be offered as an extra feature.

- Reliability

One of the quality dimensions that has been mostly affected by the M2M systems is the reliability of products. Garvin argues that this dimension is particularly important in settings where downtime costs are high. This is the common case of Alfa Laval's and Tetra Pak's customers and indeed, the reliability of their products have increased substantially. For example, Alfa Laval may now guarantee reliability as it covers the customers' costs in the event of its products causing a breakdown. Tetra Pak, in turn, has only experienced one unscheduled breakdown on its Cosmos systems, which is an important reliability improvement.

In Thermia too the M2M usage has affected reliability – the information generated by the system has facilitated functional improvements that has increased reliability. For example, several potential mistakes due to incorrect customer handling have been eliminated, resulting in fewer malfunctions. Also in Otis, the M2M usage has led to a reliability increase, facilitating the company to guarantee uptime.

In Xerox, however, the M2M system did not affect reliability, since its technological shortcomings hindered one of the aims of the system; to pro-actively alert as something was to break down.

- Conformance

Conformance quality refers both to defect rate and consistency with the specified level of performance. In terms of the latter, M2M usage does not seem to have a major effect on product quality. Indeed, an M2M implementation should bring along adjustments to the specified level of performance. Thus, as conformance is to be measured by new standards, this part of conformance quality does not seem to be affected by M2M usage.

In Xerox's case perhaps the lack of consistency with specified level of performance was the most fatal shortcoming qualitywise. Customers expected a well-functioning system, that was consistent with the performance specifications. Instead, they got a system that did not function. After all, the customers did pay for the system through subscription fees.

However, M2M systems do seem to affect the defect rate. For example, due to the M2M usage, PM-Luft has been able to detect and correct both batch faults and handling faults. Another example is Tetra Pak which may detect faults immediately after the product is installed.

- Durability

The products' durability do not seem to be largely affected by M2M usage. Only one investigated company, Alfa Laval, claims that the durability (i.e. economical lifetime) of its products may be extended with M2M. Since one fault not seldom cause a chain reaction of faults, the pro-activeness facilitated by the M2M usage has prolonged the durability of Alfa Laval's machines.

Garvin argues that there is often a relationship between durability and reliability. According to this study, however, reliability is heavily increased while durability only is marginally affected. This may be due to the fact that no investigated company have had its M2M system installed over a whole product life cycle, thus can only estimate the implications M2M has on durability.

- Serviceability

Next to reliability, this dimension of quality is affected the most by M2M usage. Again, it is the pro-activeness facilitated by the system that has enhancing effects on product quality.

For example, Otis' and Thermia's products alert before the customer is experiencing a problem, thus showing high responsiveness. This may seem to fall short of how serviceability is described in section 3.4, as the customer is not aware of anything malfunctioning. However, faults are rarely immediately detected by the customer – as in the case of PM-Luft. Indeed, the company states it could take hours before the customer experiences a problem. With M2M, a failure may be spotted instantly as it occurs, before the customer is aware of the problem. As many problems may be solved remotely, time to repair may be radically reduced by M2M usage.

Serviceability may also be increased within the aspects of competence and ease of repair. As the service personnel of for example Otis know what kind of a problem is at hand when arriving at the customer, where to go (e.g. the seventh floor) and have brought the appropriate tools, they should make a competent impression. Obviously, this information also facilitates shorter and more efficient service visits.

In the case of Xerox, the serviceability did not increase with the M2M usage. Because of the system's technological shortcomings it seldom noticed malfunctions before the customer did, thus only limitedly increased the responsiveness of service.

- Aesthetics

Neither of the cases has experienced any effects on aesthetical characteristics due to M2M.

- Perceived quality

Being a rather subjective dimension of quality, it is difficult to analyse perceived quality without having interviewed customers. What can be stated, however, is whether the companies consider the M2M usage important to their reputation. All studied companies claim that their use of M2M systems are important to their reputation. Some emphasise the importance of being positioned as an innovative company and others of being at the front edge of development. Interesting is that all cases, except Xerox, believe that M2M enhances the products' perceived quality.

5.4 Network theory analysis

Introduction

It seems likely to assume that the strength of some bonds has changed due to M2M. To what extent is however difficult to say without an in-depth examination of each bond. To begin with, some elements of a bond can be strengthened while others are weakened and the affect all in all might be difficult to establish. It should however be possible to map these effects enough to discuss them in a constructive way. The examination of the six lower level bonds will be followed by the examination of the two higher-level bonds.

Lower level bonds

- Social bonds

The inter-organisational contact is very much based on social interaction. M2M appears to have brought along new ways for manufacturers to interact with their customers. To a large extent, human interaction has decreased since much of the communication is conducted by machines. Thus the social elements in the relations seem to be lessened with M2M.

According to Hammarkvist, a lower degree of social interaction is considered to weaken the strength of the social bond. All the cases have experienced a decrease in the frequency of social interaction, and yet all of them claim that it has not weakened their ties to the customer. Why do they claim this?

Alfa Laval claims that the decrease in service interaction is compensated by a predetermined rate of meetings specified in the service agreement. Tetra Pak also claims this and adds that the service personnel often had to deal with upset customers, implying the service interactions were not always a positive social interaction anyway. Furthermore, Alfa Laval notices a shift from “fire-fighting to pro-activeness”, which should enable a more professional appearance.

Moreover, Tetra Pak claims that the scheduled interactions have become more focused on the needs of the customers in terms of process development, thanks to M2M. Before, these meetings were mostly focused on service fees and spare part prices, leaving little room for constructive consultancy and relationship development. In addition, due to the routine Tetra Pak has for Cosmos, the company now enjoys more interaction with the customers’ operators than do the operators’ own maintenance managers, if only via telephone.

Both PM-Luft and Thermia claim that fewer and shorter service visits are not affecting customer relations in a bad way, since service personnel are not considered to build relations. Otis states the same, adding that they it meets the actual customer when repairing lifts anyway. Thus indicating that fewer and shorter visits do not affect social bonds.

According to PM-Luft, the perceived service quality is enhanced due to M2M because service personnel do not have to visit customers experiencing a minor fault. Since most minor faults can be solved remotely, irritating expenditures to the customer can be avoided. Consequently one can argue that the perceived quality of the interaction is increased, enabling a more positive interaction, thus affecting social bonds positively.

Xerox has experienced quite the opposite. As the company implemented M2M, it offered it as an additional subscription. The system was however not fully accurate as it often did not recognise failures. Consequently customers became irritated, and the company terminated the M2M implementation, leaving its credibility harmed. As the company now has attempted another try with the system, it has found that customers are still sceptic towards Xerox's competence in the M2M field.

Looking at the social bond, one can see both strengthening forces as well as weakening forces. Virtually all the cases state that they believe M2M will enhance the interaction since it will provide better opportunities to actually get to know the customer. As shown, M2M in many cases lessens the number of social interactions. It does however seem likely that, all in all, the social bond will be strengthened. Why? Because ultimately social interaction benefits companies in that they provide mutual information about the actors' needs and behaviour. The opportunity for this activity seems undeniably enhanced with M2M.

- Technological bonds

As firms adapt to each other's technologies one can according to Hammarkvist state that technological bonds are at hand. Naturally companies try to strengthen this bond through various actions, for instance allowing only authorised spare-parts and authorised personnel to be involved servicing the products.

One example of a strong technological bond is found in Otis' case. As it first introduced its M2M system (REM), the equipment was locked to Otis as a service provider and customers could not choose to switch service provider without changing equipment. This was however considered too much of a technological bond by the customers and consequently Otis had to withdraw the arrangement. Today, Otis' M2M solution implies nothing but a marginal increase in the strength of the technological bond. This marginal increase is due to the minor work assumed when reprogramming the equipment to contact another service provider.

Alfa Laval and Tetra Pak both offer Cosmos to their customers, or more correctly, they offer service agreements that have Cosmos as a prerequisite. Thus, Cosmos does not imply a technological bond since the customer does not buy Cosmos itself but an agreement. Surely the customers adapt to the technology, but more in terms of knowledge as is discussed below. In PM-Luft and Thermia, technological bonds also appear to remain unaffected by M2M.

To summarise, M2M does not seem to have much of an impact on technological bonds. When examining the cases one can conclude it is not the technology itself that customers adapt to. In none of the cases customers buy an actual technological device. Rather, they adapt to other dimensions not covered within this bond. Hence, customers do not seem to be tied by technological bonds to a larger extent than before M2M.

- Knowledge bonds

As two parties work together, they get to know the strengths and weaknesses of one another, and consequently develop what is known as a knowledge bond, Hammarkvist states. One can imagine several interpretations fitting this definition. This can either be understood as one gets to know the preferences of the customers as a group, or the preferences of a specific customer. It is however also important to consider the customers' knowledge about the supplier as a part of the knowledge bond. Obviously, uncertainty is reduced as customers know what to expect from a manufacturer, thus increasing the strength of the relation.

Examining the first interpretation one can use Thermia as an example. The first M2M system implemented by the company, Supervision, failed due to poor understanding of customer preferences. To begin with, the handling routines were far too complicated, leaving the average user with no choice but to call Thermia's support. In addition, much of the features in Supervision only complicated usage, causing the customers to unwittingly change settings. Over time, the costs for support grew large and Thermia realised it had to launch a new system. Apart from being based on a further developed technology, user friendliness was enhanced. Menus were made simpler and the customer's access level was altered.

As customers now understand features and handling routines, Thermia can be said to have developed a knowledge bond to the customer. In addition, the opportunity for the customer to log in on a personal account and change settings obviously has increased the number of customers visiting the homepage, allowing the customer to find out more about Thermia's products. This can also be seen as a strengthening of the knowledge bond.

M2M also has the potential to increase the companies' knowledge about specific customers. PM-Luft, for instance, saves the extracted information about customers for five years. Taking Cosmos as an example, information about the customer's specific machines and proactiveness in handling routines are what enables condition based maintenance. As the usage of the machine is customer specific, Alfa Laval will learn each customer's behaviour patterns through evaluation of data extracted from Cosmos, and can optimise its own routines accordingly. It is not hard to see how this knowledge can be of great value to the relation. Thus, one can argue that Cosmos implies the knowledge bond to be strengthened.

In the case of PM-Luft, the company will become aware of a breakdown before the customer does. Thus, PM-Luft has the information faster than does the customer, but is this really a knowledge bond? Well, according to Hammarkvist's way of defining it as knowledge about each other's strengths and weaknesses, one might argue it is. Obviously PM-Luft has spotted a weakness of the customer - i.e. the customer does not notice a failure immediately – and has responded to this weakness.

The knowledge bond does not seem to be weakened in any way due to M2M. Rather, the analysis indicates that the strengthening forces on the bond are many, implying the bond will most likely be strengthened.

- Planning bonds

Networking companies have a strong need to coordinate their activities. The ability to plan activities can thus be seen as the essence of the planning bond. How does M2M affect the ability to plan and coordinate actions?

The enhanced possibility to plan has been articulated in several of the cases. Tetra Pak states that M2M facilitates a better resource allocation, since it now knows the time and workload for almost all service appointments well in advance. This is however not the essence of the planning bond. Rather, the main advantage is the possibility to plan with regard to the customers' routines, i.e. to coordinate actions. Alfa Laval states that this has proven to be most valuable to companies where unplanned breakdowns are costly.

It is hard to see in what ways the planning bond would become weaker due to M2M. Instead, the strengthening forces seem to increase, indicating this bond will be strengthened due to M2M.

- Legal bonds

Legal bonds are legally binding agreements that keep parties together, thus locking out competitors. In the context of this thesis, service contracts are relevant. There are several ways in which one can assume this bond can be strengthened. For instance, does M2M enable new contracts, longer contracts or are the contracts easier to prolong?

In the case of Alfa Laval, the M2M implementation has facilitated agreements impossible to offer before. In its fourth service agreement (M2M), Alfa Laval guarantees that the machinery will work and that the company will be liable to all costs in case of a breakdown. It is not hard to see how such agreements affect customer behaviour. A more reliable production is of great importance to some companies, and one can argue that it would affect their organisation, e.g. production, in a way that would make it difficult to return to operations with no guarantees.

Does this imply a technological bond instead? On the one hand, it does meet Hammarkvist's definition since the customer adapts to Alfa Laval's technology. On the other hand, one might argue that Cosmos itself is not what is central to the customer. Rather, it is the (Cosmos-enabled) guarantee that is considered valuable. The latter seems like a strong point and indicates that the guarantee is to be seen as the more binding aspect, i.e. the customer is more interested in the guarantee than in the Cosmos system. If the guarantee disappeared Cosmos can be assumed to be of much less value for some customers. However, they would probably not care as much if Cosmos disappeared as long as they still had the guarantee.

Despite a large market share, Tetra Pak had never had a service contract on separators prior to the M2M implementation. Now, the system enables Tetra Pak to tie customers to the company and doing so with little uncertainty of the costs the contracts will incur. One can assume that the uncertainty of costs involved in maintaining the fixed price contracts is reduced as it is now possible to check the status of the machines on a regular basis, preventing unforeseen service costs. Thus, M2M undoubtedly strengthens Tetra Pak's legal bonds.

As Otis implemented M2M it launched a new service contract – Remote Elevator Monitoring. The contract has however received little attention from the customers, mostly due to macro economical factors. Nevertheless, the company has strengthened its legal bonds to some of the customers thanks to REM.

In the case of PM-Luft, no new contracts have been developed after the M2M implementation. The company however, does believe M2M will improve the relation with the customers, which in turn is believed to increase the share of customers with service contracts. M2M has made it possible for PM-Luft to sell longer contracts, which it considers to be a good way of keeping track of customers.

Alfa Laval has been able to increase the average length of its service contracts thanks to M2M and sees the adoption as a way to brick wall its customers from competitors. A potential side effect, the company recognises, is that it will become easier to prolong the contracts – enabling longer and more expensive contracts. Tetra Pak recognises the possibility of longer contracts but states that they will not exceed three years, due to the uncertainty this is considered to bring along.

Tetra Pak's Cosmos offers a possibility for the customer to take out an insurance for breakdowns. Even though Tetra Pak is not the issuer of the insurance, one can surely argue that the insurance strengthens the legal bond. The logic is as follows: if the customer wants to be

absolutely certain that no unforeseen costs whatsoever will incur, the customer can buy an insurance. But in order to do so it must be equipped with a Cosmos product. Hence, the customer is tied to Tetra Pak because it, through Cosmos, is allowed to take out insurance. Thus, a legal bond can be argued to exist.

What is stated above surely gives the impression of a strengthened bond.

- Economic bonds

When customers find themselves with no economically viable choice but to continue to buy from a specific supplier, an economic bond is at hand. One can assume that if a customer makes a heavy investment, e.g. the purchase of a separator, the cost of buying an M2M device is relatively marginal. This would imply that the additional cost of switching supplier after adopting M2M is little and that the direct economical effects therefore are small. This statement however, disregards the fact that none of the cases' customers buy an actual M2M device. Rather, the device is a tool for the supplier, that enables the offering of service agreements. These service agreements tie the customer to the supplier and consequently one can argue that the effects M2M has on the economic bond to a large extent are overtaken by effects on the legal bond. Therefore, the authors believe, the effect that M2M has on this bond is very limited.

Of course, one could argue that when a customer adapts to a supplier, the customer obviously develops a knowledge of routines and the counterpart's behaviour which would raise switching costs for the customer, giving it no viable choice but to stay in the relation. But again, these effects are not primarily the ones taken into account in this bond but rather in the knowledge bond. Hence, the authors argue, the economic bond remains largely unaffected by M2M.

Higher level bonds

- Trust & Commitment

Said to be two independent variables, which make their own contributions to the strength of a relationship, are the higher level bonds trust and commitment. Should the degree of trust be low there is little potential for the relation to develop. According to Hammarkvist, trust can even be seen as a precondition for increased commitment to the relation, and obviously, commitment is lowered when trust is harmed. Mutual commitment leads to what is known as lower level bonds. Thus it is established that trust leads to commitment, which in turn leads to the six lower level bonds.

In what ways can these concepts be affected due to M2M usage? Before PM-Luft implemented M2M, its customers often had to pay for failures that to a large extent was simple and fast to repair. Often, customers had accidentally changed settings causing the product to malfunction and as the service personnel repaired it in a few minutes, customers were sometimes upset about the service fees. After the M2M implementation, PM-Luft can to a great degree solve the problems remotely, which means that whenever the service personnel actually visit the customer, a serious problem is at hand. Taken together, one can presume that the customers' trust in PM-Luft increases with M2M usage.

Alfa Laval states that it strongly believes the proactiveness in service increases the confidence in the company as a service provider. Obviously, the lowered rate of malfunction allows Alfa Laval to take on more responsibility and live up to it. One can easily argue that this increases the

customers' trust in the company. Once trust is gained, customers decide to try Cosmos. Since the usage of Cosmos requires active participation from both parties, one can assume that the M2M system brings along what Håkansson calls mutual commitment, i.e. the very foundation of bond strengthening.

Since Xerox first implemented M2M unsuccessfully, customers are sceptic when the company is now trying to launch the new M2M system. One can therefore presume that customers' trust in Xerox decreased due to the first M2M venture. Thus, an unsuccessful try on M2M might be damaging to a company's relations.

It does not seem unlikely that M2M in general affects customers' trust positively. In one sense, M2M reduces uncertainty for the customer. The customer knows that the manufacturer immediately can detect the fault at hand and in many cases even is likely to resolve the problem remotely. Hence, the customer can be assumed to have more trust in its counterparty.

The impact on commitment is quite obvious; according to Hammarkvist it is the direct consequence of "parties' intentions to act". Since M2M implies an ongoing relation, one can argue that the intentions to interact will be strengthened. Therefore, the degree of commitment may be believed to increase.

5.5 Transaction cost analysis

Introduction

In this section, transaction costs will be analysed. The primary purpose is to highlight which shift in transaction costs an M2M implementation may bring along. As a transaction may be defined as “when a good or service is transferred across a technologically separable interface”¹⁶⁰, this may be of greatest interest from a customer relations perspective.

Minimal transaction costs is the objective for any company. Thus, if M2M may lower the transaction costs in a firm-customer relationship it should be a potentially interesting investment.

This analysis will be structured according to the three non-human characteristics affecting transaction costs; uncertainty, frequency of transactions and asset specificity.

Transaction cost analysis

- Uncertainty

Transaction costs arise from uncertainty through the needs of planning, adjustments, monitoring and search for information. Consequently, transaction costs increase with uncertainty.

M2M may both increase and decrease the costs of information search. An example of the former is present at Alfa Laval. When entering service agreements, Alfa Laval has to carry out thorough investigations to uncover the condition of the customer’s machines. If these investigations are not conducted, the insecurity is too great and potentially expensive, since the machines may have been operating for years prior to requesting a service agreement.

Thus, to reduce opportunistic behaviour from the customer’s side, Alfa Laval has to undertake information search implying such transaction costs. This, however, was not to be found in the other the cases.

Information search costs may also be reduced with an M2M system. In all the cases (except Xerox), product status information is possible to obtain remotely, thus reducing the costs for obtaining such information.

With one exception, the M2M system does not imply lower costs of negotiation. For Tetra Pak it does, due to the fact that its M2M system has allowed the company to charge fixed prices for its more exclusive service agreements. Prior to M2M Tetra Pak was unable to offer fixed price on service and the meetings held with the customers often circled around pricing on spare parts and service. Nowadays, such discussions are unnecessary since the customers pay a fixed price disregarding the amount of service or parts. Instead, these issues are discussed every three years or so, when new contracts are made.

Communicational transaction costs have also decreased in many of the cases. PM-Luft, for example, claims that only some 10% of the calls to its service centre, before it launched its M2M

¹⁶⁰ Williamson, O E (1975) *Markets and Hierarchies, Analysis and Antitrust implications: A study in the economics of internal organization*

system, were due to actual malfunctioning problems. With the system, the customer itself is able to handle many of these difficulties and consequently does not have to communicate with PM-Luft as frequently as before. In Xerox's case, on the other hand, as its M2M system did not work properly, communication costs did not actually decrease. Even though the purpose was the opposite, the customer had to alert Xerox when experiencing a problem. Again, this was due to the malfunctioning M2M system.

In some cases the coordination costs have also been possible to reduce. For example, both Alfa Laval's and Tetra Pak's customers use production processes that are highly expensive to interrupt. With M2M, however, the generated status information allows for coordinated service meetings. The information gathered enables synchronising the service visits to occasions when the customer has to perform some kind of maintenance of their own, e.g. cleaning of the machine.

Another feature in Alfa Laval's M2M-based service agreements is the uptime guarantee. The company has to pay for costs incurred and the revenues lost due to downtime emanating from product failure. This way, it is in the interest of both Alfa Laval and its customers to maintain uptime. By generating goal congruence between the company and its customer, uncertainty is reduced.

Also opportunity transaction costs due to maladaptation may be reduced with the usage of M2M, as shown in the case of Tetra Pak. When installed, the company gets direct feedback if the machine does not function properly in the specific setting.

Also, in the cases of Thermia and Tetra Pak, it is possible for the customer to monitor the status of their own machines, and uncertainty may be reduced accordingly. This, since not only the service supplier but also the customer is aware of when service is needed, which may be considered a safeguard towards opportunistic behaviour (e.g. perform unnecessary service). In addition to this, the opportunity transaction costs of measuring a partner's performance may be reduced according to a similar reasoning; as the customer is better updated with the status of its machines, it may be easier to measure the service supplier's performance.

The same line of argument may also be applied on the cases, as these too are able to monitor their customers, so that they do not use the equipment negligently. Thus, monitoring transaction costs may be reduced via some of the more sophisticated M2M systems.

Another uncertainty-reducing safeguard is the insurance arrangement that the M2M usage facilitates in the case of Tetra Pak. As the company to some extent may insure against breakdowns, uncertainty is reduced.

- Frequency of transactions

As identical transactions are being carried out familiarity occurs, which is transaction cost-reducing. Thus, the larger the number of identical transactions, the lesser are the transaction costs.

Those M2M systems with possibility of being continuously connected to the monitored machines (as in the case of Alfa Laval, Tetra Pak, Thermia and Otis) may be viewed as constantly occurring identical transactions. Hence, this level of frequency of transactions leads to minimal transaction costs. It is however difficult to see what activities these transactions compensate for. Possibly, as many service alerts may be reduced, due to this continuous monitoring, alternative transaction

costs are reduced. Of course, the constantly occurring identical transaction costs are only valid for the specific activities mentioned above.

In the case of service visits, on the other hand, the frequency of transactions are not as affected by an M2M implementation. Also looking at other activities, one might argue that transactions become more identical. For example, those of Otis' customers using the M2M system do not have to alert the service organisation themselves. The M2M system does this for them in a routinely (i.e. more similar) manner, and the right service person is automatically contacted. Without a service agreement including an M2M system, the customer itself has to alert Otis. Probably, it would not contact the correct person immediately - let alone explain the fault at hand in a descriptive and informative way - thus leaving great room for circumstantialities.

- Asset specificity

The customer does not actually buy the M2M system per se. However, it buys it indirectly through more expensive service agreements, which is why the authors treat the system as something the customer buys.

Asset specificity refers to the situation where an asset is less valuable in a setting different from the proposed. It is considered the most important non-human source of transaction costs, and there are six different types; location specificity, human specificity, physical specificity, dedicated specificity, brand specificity and occasional specificity. Next, it will be analysed how these costs have changed with the M2M system implementations.

Most of the M2M systems presented need a computer or some kind of a computerized device to function. For example, the Cosmos system needs to be connected to a computer at site. Naturally, this equipment needs electricity and has certain environmental demands. It is however difficult to claim that further locational limitations have arisen due to these factors, since the monitored products too have similar demands.

What however may increase the location specificity is the products communication devices. For example, those companies using modem need a telephone line and those companies using GSM technology need network coverage. Thus, the location specificity has been slightly increased in the cases.

The human specificity has not been largely affected due to the M2M implementations. Of course, some service personnel have been given training on handling the M2M equipment, but this knowledge is hardly critically unique as the technology is easy to handle.

As the implemented M2M systems have not affected what is actually produced, the physical specificity has neither increased nor decreased. For example, Otis' lifts do the same things they did before the system was implemented.

In terms of dedicated specificity, the M2M systems have brought about increases. Often, the systems are service provider-specific, thus increasing the customers' switching costs. In the case of Cosmos, for instance, lock-in occurs as it is Alfa Laval and Tetra Pak that monitor the machines (in addition to the customer as has been described above). Indeed, historically Alfa Laval sold the system to the customers, but as a way of increasing the lock-in effect, it now only offers it as a part of service agreements.

As for Thermia, the dedicated specificity of the end-customer's systems is connected to its retailers (who provide the service). Within Otis' REM service agreements, through the M2M system, the customer's lift is linked to the company through a modem connection. Of course, this is a dedicated specificity. In the case of PM-Luft, however, as its M2M system is not connected to service agreements, there is no dedicated specificity.

Neither brand specificity nor occasional specificity was found to be increased with the M2M systems.

5.6 Perspective-oriented discussion

Introduction

In this section the authors again return to the three perspectives. The aim is to fuse together the analytical findings from the different theories and identify patterns within each perspective. This will also be the main foundation from which to draw conclusions and answer the thesis' purpose in the next chapter.

Organisational implications perspective

In terms of value chain activities, the pattern has been that the parts mostly affected by an M2M implementation are *firm infrastructure* and *service*. Within the former, planning and coordination have become easier to perform, and within the latter new possibilities such as remote repair and adjustments have had important efficiency enhancing effects.

Among the remaining activities only limited effects have been noticed. Worth mentioning is however *operations*, where improvements eliminating product's faults have been observed and *marketing and sales* where brand reputation is said to have been positively affected.

Focusing on the two most importantly affected activities, *firm infrastructure* and *service*, it is interesting to notice that the former is a support activity and the latter a primary activity. Thus, it appears as if M2M may be of either activity nature, depending on the context. It seems as M2M plays a more important role within the primary activities in companies with large service organisations, and that the system is of supportive nature within the opposite firms. Patterns have also been observed within the service activity. Focusing on the companies' customers, M2M seems to have the greatest efficiency enhancement potential where customer handling faults are common and could be remedied remotely and in complex settings where the fault may not easily be located.

Having established the overall patterns regarding the organisational implications, at least one important finding remains to be pointed out explicitly – the potential of lowered costs. The analysis shows that the potential for savings is considerable. Firstly, the transaction cost analysis clearly indicated lowered level of uncertainty, implying lowered transaction costs in customer interaction. Secondly, the value chain provided some useful guidance on where efficiency enhancements may arise.

Customer relations perspective

The analysis revealed that M2M facilitates the investigated companies to tie customers to the company in several important ways. Primarily, the legal bonds have been strengthened, owing to the more partner-like contracts the M2M usage has facilitated. Also from knowledge and planning views, the customer bonds have been significantly strengthened. Opposite to what one may assume, the technological bond has not been largely affected by the implementation. Furthermore, the very foundations of bonds - trust and commitment between company and customer - are also found to increase with M2M usage.

Moreover, the transaction cost theory lets interesting patterns stand out. From a customer relations perspective, the transaction costs of interaction have been decreased in several ways. First and foremost, the costs of uncertainty have been reduced, primarily because the parties may easier monitor each other, but also because information search costs have been lowered. The frequency of transactions and the asset specificity have not been affected to the same extent.

Thus, the transaction costs of customer interaction have been lowered with the M2M usage and customer bonds have been strengthened.

Furthermore, Cosmos may provide some useful insights on the usage of M2M. The advantage arise from the fact that two companies have implemented exactly the same technology for almost identical products implying the same potential. Hence, the level of distortion arising from highly different fields of operation obviously decreases and the comparison is thus more reliable.

It can be argued that Alfa Laval has a greater need to tie customers than has Tetra Pak. The latter, being more of a system supplier, implies the company has already tied customers through extensive sales and maintenance. The former however, used to sell its products in a transactional marketing manner, i.e. sold the product and did not attempt to build any relations to the customer. At present, however, long term relationships are in focus. In line with this, Alfa Laval has created four service agreements targeting four main groups of customers. Two of the contracts include Cosmos, which allows Alfa Laval to brick-wall its customers at the same time as it ties some of the customers more effectively to the organisation through guaranteed uptime covering all costs incurred by failures.

Tetra Pak, presumed already having strong bonds to the customers, emphasises Cosmos' internal advantages such as increased efficiency and coordination, and does not offer a guarantee to the customer. Instead, Cosmos has facilitated a possibility for customers to take out an insurance against costs due to failure, which Tetra Pak obviously considers to be sufficient.

Hence, although the technological usage of M2M does not seem to differ between the companies, surely the augmented part of the products is different.

Customer offerings perspective

The analysis has shown some changes in the customer offerings based on the three levels of product model. The core product went unaffected as it seems, but the examination of the remaining two levels revealed significant changes. Within the actual product level, brand and quality were most affected while in the augmented level the largest effects were on the after-sale service. Although difficult to establish what level is mostly affected, one can argue the augmented level is – at least in companies engaged in service. It is on this level companies of today primarily differentiate their products, perhaps indicating that differentiation is less difficult at this level of the product.

Considering the product's quality, similar patterns appear. This too may be enhanced with M2M, which is particularly obvious along the dimensions of reliability and serviceability. Furthermore, Garvin argues that the former dimension is of particular importance for companies that have high costs for downtime, which indeed is the case in some of the investigated companies.

To summarise, the most distinguishing pattern is that the product may be enhanced with M2M usage, especially along the dimensions of service and reliability.

6 Emerging insights

In this chapter conclusions are drawn from the patterns identified in the analysis. The reader will be presented the analytical findings concerning both the thesis' purpose and other observed patterns or, in other words, the insights that have emerged during the analytical process. The consequences of these insights will also be discussed as will the thesis' theoretical contribution. At the end the reader will be presented suggestions for future research in the form of hypotheses.

Introduction

Is M2M a new revolutionary technological solution that will forever change the business environment, the way firms interact and the way they differentiate their products? Probably not. However, the last years we have seen a growing interest in the concept and it seems reasonable to assume that even more firms will adopt it in the future. As we will argue in “general discussion”, M2M will probably become a more important tool in the future as companies are forced to create value within new areas of the value chain.

“In the early days, when a product's functionality does not yet meet the needs of key customers, companies compete on the basis of product performance. Later, as the underlying technology improves and mainstream customers' needs are met, companies are forced to compete on the basis of convenience, customization, price, and flexibility.”¹⁶¹

Throughout this thesis a constant discussion among us has been how to define M2M. As highlighted in the introductory chapter, the confusion among theorists, consultants and practitioners is vast. Realising the difficulties this confusion implies on studying the phenomenon, we initially hoped to be able to add to the debate by introducing a new definition. However, this was found to be too complex a job and thus we conclude this discussion by merely recognising this problem. Probably, as time pass and heavier demands are put on the vocabulary, a useful definition will emerge.

This chapter's main objective is to discuss the consequences of the analytical findings, and we believe that these effects are likely to influence other companies also adopting M2M systems. Indeed, within our delimitations we believe that we have painted a fair picture of how M2M is currently being used. Although this was not our purpose, we perceive this descriptive part of the thesis a valuable side-effect. For instance, even though the failed M2M implementation is not dealt with to any greater extent in this chapter, we perceive it as contributing to a more comprehensive picture of the explored phenomenon.

The first section deals with the purpose of the thesis. The aim is to present its parts in a straightforward manner, ground with findings from the analysis and discuss its consequences. In the following “general discussion” we reflect around findings not explicitly covered within the purpose. We end this chapter by summarising some interesting findings in the form of hypotheses, and consequently give suggestions for future research.

¹⁶¹ Christensen, C M (2001), “Skate to where the money will be”, *Harvard Business Review*

6.1 How does M2M affect the three perspectives?

Organisational implications perspective

The implications an M2M adoption has on the organisation's value chain seems to be relatively well isolated. The observed pattern is that certain value activities are more directly affected than others. The greatest potential for efficiency enhancement seems to exist within the *service* function, although this depended on its connections, or, if one wants, linkages, to the *firm infrastructure*.

We have observed that an M2M implementation has greater potential of efficiency enhancements in some companies than in others. To begin with, it seems to us that firms with a large service activity can benefit more in this aspect. However, ultimately this depends on the customer's situation. We have also seen that M2M has the greatest efficiency enhancement potential when there is a high rate of customer handling faults that could be remotely remedied and when these faults may not easily be identified.

Furthermore, we have observed that M2M facilitates lower transaction costs in the customer interaction. This in combination with the considerable efficiency enhancements possible, indicates that M2M has the potential to radically lower internal costs.

Customer relations perspective

The analysis showed that the transaction costs of customer interaction may be lowered with M2M usage and customer bonds may be strengthened. What does this imply then? Presumably, the stronger ties and increased interaction have implications interesting from a relational perspective.

According to the transaction cost theory, the firm has a choice between using the market and using the hierarchy as a basis for transactions, and should consequently choose whichever implies the lower costs. This being so, the decrease in transaction costs in the interaction between the studied companies and their customers should imply a shift from market to hierarchy.

Taking this reasoning even further, one might argue that organisational boundaries become less obvious as customers to a larger extent buy the specific services solely from the specific companies. Indeed, some kind of vertical integration seems to be at hand – at least have the vertical relationships become stronger. In terms of network theory, one may say that the network structure has become more distinct.

Trust and commitment between company and customer are found to increase with M2M usage. An interesting point may be that the increased interaction and trust also facilitate opportunistic behaviour, at least according to the transaction cost theory. Implied in the literature is that trust is a good thing and the potential of opportunistic behaviour is bad. Assuming no part is more correct, this contradiction should perhaps be viewed as two equally relevant notions: Yes, the increased cooperation seems to make things more efficient, but there is also a risk of being opportunistically exploited.

Hence, we have found M2M to be a powerful tool to tie customers to the company, owing to stronger bonds and lowered transaction costs incurred by the customer interaction. However, as indicated by the two large companies using the same M2M system, the degree of bonding may be subject to preferences.

Customer offerings perspective

It was argued in the analysis that the product is enhanced due to M2M. But in what way do enhanced products benefit the manufacturer? Basically, from this perspective, the most important issue is arguably whether it justifies a higher price. Or, more accurate, if the higher price exceeds the higher costs incurred and a profit can be made. It might be useful to once again highlight that it has not been our aim to perform a cost benefit analysis. Rather, the discussion is held on a strictly conceptual level.

Why do companies attempt to enhance their products? One can assume that they want to differentiate their products in order to achieve differentiation advantage. Such an advantage is said to be at hand when the manufacturer is able to obtain a price premium from the differentiation that exceeds the costs of providing it¹⁶².

Having stated this – does M2M actually induce the price premium needed? Given the analysis of the offering it is not difficult to argue this is the case. Indeed, we have seen an enhancement of the actual product. We have also observed a significant enhancement of the augmented product in the cases where after-sale service is central. As we learned in chapter three, service plays a crucial role in differentiating a company's offerings.

Leaving the product-focused framework behind, we believe an examination of findings from other parts of the analysis might be valuable as well. As we analysed bonds within the network theory we found they were strengthened due to M2M. According to the perspectives on M2M this implies customers become less price sensitive. Hence, a price premium can be assumed according to the findings in the network theory analysis as well.

Finally, the transaction cost theory findings also seems to provide some guidance on the matter. The analysis indicated the supplier-customer relations are altered towards a vertical integration owing to M2M. Vertical integration implies the price mechanism is put aside, facilitating premium prices to be charged.

In addition, we have observed that the product quality may be enhanced with M2M, in particular along the dimensions of reliability and serviceability. Hence, M2M usage seems to be most valuable to companies whose customers raise high demands on these dimensions.

All in all, we believe what is stated above speaks in favour of a price premium covering the costs incurred.

¹⁶² Grant, R M (1998) *Contemporary Strategy Analysis – Concepts, Techniques, Applications*

6.2 General discussion

Of course, the exploration of our purpose has been the lodestar of this thesis, both from a theoretical and empirical (and consequently analytical) perspective. However, we have also observed interesting patterns that may not readily be sorted into the answering of our purpose. Several of these findings do we perceive as sufficient to facilitate a constructive discussion on a few interesting issues. In this section we will present these findings, structured as questions with answers.

- Can M2M generate competitive advantage?

According to Porter, a competitive advantage is present when one is more profitable than the average industry performer. This may be achieved either through a higher level of operational effectiveness (doing the same things your competitors do but doing them better) or through strategic positioning (doing things differently from competitors).¹⁶³ Furthermore, Porter argues that strategic decisions are often confused with those increasing the operational effectiveness¹⁶⁴, and that achieving this type of competitive advantage is difficult with easily accessible systems. The ease, with which these may be imitated by competitors, often generates competitive convergence¹⁶⁵.

It seems unlikely that M2M would lead to a more sustainable competitive advantage through operational effectiveness. An M2M system may be readily procured and implemented by a consultant. In fact, considering only the value chain's support functions, it seems that the M2M system is not largely different from a regular information system. Indeed, as have been argued throughout the thesis, one of the M2M system's greatest merits is that it facilitates coordination and planning, thus being very much alike an information system. Consequently, as the M2M system may be adopted by any company, it will presumably lead to competitive convergence rather than competitive advantage.

Rather, it seems as competitive advantage is to be achieved through strategic positioning, i.e. by doing things differently from competitors. This implies that the M2M usage should also function on a primary level within the value chain. Furthermore, among the primary activities, we have found M2M to have the greatest impact on service. Thus, one might argue that the larger the role service plays for company performance, the greater the possibility to achieve competitive advantage. Indeed, we have seen that M2M facilitates new kinds of services that are valuable to the customer, resulting in differentiation advantage. For example, no investigated company guaranteed uptime before introducing the M2M system.

- Is the choice of implementing an M2M system a strategic decision?

As Porter argues, strategic decisions are often confused with programs promoting efficiency and effectiveness, and indeed, we have seen the potential of the latter. However, to be qualified as a strategic decision the choice should be somewhat difficult to reverse.¹⁶⁶ Thus, the connection to the company's strategy is vital, as increased operational efficiency should be desirable to any company.

¹⁶³ Porter, M E (2001) "Strategy and the Internet", *Harvard Business Review*.

¹⁶⁴ Grant, R M (1998) *Contemporary Strategy Analysis – Concepts, Techniques, Applications*

¹⁶⁵ According to Porter (2001) competitive convergence refers to the situation where many companies do the same things in the same ways. This leads to undermined industry profitability as customers end up making decisions based on price.

¹⁶⁶ Grant, R M (1998) *Contemporary Strategy Analysis – Concepts, Techniques, Applications*

We have observed that the primary activity mainly affected by an M2M implementation is service. Furthermore, we have argued that within those companies with less emphasis on service, the system may be compared to an efficiency-enhancing information system. Given this, it seems reasonable to assume that the strategic connection is more obvious in companies relying more on service revenues. Offering new kinds of services or conducting the old in new ways should have a larger impact on these companies.

Hence, the conclusion is that a choice to implement an M2M system may well be a strategic decision. If it depends on the context, but it is more likely to be so in a service oriented company.

- To what companies would an M2M adoption be of greatest value?

As discussed above, the service connection has been recognised as relevant to the implementation being a strategic decision and, ultimately, for the building of a more sustainable competitive advantage. Thus, we believe that M2M has greater potential benefits for more service-focused companies. Indeed, as was observed in one larger company, selling the system as a feature did not work well. Offered as a part of a service offering, however, many advantages appeared. In fact, without service perhaps the greatest potential gains of an implementation remains unutilized. We believe this will become even more obvious in the future as competitive convergence may undermine the advantages of operational effectiveness.

Moreover, we have seen that M2M is of particular value in settings where reliability is vital. For instance, it should be more valuable to a company where downtime is very costly than to a firm where the functioning of a copy machine is not critical to success. In line with this reasoning, one may see the connection to customers' value chains; when M2M supports customers on a primary level it is more valuable than if it does on a support level.

Furthermore, as M2M may facilitate strengthened customer relations, its usage should be of particular value for companies acting in an environment where this is important.

6.3 Theoretical contribution

Setting off to explore the phenomenon of M2M, little direct aid was to be found in the academic literature. This lack of satisfactory matching models and theories forced us to create our own structure or framework. Consequently, we took use of a number of theoretical areas to create a framework allowing us to explore the phenomenon of M2M from three different angles.

The aim of this perspective-approach was never to paint a complete picture of how M2M affects implementing firms, and indeed we do not claim to have done this. Rather, it was an attempt to fuse together different areas of academic literature so to facilitate a more complete exploration of three selected perspectives on M2M, than would be possible using only one theory or model. We found our composition of theories and models useful to explore the perspectives and the contribution to substantive theory is thus the theoretical framework developed in section 3.7.

6.4 Suggestions for future research – hypotheses

- Hypotheses one and two:

Given our delimitations, we have found that *service* and *firm infrastructure* have been more affected than the rest of the value chain's activities. Hence, it would be interesting to test the following two hypotheses:

Among the value chain's primary activities, service is the most affected by an M2M adoption.

and

Among the value chain's support activities, firm infrastructure is the most affected by an M2M adoption.

- Hypothesis three:

Some activities in the value chain have been affected more than others, *service* being one. This activity seems central also from a customer offerings perspective, as it may enhance the product. Indeed, *service* has been found central from a customer relations perspective too. Given these observations it would be interesting to test the following hypothesis:

The greater the importance of service for a firm, the higher the leverage of implementing M2M.

- Hypothesis four:

Within the customer relations perspective both the bond analysis and the transaction costs analysis indicated that M2M may generate stronger customer ties. Indeed, this was said to be a primary objective when adopting M2M within the investigated companies. With this background it would be interesting to test the following hypothesis:

The greater the importance of strong relationships, the greater the potential of implementing M2M.

- Hypothesis five:

We have observed several quality-enhancing effects of the M2M implementations. In particular, products' reliability may be enhanced. Furthermore, it seems reasonable to assume that increased reliability is more valuable in settings with higher costs of downtime. This reasoning leads to the fifth hypothesis:

The higher the costs of downtime, the greater the potential value of an M2M system to the implementing firm.

7 Bibliography

Published sources

- Anderson, J (1995) "Capturing the Value of Supplementary Services", *Harvard Business Review*, January 1995
- Avlonitis, G (2000) *Product Management - The Oxford Textbook of Marketing*, Oxford University Press, Oxford.
- Backman, J (1998) *Rapporter och uppsatser*, Studentlitteratur, Lund.
- Baron, J N & Kreps, D M (1999) *Strategic Human Resources – Frameworks for General Managers*, John Wiley & Sons, Inc.
- Cederquist, L (2001) in *Contact* no 20, Internal magazine, Ericsson
- Christensen, C M, Raynor, M & Verlinden, M (2001) "Skate to Where the Money Will Be", *Harvard Business Review*, November 2001, 72-81.
- CIO Magazin *Reengineering customer service*, August 1993.
- Crowther, J (1995) *Oxford Advanced Learner's Dictionary*, Oxford University Press, Oxford.
- Dibb, S, Simkin, L, Pride, W M & Ferrell, O C (2001) *Marketing Concepts and Strategies*, 4th European edition, Boston, Houghton Mifflin.
- Easton, G (1992) "Industrial Networks: a Review", in Axelsson, B & Easton, G (Eds.) (1992) "Industrial Networks: A New View of Reality", Routledge, London.
- Eriksson, L T & Wiedersheim-Paul, F (1997) *Att utreda, forska och rapportera*, Liber Ekonomi, Malmö.
- Garvin, D A, "Competing on the eight dimensions of quality", *Harvard Business review*, Nov-Dec 1987.
- Gould B (1998) "Relationship Marketing – But Why: Management Research & Thinking", *The Antidote*, Iss. 15 1998.
- Grant, R M (1998) *Contemporary Strategy Analysis – Concepts, Techniques, Applications*, Blackwell Publishers Ltd, Oxford.
- Grönroos, C (1990) *Service Management and Marketing*, ISL Förlag, Göteborg.
- Hammarkvist, K-O, Håkansson, H & Mattsson, L-G (1982) *Marknadsföring för konkurrenskraft*, Liber-Hermods, Malmö.
- Heide, J B (1994) "Interorganizational Governance in Marketing Channels", *Journal of Marketing*, Vol. 58 (January), 71-85.

- Holme, I M & Solvang, B K (1997) *Forskningsmetodik – Om kvalitativa och kvantitativa metoder*, Studentlitteratur, Lund.
- Håkansson, H (editor) (1982) *International Marketing and Purchasing of Industrial Goods – An Interaction Approach*, John Wiley & Sons.
- Håkansson, H (1990) “Technological Collaboration in Industrial Networks”. *European Management Journal*, vol.3, pp. 371-379.
- Håkansson, H & Snehota, I (1993) “The Content and Functions of Business Relationships”, paper presented at 9th IMP Conference, 23-25 September 1993, Bath, UK.
- Johansson, J & Mattson, L-G (1987) “Interorganizational Relations in Industrial Systems: A Network Approach Compared With a Transaction Cost Approach,” *International Studies of Management and Organization* 17: 34-48.
- Kotler, P, Armstrong, G, Saunders, J & Wong, V (1999) *Principles of Marketing*, Prentice Hall, Europe.
- Kviselius, N Z, *Swedish M2M Industry Case Study, PhD Thesis*
- Levitt, T (1981) “Marketing intangible products and product intangibles”, *Harvard Business Review*, Issue 3.
- Levitt, T (1969) *The Marketing Mode - Pathways to corporate growth*, McGraw-Hill, New York.
- Liljander, V & Strandvik, T (1995) “The Nature of Customer Relationships in Services”, *Advances in Services Marketing and Management*, Vol IX, London, JAI Press Inc.
- Lovelock, C (1995) *Competing on Service*, Planning Review, July/August.
- Miettälä, A & Möller, K (1990) “Interaction Perspective into Professional Business Services: A Conceptual Analysis in Research Developments in International Industrial Marketing and Purchasing” in Fiocca and Snehota, (eds). Proceedings of the 6th IMP Conference, Milan, Italy: University of Bocconi.
- Mintzberg, H, Ahlstrand, B & Lampel, J (1998) *Strategy safari*, Prentice Hall.
- Mintzberg, H, Quinn, J B (1996) *The Strategy Process – Concepts, Contexts, Cases*, Prentice Hall, International.
- Möller, K & David T W (1988) “Interaction Perspective in Business Marketing: An Exploratory Contingency Framework”, *Institute for the study of business markets report* 11:1988, Pennsylvania State University.
- Nygaard, C & Bengtsson, L (2002) *Strategizing – en kontextuell organisationsteori*, Studentlitteratur, Lund.
- Palmer, A (2000) *Principles of Marketing*, Oxford University Press, Oxford.

Porter, M E (1985) *Competitive advantage: Creating and sustaining superior performance*, Free Press, New York.

Porter, M E (2001) "Strategy and the Internet", *Harvard Business Review*, March 2001, 63-78.

Porter, M E (1981) "The contributions of Industrial Organizations to Strategic Management", *Academy of Management Review*.

Salmond, D (ed) (1988): *Business Buying Behavior. A Conference Summary*. Report No. 88-106. Cambridge, Mass.:Marketing Science Institute.

Silverman, D (1993) *Interpreting Qualitative Data*, Sage Publications Software.

Standifird, S S & Marshall, S R (2000) "The Transaction Cost Advantage of Guanxi -Based Business Practices", *Journal of World Business*, 35(1).

Ström, P (2002) *Prylarna snackar – Maskin till maskin-kommunikation (M2M), telematik och "ubiquitous Internet"*, Konsultförlaget, Uppsala.

Swan, J E, Trawick, F I, Silva, D W (1985) "How Industrial Salespeople Gain Customer Trust", *Industrial Marketing Management*, 14, 203-211.

Thorelli, H B (1986) "Networks: Between markets and hierarchies", *Strategic Management Journal*, 7, pp.37-51.

Webster, F E Jr (1992) "The Changing Role of Marketing in the Corporation," *Journal of Marketing*, Vol. 56 (October), 1-17.

Wilson, D T & Mummalaneni V (1986) "Bonding and Commitment in Buyer-Seller Relationships: A Preliminary Conceptualisation," *Industrial Marketing and Purchasing*, 1 (3), 44-58.

Williamson, O E (1975) *Markets and Hierarchies, Analysis and Antitrust implications: A study in the economics of internal organization*, Free Press, New York.

Williamson, O E (1983) "Organisational innovation: the transaction cost approach", In *Entrepreneurship*, p101-133, Lexington books, Lexington, MA.

Williamson, O E (1985) *The Economic Institutions of Capitalism*, The Free Press, New York

Willoch, B-E (1995) *Business Process Reengineering – En praktisk introduktion och vägledning*, Docendo Läromedel AB.

Company specific information

"Cosmos – On-Line Condition Monitoring System" (2003) information brochure, Alfa Laval

"GOLDen EYE" (2001) product brochure, PM-Luft

"Nonstop Performance" (2002) advertising leaflet, Alfa Laval

”Diplomat” (2002) product brochure, Thermia

“Tetra PlantCare, Cosmos” (2003) presentation of Cosmos (CD-rom)

Verbal sources

Blixt, Stefan, Xerox AB (030508).

Froborg, Nicklas, Alfa Laval AB (030507).

Olsson, Patrik, Thermia AB (030506).

Rasmussen, Jens-Erik, AB Tetra Pak (030430).

Sandgren, Mikael, PM-Luft AB (030424).

Sederholm, Fredrik, Otis AB (030516).

Electronic sources

All electronic sources were accessed during the period of 030101 to 030531

www.accenture.com

www.ad.se

www.alfalaval.se

www.arcgroup.com

www.m2mportalen.com

www.nokia.com

www.otis.se

www.pm-luft.se

www.tetrapak.se

www.thermia.se

www.xerox.se

APPENDIX 1 - Questionnaire

Background

The interviewee:

- What is your formal position?
 - For how long have you stayed with this company?
 - How involved have you been in the company's M2M project?
 - Is your knowledge emanating from the commercial or technical sides of things?
 - What is your view on what M2M means?
-
- Which division(s) of your company employs the M2M system?
 - Does the usage differ depending on the division?
 - What kind of communication technology do you use for your M2M system?
 - What is the reason behind the choice of that particular technology?
 - How does your service organisation operate?
 - What do your service contracts look like?
 - What is the contract period?
 - Are there any plans of developing the service contracts?
 - What is the warranty limit?
 - What does it implicate?
 - What share of new customers demand contracts based on M2M?
 - What share of the total amount of customers are using M2M based contracts?
 - What share of the net sales emanates from service?
 - Describe how your M2M system works.
 - Have you evaluated the results of the M2M implementation in any way?
 - What did the evaluation tell you?
 - Are there any other companies in your line of business using M2M?
 - How do they use M2M?
 - What were the main reasons for implementing M2M?
 - I will give you some reasons as statements, and then you can tell me if you agree or not:
 - To decrease your costs internally?
 - To offer better service?
 - To enable the offering of new profitable services?
 - To enable the attracting of new customers or customer segments?
 - To get hold of information regarding how the customer uses the products?
 - To follow business tendencies?
 - To tie the customer?
 - To increase customer satisfaction?
 - To distinguish from competitors?
 - To position the company as innovative?
 - What was your chief focus – internal cost savings or increased revenues?

Organisational implications

- If we by higher efficiency mean better usage of time and resources, in what way has M2M implicated better efficiency in your organisation?
 - In what ways has it implicated less efficiency?
- Which part(s) of the organisation has been affected by the M2M implementation?
 - How?
- Has the stock keeping been affected by the M2M implementation?
 - How?
- Has the product manufacturing been affected by the M2M implementation?
 - How?
- Has the marketing division been affected by the M2M implementation?
 - How?
- Has the sales division been affected by the M2M implementation?
 - How?
- Has the service organisation been affected by the M2M implementation?
 - How?
 - Has the M2M system implicated less service meetings?
 - In what way?
 - Has the M2M system implicated shorter service meetings?
 - In what way?
 - Has the M2M system implicated less expensive service meetings?
 - In what way?
 - Have any lead-times been decreased?
 - What lead-times?
 - How have these been decreased?
 - Has the procurement of input material been affected by the M2M implementation?
 - How?
 - Has the product development been affected by the M2M implementation?
 - How?
 - Have new routines or processes emerged due to the M2M implementation?
 - Describe!
- Do you experience any change in the old processes due to the M2M implementation?
 - In what way?
- How has the M2M technology been accepted by the staff?
 - What kind of problems have they experienced?
- Have you employed new staff due to the M2M implementation?
- Have you been able to rationalise?
- Has the M2M implementation facilitated your planning and budgeting?
 - In what way?
- Has the M2M implementation facilitated your quality control?
 - In what way?
- Do you plan to make your organisation more efficient because of the M2M technology?
 - In what way?

Customer offerings

- Do you offer M2M with all your products?
 - o What determines if you offer it or not?
 - o Do you offer it with new as well as with already purchased products?
- Do you offer M2M to all of your customers?
 - o What determines if you offer it or not?
- Has M2M implicated any new price structures?
- Have the customers been willing to pay for the new services?
 - o Were there any investigations made on the subject, prior to commencing the project?
- Are you able to attract new customers thanks to the M2M system?
 - o What are the reasons for this?
- Are there any customers who have been negative towards the system?
 - o Why?
 - o How has this become apparent?
- Does the M2M solution lower the costs for the customer?
 - o In what way?
 - o Do you use it in the marketing?
 - How?
- Has the M2M solution generated any information about the products or the customers?
 - o What kind of information?
 - o How do you use this information?
 - o Has the increased knowledge enabled more efficient pricing?
 - How?
 - o May the customer access the information?
- If looking at the lifetime of the product as how long one can use the product before it is broken and it is most advantageous to replace – does M2M change the lifetime of the product?
 - o In what way?
 - o To what extent?
- Would you consider the reliability of the products changed, in terms of e.g. fault frequency and need of service, due to M2M?
 - o In what way?
- If one imagines service from the customer's perspective, e.g. in terms of customer effort and how long they have to wait for functionality – would you consider service to be facilitated from the customers point of view?
- Would you consider M2M to alter the perceived quality of the customer?
- Is it positive for your reputation to have M2M?

Customer relations

- Has M2M in any way strengthened the relationship with the customer?
 - In what way?
- Has M2M in any way weakened the relationship with the customer?
 - In what way?
- Would you consider the customer to receiving better service with the M2M system?
 - Based on?
- Do you consider it a risk, not seeing the customer as often as you used to?
 - How do you handle it?
- Is the customer more tied to you on a technological level due to M2M?
 - In what way?
- Are you able to make longer contracts owing to M2M?
- Are the contracts self-renewing?
 - Is the renewal of the contracts facilitated with M2M?
 - How?

Finally

- What has not worked out well during the project?
 - What were the most difficult problems?
 - Is there anything you would act differently on today?