Management of Buyer-Supplier Relationships in the Supply Chain
- Case Studies of Automotive and Telecom Supply Chains

Weihong Wang

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Management of Buyer-Supplier Relationships in the Supply Chain – Case Studies of Automotive and Telecom Supply Chains

Weihong Wang
Division of Traffic and Logistics
To my beloved husband Lars and my dear son David
ABSTRACT

This dissertation consists of two parts. The first part is about “Managing buyer-supplier relationships in auto production chains – a case study of Volvo and its supplier relationship management”. The second part is about “Managing buyer-supplier relationships in telecom supply chains – a case study of Ericsson and its supplier relationship models in different business situations”.

The scope of this study is restricted to supply chains in the automotive and the telecommunication industries, where the success of supply processes is dependent on how well a company manages its supply chain with horizontal or vertical integration to fulfill its customers' demands.

The research is carried out as a number of case studies of buyer-supplier relationship management in the auto and telecom supply chains. The studies aimed to answer the research problem by analyzing how a company fulfills customer demand in the best way through different supplier relationships, and how alternative relationship types are used in reality, and why.

The study is based on the relationship between two focal companies and their suppliers. Case study methodology is used, and data is collected from selected cases through interviews and observations. Analysis is carried out within cases and across cases. From the case interpretation and analysis, conclusions are drawn as to which strategic level of buyer-supplier relationship is appropriate for different situations.

As a result and in conclusion, a static supply chain-reaction model is built at the end of the Part I. The static model describes the importance of collaborative buyer-supplier relationships in the product development process. Based on the research result from Part I, Part II has concluded that the most suitable supplier relationship is different for different products. For the same product, the most appropriate buyer-supplier relationship varies with the product’s life cycle timing. Therefore, two dynamic buyer-supplier relationship models under different business conditions and in different product life-cycle periods are created in Part II. The models apply to dynamic processes, not to interacting company organizations in general.

As a case study, this research is expected to make a contribution to both the industrial and academic communities as to the selection of the most appropriate supplier relationships in different business situations.

Key words: buyer-supplier relationship, sourcing strategy, supply chain management
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Stockholm, June 2004
Weihong Wang
ABBREVIATIONS

AR    Action Research
ASIC  Application-Specific Integrated Circuit
AVL   Approved Vendor List (A parts list specifying the approved
       manufacturer and part number)
AXE   Ericsson fixed network switch product
CNY   Chinese Yuan
CPM   (Ericsson) Corporate Program Manager for EMS provider
DC/DC Power box in RBS for different Direct Current
ERA   Ericsson Radio AB
GAA   Global Alliance Agreement
GPA   General Purchasing Agreement
GSM   Global System for Mobile communication
EMS   Electronic Manufacturing Services (providers)
ENC   Nanjing Ericsson Panda Communications Co. Ltd.
EOL   End of (product) Life
ETC   A short name of Ericsson ( China) AB
FTS   First Tier Supplier
IPR   Intelligent Property Right
KPI   Key Performance Index
LT    (Product) Lead-Time
NPI   New Product Introduction
NPC   New Product Centre
OEM   Original Equipment Manufacturers
PBA   Printed Board Assemblers
PCBs  Printed Circuit Boards
PCBA  Printed Circuit Boards Assembly
QA    Quality Assessment
RBS   Radio Base Station
SCM   Supply Chain Management
SSA   Special Sub-purchasing Agreement
STS   Second Tier Supplier
TK    Tillverkningskostand (production cost)
TPI   Transfer Product Introduction
TRU   Transmit Receiver Unit
TTC   Time-to-customer
TTM   Time-to-market
WCDMA Wide-band Code Division Multiple Access (mobile system)
WCL   World Class Logistics
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PROLOGUE

When I came to Sweden in the early of 1990s as a guest researcher from a completely planned economy, everything was quite new and attractive to me. I was curious and greedy to acquire new knowledge by reading Western management books and papers, by visiting different companies including assemblers and suppliers, and through discussion with my supervisor and colleagues. A book named "The Machine that Changed the World" (Womack, et al., 1990) influenced me strongly and thus decided a total new direction for the past ten years of my career. The book led me into a wonderful lean supply chain world. Since then, I have studied and worked in supply chain management in both academic and industrial environments. This dissertation is a result of my last ten years work and study.

This thesis consists of two parts. The first part is my licentiate thesis, entitled “Management of buyer-supplier relationships in auto production chains - a case study of Volvo and its supplier relationship management”. The second part is about “Managing buyer-supplier relationships in the telecom supply chain - a case study of Ericsson and its supplier relationship models in different business situations”. After finishing Part I in 1996, I joined Ericsson Radio Systems for its logistics and supply chain management. From 1997 to 2001, I worked as a logistics manager, time to customer (TTC) process improvement leader, and, as an area manager of contract fulfilment support for different Ericsson products and marketing areas. I have been back at the Royal Institute of Technology since 2002 to complete Part II of the dissertation.

Part I

Great changes have taken place in manufacturing during the past two decades. These include an increasing interest in purchasing, specifically in the development of supplier relationships, which have resulted in a multitude of new structures in the organisation of purchasing and supply chain management. The auto industry is normally considered as a pilot industry for leading this great change.

Why are supply chains needed? Japanese success in the auto industry has proved its motto: “Manage the supply chain for competitive advantage rather than to reduce costs.” Namely, the supply chain can be an important source of competitive advantage to any company willing and able to devote time and effort to supplier co-operation and development.

This study started with the auto supply chain. Four research questions arose in Part I of this dissertation. They are:

1. If buyer-supplier relationships are going through great change, how does this reflect what is happening in the auto industry? How many

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1 Quotation from Peter Hines: “Creating World Class Suppliers” 1994, P. 3.
different sorts of buyer-supplier relationships are there? What is the developing tendency that will set the tone for future practices?

2 Where supplier integration is concerned, why do buyer-supplier relationships change from first reducing supplier integration, to increasing it again? What is the role of quasi-firm integration in the automakers' product development process?

3 If there are two different "Just in Time" (JIT) systems, what is the Swedish JIT style?

4 Do buyer-supplier relationships change from country to country, and from company to company within international production chains? If yes, why are there differences?

In order to answer these research questions, two major cases have been constructed from the auto industry. Case one is based on Volvo's supply chain in Sweden and concerns "the changing buyer-supplier relationships in the Swedish auto industry." Case two is based on Volvo and Japanese auto buyer-supplier relationship management in Thailand. "Auto makers and their local supplier relationships in Thailand."

As a result of the empirical case studies on buyer-supplier relationship management in the Swedish and Thai auto industries, Part I has answered these research questions and come to the following conclusions:

1 There are three sorts of buyer-supplier relationships in auto supply chains:
   • Traditional pure market relationships without co-operation, such as has been observed among some specialist suppliers and their buyers
   • A black box relationship with different levels of co-ordination, such as functional or second tier suppliers and their buyers
   • Vertical quasi-firm relationships with a high degree of cooperation similar to relationships between some system suppliers or first tier suppliers and auto makers

2 Vertical quasi-integration is a high level of buyer-supplier cooperation, actively and positively promoting automakers’ “product development” and suppliers’ self-development. This is profitable to both buyer and supplier within auto supply chains.

3 The principle of JIT delivery is important for the promotion of flexible production and for buyer-supplier co-operation, but not for
concrete action. It is not therefore necessary to classify different JIT styles.

Factors other than price, quality, delivery reliability, production flexibility and engineering skill affect the buyer-supplier relationship. Companies’ and countries’ cultural backgrounds make a great difference in establishing buyer-supplier co-operation and collaboration.

Based on the answers to the above research questions, Part I has reflected on the general supply chain-reaction mechanism needed to build up a static model of a positive chain-reaction driven product, and to see if a close buyer-supplier co-operation exists (see the Part I, Figure 6-3).

The model conceived comprises nodes in a linked technical and non-technical state of change where the potential interaction between buyer and suppliers can be described as close collaborating games. Figure 6-3 shows such a transformation process, starting from one part of the chain, continuing in several steps to others, and after some time reinforcing the positive effects of the initial competitive advantage in several nodes throughout the whole supply chain. The “supply chain-reaction” is based on the case studies and unlocks the mutual competitive advantage. By doing so, it gains a significant competitive advantage.

The chain-reaction model describes the importance of collaborative buyer-supplier relationships in the product’s development process. Perhaps we can say that without such a co-operative relationship, industry, the auto industry at least, cannot move forward.

Because the research of Part I is made almost ten years ago, some of conclusions may not be as relevant for today. However, basic buyer-supplier relationship theory, and conclusion about the “quasi-firm” integration is still interested, as we can see from Part II.

Part II

Once the auto industry case study had been completed, I embarked upon this research project within the telecom supply chain. As supplier relationships differ from country to country, and from company to company, I became interested in the differences between industries. It was reported that the telecommunications giant Ericsson was developing a new strategy for the establishment of supply co-operation within the supply chain. I referred to this at the end of Part I: “Ericsson might become a new case study objective in the near future.”

\[\text{Refer to: “Ericssons nya strategi: Mera programutveckling och fler underleverantörer” from the journal Elektronik, Sweden, (14/1995).}\]
In addition to a common focus of buyer-supplier relationship management, the case study approach in Part II is different from Part I. When I started the case study on the telecom industry in 2001, I had, had more than five years experience working within the case company in various logistics and supply related roles and had basically seen the development of Ericsson’s supply chain management. I was thus familiar with the business context and the challenges involved. The purpose is not only to test any existing theories as I did in part I, but also to make a further contribution to the existing body of knowledge. Part II of the study started with a co-operative research project together with Ericsson China. Thus, two goals are involved; the first is to solve a problem for the case company, the second, to make a scientific contribution. Subsequently, Part II is more interactive and developmental than Part I.

The main research question arising in Part II concerns the selection of the most appropriate type of buyer-supplier relationship in different business situations.

This research problem is explicitly studied from a buyer company’s standpoint. It can be divided into the following key research questions:

1. What types of buyer-supplier relationships can be classified in the supply chain? (Theoretical classification)
2. How are alternative relationship types being used in reality and why? (Case description)
3. Which selection factors actually specify the most appropriate supply relationship for a focal (buyer) company? (Prescription)
4. How, and under which conditions, should a relationship segmentation model be used? (Application)

The scope of Part II is restricted to supply chains within the telecommunications’ industry, where the success of the supply processes depends upon how well a focal company manages the chain employing either horizontal or vertical integration to fulfill its customers' demands.

The research is conducted as a number of case studies of Ericsson’s supplier relationship management. The studies aim to answer the research problem by analyzing how a company fulfills customer demands in the best way through different supplier relationships. It also addresses the issue of how alternative relationship types are used in reality and why.

As in Part I, Part II is based on the relationship between a focal company and its suppliers. Case study methodology is used; data is collected from selected cases through interviews and observations. Analysis is carried out within cases and across cases. Conclusions are drawn from the case interpretation and analysis as to the choice of strategic level for the different buyer-supplier relationships under scrutiny. A new model and theory is built upon this analysis.
This empirical investigation of buyer-supplier relationships in the telecom industry argues that no general "best" kind of relationship exists in real industrial life. It is more important for a company to choose the most appropriate relationship applicable for each individual supplier dependent upon the business situation and timing. Conclusions from the case studies are summarized briefly below:

1. The most suitable supplier relationship differs for different products. The relationship depends on the degree of business importance and the complexity of the supply market.

2. Supplier relationship changes with product life cycle timing.

3. A project/product-oriented relationship is recommended.

Conclusions based upon research results from the in-depth case analysis are as follows:

(1) For different products, relationship strategies vary according to each respective product’s "business importance" and the "complexity of the supply market" – The study concludes that different products in different business situations each require their own buyer-supplier relationship model. (See Part II, Figure 7-1).

(2) For a particular product, the appropriate relationship strategy varies with the product’s life-cycle timing - A dynamic buyer-supplier relationship model has been constructed from the research experience proposing different relationships to be applied during different periods of the product’s life cycle (see Part II, Figure 7-2).

In order to apply these relationship models in reality, it is a prerequisite that focus is on a specific project, product or service. The case study results have approved that cooperation between buyer and supplier on project level, as quasi-firm integration, may be more efficient than a full integration between two companies in the supply chain. The models apply to dynamic processes, not to interacting company organizations in general.

A Comparison of Part I and Part II

As these two parts of the work were finished at different times, they have been carried out relatively independently. However a common theme of “buyer-supplier relationship management in the supply chain” has connected them to each other. In principle, the two parts have a common theoretical base, which is supply chain
management theory, although to some extent supply chain theory and relationship knowledge has changed and developed over the past ten years. In fact, part II is a continuation and development of my licentiate thesis. Both parts have a common focus on managing buyer-supplier relationships in an industrial society, but within different industrial areas. Using the same research methodology, case studies have been carried out on Volvo and Ericsson's buyer-supplier relationship management.

Both Part I and Part II started with a supply and relationship literature review and investigated different types of buyer-supplier relationships in focused industries. Part I has tested Richard Lamming's quasi-firm integration theory, (1993) which is more traditional and positivist in approach. As Part II of this study is based on my five years of Ericsson work experience in conjunction with a joint-research project with Ericsson China, the study thus represents a more hermeneutic research approach as opposed to the pure positivistic thinking reflected in part I.

The conclusions from the two parts differ accordingly. One of the conclusions from Part I states as follows; “In order to create competitive advantages and world-class suppliers, the buyer-supplier relationship is changing towards closer collaboration”. However, the case study in Part II has found that close collaboration can increase conflict and problems for both partners. For instance, it is often difficult to set a common goal for two strategic alliance partners. Using Lamming’s “quasi-firm integration theory, the case study 4 of Ericsson new supplier relationship in RRU project has shown that the project-orientated quasi-firm relationship is a successful example of how close collaboration around a common goal can be used for a special project period and individual product.

To sum up, a static supply chain-reaction model was constructed at the end of Part I. The static model describes the importance of collaborative buyer-supplier relationships in the product development process. Based on the research result from Part I, Part II has concluded that the most suitable supplier relationship differs for different products; and that for the same product, the most appropriate buyer-supplier relationship varies with the product’s life cycle timing. Therefore, two dynamic buyer-supplier relationship models have been created in Part II. They apply under different business conditions and at different product life-cycle periods. The models apply to dynamic processes, not to interacting company organizations in general.
Part I

Management of Buyer-Supplier Relationships in Auto Production Chains
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1 Introduction

During the 1990s, more changes have taken place in manufacturing than in the two preceding decades. An increasing interest in purchasing, specifically in the development of supplier relationships, has resulted in a multitude of new structures in the organisation of purchasing and supply management.

Today, in most leading firms or many great final manufacturers, the function of purchasing, as once used in traditional business relations, is expanding into supply market strategy. Included in this expanded responsibility is the integration of long-term subcontracting with co-operation between buyer and supplier dramatically increasing in today's industrial society.

As an engineer qualified about 15 years ago, nurtured in a completely planned economy and management, I have acquired new knowledge by reading interesting books or papers, visiting final assemblers or component supply firms, and through discussions with my supervisor and colleagues. Everything is quite new, coming in contact with so many new cross-functional teams and conceptions in product development and subcontracting processes. Why do auto makers need to collaborate with their suppliers? Why are buyer and supplier representatives working side by side with engineers in designing a new product? How does a supplier integrate into the final producer's product development without ownership ties? Purchasing being simply a firm's strategy, instead of a departmental function? ......These were unheard of when I was a student, even when I was a teacher at university! More often than not, one outgrowth of this new way of doing things has been the use of more single or dual sources - with longer term collaborative type contracts - and a major reduction of the firm's supplier base. All of these facts are very interesting, in making a thorough inquiry.

What is the driving force producing these and a great number of related changes? In the industrial setting, a major driving force is keen competition. With the development of production internationalisation, global competition has become more important. For final producers and suppliers within production chains, it is essentially the same thing: increasing competitive advantage through closer co-operation.

This research concerned with buyer-supplier relationships in the auto industry follows the cooperation of dynamic chains of activities, responsibilities and organisations, needed to make a complex car. This phenomenon is variously called: out-sourcing, purchasing and supply, supply chain management, etc.

These subcontracting relations are explored by observing two different cases: "Changing buyer-supplier relations in Swedish auto industry" (Ch. 3) and "Auto makers and their local supplier relations in Thailand" (Ch. 4).

In due course, the project started by observing automobile assemblers, component suppliers and their relations separately in Sweden and Thailand. By analysing subcontractors and customers links as well as their interactions, while reflecting upon co-operative relationships driving production, promoting transfer of technological "know how" and promoting skill formation along production chains, the case studies took shape.
1.1 Background to the present study

This study is based on Odhnoff's perspective of production chain theory. In order to achieve a finished product, a whole manufacturing course, no matter how simple or complex, comprises a production system. According to Odhnoff's general observations in Sweden and some South-Eastern Asian countries during 1967, 1983, 1985, 1991, a production chain exists within the production system, as an inter-firm structure linked consecutively between firms from producer to user\(^1\). The chain is described through serious relations such as logistics, technique, steering and control as well as knowledge learning and transformation etc. (Averskog and Edsparr, 1994). As Odhnoff (1983, 1985) observes in Malaysia and Singapore, governments introduce incentives for such chains to maximise added value in the national share of industry. A Malaysian case study (Odhnoff et al, 1991) gives many examples of production chains that grow, by starting obviously as merchants in agricultural products and integrating backwards.

At national industrial development level, Porter (1986, 1990) mentions the concept of value chains, pointing out that the added value in national parts of production chains may be promoted by governments seeking industrial development. However, there is another feature of production chains in company development that gives more lasting stimulus and support to final product development: the transfer of technological "know how" along the chain when conditions for cooperation in product and process development exist. Rosenberg publishes examples of such cooperative efforts in his study of "learning by using". Odhnoff (1967) and Lundgren (1989) achieve similar results in researching Swedish industry.

Fundamental concepts of inter-firm relations in a fast changing competitive environment are altering. Traditional thinking, where every company remains in position on a production chain with primary suppliers providing inputs, has gone forever. Seen from this perspective, strategy is primarily positioning a company in the right place on the chain - the right business, the right products and market segments, the right value-adding activities.

Today, however, this understanding of inter-firm structure is as outmoded as the old assembly line, now totally altered in manufacturing industry. International production processes, global competition, changing markets and new technologies demand new relationships throughout. With the reduction and selection of suppliers and customers, buyer-supplier relationships as well as their vertical integration are changing dramatically. Since the emergence of the Japanese auto maker's "lean supply chain" (Womack et al. 1990): successful companies do not just add value, they reinvent it through creating new competitive advantage, focusing strategic analysis not on individual companies but throughout the whole manufacturing system, where different nodes along the chain - suppliers, business partners, customers - work together to co-produce final products and co-create value. A key strategy is re-configuring functions and relationships among the actors to mobilise the creation of value in new forms.

Two well-known research projects ("The Future of the Automobile", Womack et al. 1984 and "International Motor Vehicle Program", Womack et al. 1990) report on "coordinating the supply chain" creating competitive advantage in the auto industry. Recent research on "Strategic Industrial Sourcing" (Nishiguchi, 1994) develops a deeper and more detailed description of innovative Japanese supply management, where a reorganised collaborative production chain effectively promotes product development.

My interests are to observe and analyse relations between different production stages (nodes or links), then to discuss some possible and positive chain-reactions promoting product development in auto production.

\(^1\) See Odhnoff, J. (1990), Tekniköverföring genom produktionskedjor i Thailand, p.3.
1.2 Why choose auto production?

Process industries supplying chemicals, plastics, pharmaceutical and food products using raw materials common to many competitors, have been termed "non discrete parts industries" by Funk (1992). In comparison the "discrete parts industries" such as automotive, electronics and machine tool industries use discrete, or unique parts. The importance of the automobile industry, once dubbed "the industry of industries"\(^2\), has been recognized by many researchers as the world's largest manufacturing activity. Throughout most of this century, cars and trucks have been an important part of our everyday lives. Millions of people spend much of their time "loving" their cars. Yet the auto industry is even more important to us than it appears. Competition has often been based upon styling as opposed to technical refinement, upon image rather than performance. It is said the machine is changing the character of the world\(^3\).

The automobile industry is said to have two distinctive characters. First, it is generally more consumer market oriented compared with other industries; secondly, the auto industry has gone through two great changes in production organisation during the process of industrialisation. The first is the change from craft production to mass production; the second is from mass production to lean production. These changes in production concepts, "twice in this century has changed not only our most fundamental ideas of how we make things, but the fate of companies and nations and how we work, how we think, and the way we live" (Womack et al., 1990, p.11). Therefore discussion of the automotive industry and its development inevitably becomes a discussion of manufacturing itself.

The automotive industry can be considered as a global production system that may be analysed by focusing on diverse "levels" or "sections", where the general concept of "production chain" is used to stress links between supplier and supplier, between supplier and assembler, and between different stages in the production sequence inside the industry. The supply chain, as discussed in the MIT international Motor Vehicle Program, is the key to analysis.

1.3 Problem setting and purpose of the study

According to Oliver et al.\(^4\), competitiveness of a company is influenced by many factors:
- Product design and technology
- Customers
- Politics
- Process design and technology
- Supply chains and external relationships
- People.

The scope of this study does not address the all dimensions listed, concentrating on auto makers as the unit of analysis with the focus on supply chains and external relationships.

Why are supply chains needed? Japanese success in the auto industry has the motto: "Manage the supply chain for competitive advantage rather than to reduce costs" (Senior

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executive, Kirin, Brewery, Yokohama, Japan). Namely, the supply chain can be an important source of competitive advantage to any company willing and able to devote time and effort to supplier cooperation and development.

Then, how is the chain managed? This central question results in other related questions mentioned in this thesis. Why do subassemblers and a final assembler choose outside purchasing rather than in-house manufacturing? Do buyer-supplier relationships play a more important role in certain economies or industries compared with others? Has the structure of suppliers changed over time? What is the driving force of suppliers’ restructuring? Are changes in producers’ strategies responsible for the emergence of relationships between buyer and supplier? Does the resource policy to supplier differ according to the suppliers’ size, skills, and technical expertise? If so, how are contractual relationships affected when markets shrink? How does government policy influence final assemblers and suppliers within international production chains? Furthermore, if there are national differences within the organisation of suppliers and in-house manufacturing, what socio-economic and historical factors account for these differences? Is there a correlation between firm-level or international competitiveness or the way that subcontracting is organised by certain firms and national economies? How can technological “know how” be transferred along the production chain? And what are the key elements of new buyer and supplier relations? In sum, all of these questions concentrate on how supply chains are integrated into auto production systems without ownership ties.

The purpose of this study is to observe developing processes of buyer-supplier relationships in auto production chains, to answer particular questions that are formulated at the end of chapter 2; furthermore, to conceive a positive chain-reaction model on how close buyer-supplier cooperation drives production and creates competitive advantage in product development.

Researching previous surveys offers several theories to answer these questions. However, all of them have their shortcomings, as historical origins, economic rationale, and organisational functions of buyer-supplier management and subcontracting differ from society to society.

This study of buyer-supplier relations offers two levels of analysis: theoretical, and empirical. At the theoretical level, it examines detailed historical and contemporary evidence regarding the evolution of traditional American supply systems toward a collaborative Japanese lean supply chain. This evidence serves to clarify the shortcomings of traditional accounts. At the empirical level, two cases in Sweden and Thailand may present two examples of new strategies for ongoing manufacturing and subcontracting activities.

The study investigates some national and international subcontracting relations including the process of supplier restructuring in the different countries. In order to achieve a “right product”, one production process comprises many production actors. Every actor functions respectively and links as well as interacts with others. Their actions in the production process are just like node actions in one production chain. Analysing different cases in Sweden and Thailand, reveals how “node action” and “chain-reaction” may increase product competitive advantage.

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5 Quotation from Peter Hines, Creating World Class Suppliers, p.3.
6 Through this study, I use the term assemblers more often than others such as original equipment manufacturers (OEMs), prime contractors, customers, purchasers, top firms, principle employers, and primary manufacturers, because depending on the context and the way in which they are used, the expression assemblers is maybe more popular and easy to understand comparing with these other terms.
1.4 Research Methodology

Being an essential condition in any successful scientific undertaking, choosing a correct method is dependent on the purpose of the study. In this thesis, methodological problems are involved in the investigation of variables related to a firm’s behaviour and inter-firm relations. In fact, variables are difficult to define and measure. Furthermore, information concerning a firm’s management and partners’ co-ordination, contain values based on the production chain that are sensitive and thus difficult to collect. Finally, some information may be hard to interpret. Since most companies are loath to disclose details of technology and management, either as a matter of general corporate policy, or in co-ordination with their partners; the importance of research methodology in the study becomes essential.

1.4.1 Why the case study method?

As the title shows, the method fulfils the purposes of this research, as it naturally lends itself to a “holistic” view of social reality; to the description of historical development; and the intensive study of a “dynamic” process.

According to Gummesson (1988), among the methods available to the traditional researcher, qualitative (informal) interviews and observation provide the best opportunities for learning. Seltiz et al. (1976) find the case study method preferable for performing detailed observation of comprehensive production.

Since this research requires tracing the development of relations between auto assemblers and their component suppliers, the case study is the most appropriate method. Presenting a more complete picture of the object, including relevant facts, providing detailed descriptions, thus enabling a complete analysis of the strategic choices made.

The activities of buyer-supplier co-operation are interwoven with many others throughout a product life cycle. Consequently, research should report real change processes, considering different viewpoints of the phenomenon and complex environmental relationships. Case study methods facilitate such purposes, allowing the researcher to undertake a broad study, without focusing in advance on a limited number of variables or relationships (Norman, 1976). This method of analysing integrated technological cooperation continues to provide critical insights and information for a better reading of trends in industry.

Because the demand for close co-operation comes, not only from auto assemblers but also from suppliers, the study of their relations requires close observation. It is quite possible that one event, after “the intensive observation approach”, offers an opportunity of perceiving different aspects in their relations to each other, thus enhancing the researcher’s knowledge. This method, therefore, confers a better chance of a total understanding of the study object” (Valdelin, 1974, p.47) and of studying phenomena in their context (Yin, 1984).

In addition to using various sources of evidence, such as documents, organisational records and interviews: visits to the case study sites for direct observation, are also necessary to avoid a unilateral perspective. By interviewing managing directors, marketing and purchasing managers in Sweden and Thailand, multiple measures of the same phenomenon are obtained. The interviews with both buyer and supplier cross-check their responses and degree of co-operation. It is interesting to get different viewpoints from both for the same event or question, because they are at different positions in the production chain.
On methodology, two Chinese idioms are instructive: "If you want to know the taste of a pear, eat it yourself"; and "If you want to recognise the profile of a mountain, observe it from outside instead of inside". During my case studies, I used "inside" observation first, then, a distant view by thinking and reflecting upon my case study results.

Detailed observations reveal many different aspects in relation to each other, thus viewing "the process" within its total environment. Then by analysing and reflecting upon the data, one may arrive at the knowledge formation process.

The process consists of three phases. In phase 1, general contacts are made with suitable researchers and companies, and field work methods are applied during a series of interviews (auto assembler and components supplier series). This phase began during the autumn of 1992, and continued through the spring of 1994. Phase 2 started in spring of 1995, including intensive interviews and close observations, as well as the collection of documents to dwell upon. In particular, on the structure of buyer-supplier cooperation characterising the respective companies. Phase 3 is the conclusion stage (autumn, 1994 and summer, 1995), summarising, analysing and reflecting upon results of the case studies.

However, as Yin points out, case study methods may have certain drawbacks. Two common concerns raised about case methods, relevant in the context of this thesis are: (a) that case study research lacks rigor, and (b) that it provides little basis for scientific generalisations (Yin, 1984).

The lack of rigor associated with the method relates to the question of whether case study findings are inherently more biased than findings based on, for example, a survey. In essence, it is the internal validity of the case that is at issue. Yin (Ibid., p.21) explains that "what is often forgotten is that bias can also enter into the conduct of experiment and in using other research strategies, such as designing questionnaires for surveys." In order to avoid the introduction of bias, Yin cautions, great care must be exercised in case study design.

In this connection, certain criteria for judging the methods quality can be employed as tactics at various phases of the research to maximise validity. For the present study, measures are taken at (a) the preparation phase of data collection, (b) the actual data collection, and (c) the data analysis and reflections. While (a) and (b) are discussed below, (c) follows the case presentation, to be taken up in chapter 6.

1.4.2 Selection of object for investigation

Access is an important factor in the choice of firms for study (Brown, et al, 1976; Gummesson, 1988). Since the aim is to study production chains, it is vital that both the assembler and the components suppliers are accessible. Access to Volvo assemblers and their component suppliers in Sweden and linking to their joint venture final assembly, as well as related local suppliers in Thailand are important determinants of case selection. During the first year, the case study concentrated on Volvo assemblers and their components suppliers in Sweden, then, extended to Volvo in Thailand and its Thai subcontractors during the second year. For comparison with Japanese supplier relations, Toyota and other Japanese auto assemblers and their local suppliers were also visited. Some necessary re-visiting activities continued in the third year in both countries.

1.5 Structure of the study

This consists of an introduction, a conceptual framework with case studies, reflections and conclusions all within five chapters. Figure 1-1 shows how research is implemented.
Part one is the introduction to the topic, comprising one chapter. The first chapter introduces the background, problem setting and goals of the research method and strategy.

Part two presents the conceptual framework within the second chapter defining the central concepts used, reviewing and analysing various ideas that come under the heading of theories of subcontracting, plus relationships between the auto buyers and suppliers. While relating to past research, the discussion lays the ground for a model of the production chain. Two typical supply systems are also introduced.

Part three comprises the empirical work consisting of two chapters with two separate case studies. Chapter three explains the changing buyer-supplier relation in Swedish industry, discussing the co-operation between Volvo and its components suppliers as well as Swedish suppliers' restructuring tendencies. Chapter four presents study results on auto makers and their local supplier relations in Thailand, where international production chains are extended.

Part four comprising two chapters includes case analyses, conclusions and reflections. In order to answer, "why are there so many differences between the two cases"? Chapter 5 analyses the impact of national background and company culture on the development of buyer-supplier relationships, plus a related methodology discussion. Chapter 6 presents (a) general chain reaction theory; (b) a chain reaction model of new buyer-supplier co-operation as a positive chain reaction driven product, with skill formation as well as technology transfer within production chains. Finishing with some reflections on the case studies.

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Figure 1-1 Structure of the study
2 Buyer-Supplier Relationships within Auto Production Chains

2.1 “Cross-sections” of the auto production process

Why is auto manufacturing considered a complex production system? One reason is that the system crosses national boundaries constituting an international production chain. Another is that the system is not expressed simply in a single context but deals with different structural and organisational terms, called "cross-sections" of the production system. In a 1993 article, Odhnoff presents a system analysis of categories and relationships viewed as a complex production.

In this "cross-sections" perspective, three important system levels are involved in auto production. Each cross-section reflects one structure of changes in production and product development, including links between these changes and companies at a certain system level. Thus, these three cross-sections constitute a stereoscopic structure in the production chain.

The first cross-section is "industry organisation" in auto production. The manufacturing process of a car involves many industrial categories. As the "industry of industries", auto production includes the widest of industrial fields and technologies in comparison with other industries. This cross-section depicts interrelationships between different production units in a chain-linked structure, locating it at a high level in the production chain.

The second cross-section, is probably the most important, being the "production organisation", focusing on product development and concerning various links (such as design, assembly, manufacturing, marketing, etc.) with production relationships. In car production, control and management are about relationships between buyer and supplier, including supplier organisation. Traditionally, control and management originate from auto assembly companies acting as a primary sector in the chain. With the emergence of buyer-supplier partnership, product development becomes a mutual concern.

The third concentrates principally on "work organisation", focusing on production organisation at workshop level. In recent years, research concentrates on work organisation models in the final assembly stage. Japanese lean production and Swedish reflective production, both express a tendency that attaches more importance to productive flexibility and knowledge as well as workers' skill formation.

Three types of relations are of particular interest in studying auto production. The main interest here is to discuss great changes in "production organisation" located at the middle level of the chain.

2.2 The model of the auto production chain

Why do production chains exist? One simple fact, as Odhnoff mentions\(^\text{1}\), is to assemble a final product, not all production steps can be combined to produce every component within one company. Therefore one entire production system links producer to user. For example, in order to produce bread, there are at least three production links: growing

\[^{1}\text{See Jan Odhnoff, } Industriella produktionskedjor, \text{Tidskrift av KTH, 1992.}\]
wheat, milling flour and baking. This process, “from ears to loaf”, constitutes a classic production chain. In modern industrial society, production chains extend into many more links.

With increasing global market competition, it is becoming essential that suppliers integrate themselves into the auto makers' product development without ownership ties. Companies spread activities around the world, utilising world-wide operations to exploit and strengthen competitive advantages. Subcontractors delivering technically advanced components become more prominent.

The automotive industrial structure of professionals and workers in plants, seen as a global production system, may be analysed by focusing on diverse "levels" or "sections". The concept "production chain" stresses links between supplier and supplier, between supplier and assembler, and different stages in production sequences inside the production process.

One production chain may involve several or even more industrial fields, transfers over many countries' boundaries at different industrial levels and within different political systems, owning multiple tier-structuring supply networks, global marketing systems etc. The chain is normally steered by a larger company, e.g. the final auto assembler. The leading company may distribute resources and transfer new technology along production chains.

The contents of the "production chain" not only links different production stages but also transforms components into intermediate or final products at diverse production stages (nodes). Transformations are identified as interacting results between two or more nodes. Interesting characteristics are the changes and the major driving forces promoting change including meaningful results, i.e. possible and positive "node-reaction" and "chain reaction".

The links in a chain of development are important. Being difficult to research whole nodes and their links in the chains, this study concentrates only on manufacturing assemblers and component suppliers within their buyer-supplier relationships. By choosing to highlight the "supply chain", the product sequence of the automobile industry itself is included.

Suppliers' different performing abilities influence product development. Clark and Fujimoto mention three supply systems, the traditional US, the typical Japanese and the European. One important standard is the suppliers' share of "engineering efforts", concerning different degrees of suppliers contribution to auto product development. By this standard, the suppliers share is 30 per cent in Japan, compared to 7 per cent in the US and 16 per cent in Europe. The degree of Japanese suppliers product development is the highest, the US being the lowest in the share of "engineering efforts", demonstrating two completely different supplier systems.

According to Clark and Fujimoto in their book "World Auto Industry" (1991, p.137), "the traditional US system" is characterised as a large number of suppliers dealing directly with auto makers on the basis of short-term contracts. Most subcontractors have little engineering capability, and as communication between subcontractor and auto maker is so limited, "the parties behave as adversaries". The auto maker sends offers to the supply markets, so potential suppliers are played off against each other. That is how traditional business relations between buyer and supplier are conducted in the US.

In contrast, the Japanese supply system is a co-ordinated system for co-operation in engineering work as a multi-level, hierarchical system built on long-term relationships (Lamming, 1993), as well as an admired practice in the supply and development of production processes.
Compared to unwieldy American suppliers, the Japanese system is a lean supply chain. Component suppliers are normally single or dual sources. Suppliers are structured in "tiers" or separate levels. Only a few, highly capable, primary subcontractors produce sub-assembled units from parts produced by secondary or tertiary suppliers, acting as first-tier suppliers, having close ties to one assembler, while maintaining distant but still important links to others. Stronger vertical strategic relationships between customers and suppliers exist throughout this tier structure, including those between the assembler and the first-tier suppliers.

The Swedish supplier system is said to be similar to the American\textsuperscript{2}. But obviously it has moved towards the Japanese. It is important to argue that co-operative engineering relations between nodes in production chains are not a "typical Japanese style", even in the auto industry. Chapter 3 offers a more detailed discussion on changing buyer-supplier relations in Swedish industry.

This case study paper is built upon experience from Volvo and its Swedish as well as Thai suppliers. A chain is conceived of nodes: a linked auto assembler and suppliers, where relations between nodes can be described as co-operative partnerships. "Chain-reactions" are transformation processes, some "node actions" starting from one node, continue in several steps to others, reinforcing the positive effects of the initial technological change in several nodes.

\subsection*{2.3 The concept of relationships within production chains}

In order to adapt to an uncertain and fast-changing competitive environment, relationships between organisations become increasingly important. Emphasis is shifting from approaches based upon confrontation towards those implying close co-operation and collaboration. The great change originates in Japanese "lean production" in the early 1970s (Womack et al., 1990). Today it has spread over the whole globe, characterized by a distinct shift in many large auto makers' purchasing policies. See figure 2-1.

Recession and "down size" process (reducing supply sources) brings enormous pressures on the auto industry. Makers and component manufacturers become more competitive, reforming their commercial relationships towards more inter activities than before.

More severe competitive environment in the world auto market leads to closer attention to dynamics and interactions within supply chains. In particular, it is recognized that more co-operative models are required to replace the traditional confrontational arms-length types. The latter having several suppliers to choose from, using multiple sources and a price orientation (Håkansson and Eriksson, 1993), is too inefficient to survive under 1990s conditions. In interviews, final assemblers and suppliers admit being obliged to adopt radical changes in organisations and relationships (see Ch. 3 and Ch. 4).

This interest in new relationships is sparked by basic changes in production methods. With concepts such as "just in time" and "zero defect" determining how auto makers support supplier partnership philosophy, it is necessary to establish a clear definition of the term "supply partnership".

Early in the 1960s, Macaulay defines the role of relationships, pointing out that formal contracts are rarely the most important part of inter-firm deals:

\begin{quote}
Contract... often plays an important role in business, but other factors are significant. To understand the functions of the whole system of conducting exchanges, it must be fully explored (Macaulay, 1963).
\end{quote}

\textsuperscript{2} According to letter from Jan Wiklund to Weihong Wang, Jan. 18, 1993.
During the 1980s, new editions of standard texts began to include passing references to relationships. Within industry and the literature there are many definitions and interpretations of supplier partnership. Cousins (1992) gives the following definition:

Partnership is entering into a long-term agreement between buyer and supplier, the sharing of risks and rewards, of technology and innovation, leading to the ultimate creation of energy and competitive advantage.

Definitions deliberately described methods of operation, not specific goals, ensuring continuous development in a general direction rather than in the pursuit of a specific finite end.

![Purchasing and Supply Market Strategy](image)

**Figure 2-1 Traditional focus vs. current focus in purchasing**

Source: Electrolux (Published in Axelsson & Laage-Hellman, 1991)

According to Womack (1990) and Lamming (1993, 1994), two typical traditional buyer-supplier relations are described as "hierarchy" (vertical integration with ownership) and "market" (wide-ranging enquiry and quotation processes and arm's length dealing). Does there exist a third between these two extreme situations? Williamson (1975) recognised the existence of intermediate forms of exchange between these two. He coined the term "relational exchanges".

Recently, the term "relationship" is applied with increasing frequency to the organisation and activities between a supplier and a customer. The concept of relationship is continually reviewed in theoretical and practical fields. Because of more "out-sourcing", the overall degree of vertical integration has decreased. While marketing changes continually, auto assembler and component supplier have tried to develop their competence through expanding technological capacity. As original marketing relations cannot meet their needs, co-operative development between them is becoming an essential strategy.

Ford (1990) sees that marketing literature tends to apply the themes of consumer marketing to industrial situations, presuming that industrial buyers are passive while
suppliers are able to control the process. More recently, marketing writers have begun to amend this situation especially those working collectively as the Industrial Marketing and Purchasing group (IMP), who have pioneered research into relationships and networks. The IMP “interaction” model sets the activities of buyer and seller in an “atmosphere” defined as a combination of variables. There is reference to the “closeness” of the relationship – the transaction cost may be reduced by improved closeness of the partners – and the control dimension is addressed by analysis of the power/dependence position of the partners. Hardwick and Ford (1986) conclude that the dependence of the buyer upon the supplier may be involuntary, but that the commitment shown is a positive factor.

After Williamson, Dore advances “relational contracting” (1987) based upon the concept of perceived and actual high levels of trust and moral trading in Japan. Then both of Williamson’s and Dore’s concepts are developed by Sako (1992) in her spectrum of relationships from arms-length contract relations to obligation contract (ACR-OCR). The obligation contracting being in the middle range between vertical integration and spot contracting (Nishiguchi, 1994).

Lamming (1988, 1993) constitutes a framework of customer-vendor relations. In his analysis, the relationship is regarded as an independent entity, but without the characteristics of either individual company. It consists of a collection of resources brought together at a finite stage in the value chain for the purpose of adding specific value and performing specific functions. Therefore, Lamming (1993) considers it as a “quasi-firm” or an independent third entity between the customer and the supplier. Like an independent firm, it is possible that the buyer-supplier relationship possesses its own goals, policies and communication mechanisms. This character is shown in figure 2-2. This recognition extends to the shared view of characteristics of relationships that are unique to it: differing from corresponding features of the two partners. The relationship, acting as a “quasi-firm”, stands between customer and supplier. It really develops its own conception, strategy and organisation etc.

In close relationships, it is possible to identify and activate complementary resource bases. Many products are characterised by the need for deep knowledge in several areas of technology. Owing to increasing specialisation, it is not possible for one company to cover all these areas. It is necessary, therefore, to find suppliers who are willing and able to contribute to technical development. One positive effect is an extension of the total resource base. Another is that interactive effects might emerge. In the active confrontation of two resource bodies, innovative sparks can arise (Håkansson, 1987). It is not surprising, therefore, that suppliers have, over time, been increasingly used as a resource in product development.

The other main reason for activating suppliers in development processes is to shorten lead times. When suppliers become involved in the development processes much earlier than they have previously been allowed to be, it is possible to shift certain development activities to them, making it possible to reduce lead times substantially. In part 3 below, the Volvo case identifies this deeper co-operation between buyer and selected individual suppliers to achieve benefits regarding rationalisation and technical development.

Many researchers think that the recognition of interdependence is a crucial feature of supplier partnership; for the position to be called a relationship, a number of features need to be recognised by both parties (Lamming, 1993). These features include a continuing dialogue on issues beyond those normally covered in contractual negotiations, including joint product development, joint actions on quality improvement and access to respective internal organisations. The issue here is often that one of the parties (customer or supplier) perceives a relationship whereas the other perceives itself as the weaker partner in a power-based contractual position.
The relationship itself takes on an identity

Figure 2.2 The supply relationship as a “quasi-firm” between customer and supplier

Source: Richard Lamming, Beyond Partnership: Strategies for Innovation and Lean Supply, UK, 1993

During the course of the case studies, my observations follow Lamming’s “quasi-firm” theory. I wonder: whether this “invisible firm” exists; if so, does it add specific value and perform specific functions? Furthermore, can we consider this relationship as quasi-node in production chains? In the following chapter, one case studying result has identified its emergence, function and links between buyers and suppliers.

2.4 General chain reaction mechanism

In Schumpeter’s seminal work (1912, 1934), innovation (in a general sense) was identified as the major engine of economic growth. He gave a broad definition of innovation that encompasses both techniques and non-technical elements. As we shall show later, in technology-driven economic development all technological elements (including organization and management factors) appear to be dynamically related to one another in a characteristic chain reaction.

The “Schumpeterian” paradigm - broadly understood here as the research program that aims to explain economic development, by emphasizing the role of technology as a driver of the process, - has evolved in the course of a number of decades to explain economic growth as a continuing phenomenon that involves two basic chain-reaction mechanisms. The first to be articulated depends on the existence of returns to scale in production and non-zero price elasticity of demand in the market place. The second chain-reaction mechanism depends explicitly on investment in R&D to drive technological progress. These two chain reaction models were described by Ayers and Zuscovitch (1990) as follows:

(1) The returns-to-scale cycle
As economic growth continues and more purchasing power is distributed through the economy, demand can be oriented toward other (customer or producer) goods and the chain reaction - increasing demand, increasing scale of production, lower unit costs - starts all over again. The returns-to-scale chain reaction is illustrated schematically in Figure 2-3.

Effective in later (adolescent maturity) stages of the product-cycle, subject to:
(1) Price elasticity;
(2) Returns to scale in production.
The later, in turn, require standardization i.e. mass production.

Figure 2-3 Cost-price-driven product


(2) The returns-to-R&D cycle
The second chain reaction model is described below: technological progress makes for product improvement. This results in market leadership and profit leadership, which in turn permits further investment in R&D maintaining technological leadership. A schematic version of the cycle is shown in figure 2-4.

Applying general chain-reaction principles to the case studies, we could constitute a new positive chain-reaction model driven product through close buyer-supplier cooperation along auto production chains.
2.5 Theories of buyer-supplier relationship

2.5.1 Dualism

What is the major driving force of a buyer-supplier relationship? Some researchers explain it with a theory of dual economies.

The essence of a dual economy is that economic sectors located in different segments of the economy are treated unequally, leaving their objective worth out of consideration. Since the 1950s, the theory has been used extensively to describe inequality in labour markets - between the internal and external markets (Kerr, 1954; Wilkinson, 1981 etc.) - between the core and peripheral economies (Averitt, 1968).

In the late 1960s, through analysing the dynamics of American industry structure, Averitt advanced a theory of the dual economy (1968). According to the theory, American industrial society was divided into two distinct but related sectors, that is centre economy and peripheral economy. The peripheral economy composed of small firms has the longest history but is now the less important. The centre economy is rooted in key manufacturing industries and mass retailing, where large firms predominate.

Averitt defined the peripheral firm as follows:

- The periphery is populated by firms which cannot, given their present size and structure, achieve potentially limitless long-run growth. When their productive capacity increases beyond a certain level, long-run average costs necessarily rise (Averitt, 1968, p.86).

- Centre firms, through structural metamorphosis, have freed themselves from the conventional restraints on growth. The centre economy is composed of these firms whose long-run average cost curves potentially rise as capacity increases, but may not actually do so. Centre firms have thwarted potential increases in their long-run costs in several ways. They have circumvented the diseconomies of greater-than-optimum plant size by duplicating plant facilities; a single product can be produced

in many plants as firm output increases, with every plant approaching the size of operations producing optimum efficiency (Averitt, 1968, p.105).

The essence of the modern dualism theory applied to industrialised economies is its disequilibrium between economic agents, which may be workers or firms, located in different segments of the economy, regardless of their objective worth. Whatever the differences in conceptual formation and terminology, dualists see inequality between the primary and secondary sectors, or between the central and peripheral economies.

Nishiguchi (1994) applied the theory of the dual economy to the language of subcontracting, and commented:

These dualism theories can be interpreted as follows: Neither workers - often with a temporary status and/or in peripheral firms in the external labour market or the secondary sector - nor small firms - frequently subcontractors in the peripheral economy - receive what they are worth. That they do not earn what the market dictates is built into the structure of dualism rather than based on their individual skill levels (Nishiguchi, p.9, 1994).

Berge and Piore (1980) analysed an application of the dynamic theory of larger buying and small size supplying firms. They thought that the dual economy would help large firms to survive in a world of uncertainty and flux, through shifting many of the productive process - and therefore the risks - to the secondary sector. They cited French and Italian examples in which the origins of this strategy are seen as a corporate response to the massive wave of strikes in the late 1960s in both countries that halted production and, through subsequent legislation, made labour contracts in the primary sector more rigid. Resorting to flexible subcontracting is seen to have resolved the problem.

This disequilibrium existed in traditional auto production. Primary sector (normally being auto maker or final assembler) used to dominate and control many small size component suppliers acting as secondary or peripheral sectors, mostly with weak engineering ability, where buyer-supplier relations in the auto industry seem to benefit only the primary sector. The final auto assemblers want their suppliers to be more flexible, especially in a rapidly changing competitive environment. When market demand is booming, suppliers are used extensively, but when it contracts, some of them are forced out. Obviously, suppliers are not satisfied with this unfair competitive situation, and want to emerge from this peripheral position. This triggered the development of new buyer-supplier relationships.

Although the dual economical phenomenon is not so obvious in Sweden, probably because of its small size in the domestic market and highly internationalised industry, we can still divide Swedish auto assemblers and their suppliers into primary and secondary sectors. One Swedish observer argues that Swedish auto assemblers hope their suppliers are as thin and flexible as Japanese lean supply chains; whereas Swedish suppliers set their minds on selling products and building their self-confidence with the object of long-term development3.

Dualism, as a major driver, stimulates suppliers’ restructuring in the auto industry to break up inequitable competition between final assemblers and component suppliers. Assembler and supplier seek a new co-operative partnership which is quite different from traditional "adversary" and "arms-length contractor relations". Buyer-supplier relations are built upon mutual confidence and long-term cooperation.

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For suppliers, various ways of restructuring themselves and achieving new partnership are through:

First, peripheral suppliers increase vertical integration with a central assembler through close co-operation, so suppliers systematise themselves into a tier structure, then, the first tier supplier is involved in assembler’s product development much more than before. Companies activities become part of activity chains with their resources forming parts of greater resource constellations within whole production chains. One purpose of the close relationship is to integrate suppliers with internal resources for production and development. Efficiency comes from integration (e.g. shortening lead time). In chapter 3, some examples of cooperation in "Advanced Engineering Process" between Volvo and its first suppliers confirm this point.

Secondly, some suppliers enhance their horizontal connection with the same sort of subcontractors, acquiring more technological help and improvement from their colleagues. So that new suppliers structure moves towards vertical and horizontal integration, with a more specific network model emerging. An important characteristic of the network approach is that it blurs company boundaries. Legally, a company should be a clearly defined unit. From a resource and activity point of view, however, it is not. For horizontal cooperation extends resources and abilities of a company without strictly limiting its boundaries. Thus the efficiency of the company is not only determined by the design and performance of its own activities and the allocation of its own resources, but also by the way activities and resources are related to its cooperative partners. This case study observes the role of the horizontal cooperation in new buyer - supplier partnerships.

Thirdly, a few small size units producing very special parts diversify through seeking extensive co-operation with different primary sectors in different fields. In this situation, they may be involved in several production chains. Normally, they are quite independent in technology with weak cooperation vertically and horizontally.

Consequently, auto makers extend assembly processes to many first tier suppliers, acquiring greater flexibility, while suppliers increase their technological capacity in a number of ways in co-operation with assemblers or colleagues in technical development, under a stable and longer-term partnership.

2.5.2 Flexible specialisation

According to Piore and Sable (1984), industrial development has experienced two important divides, the first at the emergence of mass production during the beginning of the twentieth century. We are living now through the second industrial divide. Extrapolating from current developments, Piore and Sabel claim that two contradictory alternative strategies are available. The first builds on the dominant principles of mass production technology, inherently inflexible in its use of machines and semiskilled labour to produce standardised goods; the second strategy diverges from established technological principles leading back to those craft methods of production that lost out at the first industrial divide.

With the resurgence of flexible specialisation, mass production technology and existing regulatory institutions based on mass production principles are crumbling, being too rigid to adapt to a fast changing market situation.

As Piore and Sable point out, if industrial society is to become prosperous again, it must adopt institutions and production methods based on principles of flexible specialisation: a derivative of the craft model of production that mass production replaced.
The core of the second strategy is to adopt flexible specialisation technology, which allows skilled workers to use general-purpose machinery to turn out a wide and constantly changing assortment of goods for diversely demanding markets.

Evidence from various regions in the world indicate this strategy's resilience to changing realities. A typical representative of the first strategy is Japanese lean production - based on mass production dramatically extended to existing regulatory institutions. It is considered a successful flexible model compared with traditional mass production. Swedish reflective production, as a good example of the second strategy, is characterised as being more flexible than lean production (Ellegård et al., 1990). Figure 2-5 gives a simple illustration of the progression of production forms in the auto industry.

![Graph showing progression of production forms in the auto industry](image)

**Figure 2-5** The progression of product variety and production volume in the auto industry

(based on Womack et al., 1990, figure 5.7, p. 126)

Reflective production, tested in Volvo Uddevalla Assembly Plant, is designed according to principles of craft production. Stationary dock system replaces the traditional assembly line in the factory. The assembly shop presented in June 1986 is based on a functional assembly sequence and its 1/4-cars. The "Uddevalla model" combined a complete abandonment of the assembly line principle with a compressive organisational decentralisation, some unique features were as follows:

- Assembly of stationary units - there is no assembly line;
- Small team builds entire car;
- Materials supply with kits for individual cars.

The Uddevalla model has created a good example of achieving efficiency and flexibility, called "reflective production" (Ellegård et al., 1991). A main advantage is that it meets the human need to actively reflect on daily activities. Additional advantages of such highly paralleled production systems are improved mix and volume flexibility. From the view of Ellegård et al. (1991, 1992), the new production concept in final assembly is as efficient
as lean production for high productivity, high capital turnover and high product quality, in addition to being socially efficient and more flexible.

Although the Uddevalla Plant was once closed down due to some special reasons, reflective production, as a new production concept developed and refined from lean production, is positive and meaningful in promoting the process of "flexible specialization" in the auto industry. Volvo has acquired useful knowledge from Uddevalla's experience, now disseminated to its other assembly factories. For instance, one "Special Vehicle Operations Workshop" in Volvo Car International AB is called "a small Uddevalla plant". In the workshop, special cars are assembled within the stationary duck system without an assembly line, with most of its production organization and management thinking coming directly from the Uddevalla. In fact, the Uddevalla Plant is now opened again!

In auto industrial development, the importance of flexible specialisation is clearly understood by many more companies, even in Japan, the birthplace of "lean production", greater changes are under way. As Berggren (1993) presented in "Toward Normalization", lean production is moving towards more flexible methods.

According to Berggren, the new guiding principles in the Japanese planned, "Dream Factory" are:

- Good working environment and high safety standards;
- High flexibility;
- Friendly to the natural environment.

Based on these new principles, in Tahare, Toyota's tenth plant started in 1979, the assembly line is divided into eight "mini-lines", with a five-minute buffer at the end of each section to increase on-line quality control and make each section self-completing. Much more effort is put into improving ergonomics and flexibility than at traditional Toyota plants.

Toyota's "Dream Factory" is quite similar to Swedish reflective production in flexibility of thought and organisation. Both argue: "We have a choice; a more socially efficient, flexible and humane alternative exists". Whether Volvo's "Uddevalla mode" or Toyota's new "Dream Factory" can prevail, "flexible specialization" is becoming an inevitable tendency of industrial development. It is possible to abandon standardised mass production seeking prosperity through a system of flexible specialization in industrial society.

In order to assess a firm's flexibility, Nishiguchi describes five kinds of plant-level flexibility:

1. Mix and variants of products - to accommodate a mix of product and variants, measured by changes over time, changes over frequency, and the number of variants in a given set of manufacturing facilities.

2. Design changes and new products - to accommodate these as measured by the lead times for a new set of fixtures and tooling, especially dies.

3. Manpower flexibility - to adjust to fluctuating product mixes, without increasing the size of the work force through its flexible inter-process mobilisation, as measured, by proxy, by the number of job classifications and the multiskill levels of the workers.

4. Inventory levels - achieving the foregoing requirements without resorting to production buffers (which increase storage costs while masking quality problems), as measured by inventory levels.
(5) Delivery performance - making quick and frequent deliveries to the customers, as measured by just-in time (JIT) deliveries (Nishiguchi, 1994, p.194).

Obviously, the just-in-time (JIT) system is a very important factor when discussing flexibility. It is already widely applied both in production and purchasing, being more a company philosophy than a manufacturing tool, as it defines the way a delivery process should be managed. Hines (1993, p.44-45) points out six principles of this management process:

(1) Just in time - producing finished goods just in time to deliver them, producing the semi-finished products just in time for assembly and re-supplying with purchased parts just in time to use them.

(2) Stockless production - From a well-buffered situation (with as much inventory as is needed to cover problems) to an un-buffered situation (with as much inventory as is needed to identify problems).

(3) Preventing waste - The minimum of materials, parts, space and work time necessary for adding value to products.

(4) Flow production - Manufacturing as a flow without interruptions: raw materials moving through to a finished product without unnecessary handling or time wasting.

(5) Pull system - A movement from a situation where production determines the flow of materials to one in which the flow of materials determines production.

(6) Dynamic responsibility - A movement based on the needs of the material flow.

The JIT system of supply delivery, invented by Toyota in the late 1940s, spread quickly to the US and European auto industries during the 1980s. When JIT was first introduced into the West, the effect was that inventories were moved to an earlier stage in the production chain. This was found in a comparative study of JIT in Europe, Japan and the USA (Nishiguchi, 1989). In the US auto industry it was observed that suppliers increased their delivery frequencies. However, these deliveries often came from newly established warehouses. The inventory business in Detroit was booming; one company even picked the name “JIT Warehousing” (Raia, 1988). Lamming comments that this sort of the JIT system benefits only buyer or customer but not suppliers (1993, p.206-207). Nishiguchi also points out that this JIT is not a real JIT (1994, p.202-204).

It seems that there are two different JIT systems. But what is the real situation in Volvo? Does a third JIT exist in Sweden? What is the role of JIT in a new buyer-supplier relationship?

New buyer-supplier relations arising from changing environments vary in tone and detail, requiring both partners to become more flexible than before. But, if there were significant differences in flexible capabilities among them, it would surely affect the overall performance. It requires that both buyer and supplier achieve flexible specialization at same level and time. Otherwise, the flexible operation may create more problems than solutions.

2.5.3 Voice relations and the importance of trust

More than two decades ago, meditating on service deterioration in Nigerian state railways, Hirschman formulated a theory of “response to decline in firms, organisations, and states”. He postulated two types of response to such problems: “exit” to a better alternative; and “voice”, defined as “any attempt at all to change, rather than to escape
from an objectionable state of affairs” (Hirschman, 1970:30). This theory has been extended to other institutions since then.

Applying Hirschman’s concepts of exit and voice, Helper (1991) proposed a further extension: beyond individual consumers’ response to deterioration of quality, to include response to problems of various types arising between customer and supplier firms. In this situation, agents’ choices of exit or voice as a method of problem resolution turns out to be an important strategic decision, one with implications for all parts of the organisation, not just for purchasing. “Exit” in this context means if a customer has a problem with a supplier the customer finds a new one, while “voice” signifies a relation where the customer works with the original supplier to resolve the problem. These relationships imply different values on two dimensions, information exchange and commitment. These are combined in a simple model. See figure 2-6.

![Figure 2-6 Dimensions of supplier relations](source: Susan Helper, 1991)

In this model, quadrant 2 depicts voice relations and quadrant 3 exit relations. To apply an exit strategy the customer must maintain a credible threat to leave the relationship. Thus, the commitment is low, and so is the information exchange (quadrant 4), being what Helper calls a stagnant relationship. As an example, American General Motor’s relationship with its Fisher Body division in the 1970s. By contrast, it is not possible to have high information exchange if there is no long-term commitment, so quadrant 1 is not feasible, because information exchange is costly and requires trust.

Implicit in Helper’s account of voice-based relations is the need for trust between participating firms. Trust is a concept traditionally not analysed by economists, being difficult to pin down in existing relations. Nevertheless, it has attracted a lot of interest as an important element in new industrial patterns. A useful introduction to this discussion is provided by Edward Lorenz, in an article with the apt title “Neither strangers nor friends” (Lorenz 1988). His analysis is not based on studies of automotive corporations but on observations of changing relations between small and medium-sized engineering firms in France. That is of particular relevance here, since this study is concerned not only with relations between the Swedish auto makers and their component specialists, but as much with relations between the component specialists themselves (often medium-sized operations) and their suppliers (being small enterprises in most of cases).

In his French studies, Lorenz found that since the early 1980’s medium-sized firms had begun subcontracting a large number of their mechanical operations to smaller firms. Interestingly, the customer firms tended to describe their relations with the smaller subcontractors as partnerships and not as simple market relationships. Their managers emphasised “the importance of loyalty, the existence of a moral contract and the need for mutual trust” (196). Lorenz noted this and pointed out three related questions:
- What are the mutual obligations implicit in a partnership?
- How does a firm decide if it can trust another?
- Can trust be internationally created?

According to Lorenz trusting theory, trust presupposes a situation of risk and uncertainty. There must be a real chance that the other player will behave opportunistically. If there is no risk, no trust is needed.

In inter-firm relations, an important theme is the term “transaction costs” including both the cost of reaching an agreement, of adapting that agreement to unforeseen circumstances and of enforcing its terms. Lorenz argues that if “transaction costs are thought of as friction in the economy, then trust can be seen as an extremely effective lubricant” (198). Information sharing is no substitute for trust. It is not enough for firms to come together and disclose information on their costs and revenues. They must also trust each other’s word. Economists generally assume that the narrow pursuit of interest results in efficient economic exchange. The consistency of each party’s behaviour must be observed and tested over a considerable time; it also takes time to create the personal rapport essential for smooth information exchange and effective adaptation to contingencies. Finally trust-building involves a set of polices and safeguards which cannot be treated as expediencies. However, while trust-building is costly, lack of trust is more costly still. It can be built internally - but again, only if the parties are prepared to behave consistently over a long period, investing in a broad spectrum of interaction and personal contacts.

2.6 Changes of purchasing strategies

The emergence of the buyer-supplier partnership concept in auto production chains results in auto manufacturers changing many requirements to their suppliers. Three major auto makers objectives are characterised by Grant and Gadde (1984):

- Auto manufacturers want suppliers to take more responsibility in product development;
- Auto manufacturers are interested in buying systematic components rather than individual products;
- Auto manufacturers want to establish integrated production systems based on the just-in-time concept.

All these changes alter auto maker's purchasing activities, redirecting purchasing from money-saving activity towards new cooperative strategy. Gadde and Håkansson (1994) argue that the strategic purchasing context for the partnership model is very different from that of the traditional model, and similarly for just-in-time exchange versus market exchange.

Strategy becomes the art of creating value, whereas function is just one of many tactics to fulfil correspondent strategy. One correct strategy provides the intellectual framework, conceptual models, and governing ideas allowing a company to identify opportunities for adding or creating value and for delivering that value at a profit. In this respect, strategy is the way a company defines its business and links together the only two resources that really matter in today's economy: knowledge and relationships between different sectors in the value chain.

In order to fulfil auto makers' objectives, the new purchasing strategy can be identified in two dimensions: the first: whether to buy or to rely on in-house production; the second: suppliers’ structuring and organisation governing relations between auto maker and supplier or inter-structure within supply chains. The latter issue regards the number of suppliers to use, as well as how they relate to one another. When a buyer-supplier
relationship turns into a partnership of just-in-time exchanges, the suppliers become part of the buyer’s production chain. Both may benefit from this new purchasing strategy.

- Making or buying
This has been a major topic since industrial activities were established but it has not been considered a strategic problem by manufacturing firms. In fact, the traditional buyer-supplier relation is kept at two extreme points: (1) “making” inside with a total vertical integration; (2) “buying” outside as a pure business relation without any co-operation.

However, rapid changes in the market, plus the inflexibility of in-house production, made buying a cheaper alternative except for very few important components. Japanese lean production success verifies this point, causing traditional vertical integration to decrease in recent years. This is illustrated by examples in Gadde and Håkansson (1993). In a study of four large multinationals in the Swedish engineering industry, it was shown that components and systems purchased from outside suppliers accounted for about two-thirds of the turnover. In a study of 123 Swedish companies, purchasing accounted for more than 40% of the turnover for 70% of the companies. For almost every fifth firm, the proportion extended to 70% (Håkansson, 1989).

- Suppliers restructuring
After deciding to buy from a supplier, the new purchasing strategy is based on how to select a supplier and organise the supply-base structure. This strategy starts by reducing the number of suppliers having a direct contract with the auto maker (the first supplier), then deals with organising a second supplier level with other lower tier suppliers to create a hierarchical supplier chain.

The number of suppliers has always been an important aspect of purchasing strategy. In traditional relations, the major function of purchasing was saving money. So that a group of suppliers for the same part was better than only one - mainly in terms of price. At that time, purchasing from single sourcing was considered an “invitation to disaster” (Newman, 1988), because buyers implementing single sources would lose opportunities for price control, as well as diversification of risks.

Today, it is argued that single sourcing or dual sourcing leads to an increase in the reliability of supply. Purchasing firms reduce the number of suppliers and strengthen their relationships with the remainder to establish very efficient logistical systems with them. One reason for the changing view is the insight into the advantages that can be obtained from more co-operative relationships with a reduced supply base. Activities that deepen individual relationships have an effect on the supply-base structure as a whole.

Regarding price control, reducing supply sources is verified as positive, where single or dual sourcing are built on a long-term contractual relation. Whereas long-term price contracts are important for auto makers to increase their control over future costs and consequently, over the behaviour of their suppliers, for example, in demanding “open book” and continuous “price reductions” etc. This can benefit suppliers, because not having done that before, now they have to take a hard look at all their operations and launch long-term productivity improvements. Price is only one of the costs affected and changed, when purchasing activities are radically altered. Gadde and Håkansson (1994) argue that re-organisation of the supply-structure can affect and improve a number of indirect cost factors, for example, rationalisation of administrative costs, production costs including material flow costs.

New partnership requires the supplier base being "leaner" than before. Multi-sources are replaced by single or dual source. By being responsible for product development and systematic component supply, rather than individual parts, auto makers increase co-operation and interaction.
This reducing process is obvious in the world auto industry since the 1980s. General Motors reduced its supplier base for its Quad-four engine from 140 to 69 through single sourcing (Offidile and Arrington, 1992). Results of a US survey of more than 1000 suppliers show that the average number of firms competing with the average supplier to produce the same product for a given customer decreased from 2.0 to 1.5 in five years (Helper, 1991). Such changes for specific components and firms have substantial effects on the supply structure as a whole.

The effects of various organisational forms are illustrated in a study of supplier relationships in the auto industry (Gadde and Grant, 1984). The number of suppliers dealing directly with auto manufacturing showed substantial variability. General Motors, in their US operations, used around 3,500 suppliers and Volvo Car Corporation relied on 800 suppliers. But only around 200 suppliers delivered directly to Toyota and Nissan in spite of the fact that the production output of these companies was closer to that of GM than that of Volvo at that time.

In fact, from country to country, and from company to company, the organisation of suppliers restructuring went different ways. For example, Volvo was more familiar with the American style, having a GM model at that time. The strategy of supporting competition among suppliers through multiple sourcing resulted in fairly "wild" structures. Toyota and Nissan organised their suppliers into hierarchies. Only suppliers on the first level delivered directly to the customer. These were made responsible for just-in-time deliveries. They became more "system" than "component" suppliers over time, and were to an increasing extent responsible for product development, being responsible for the activities of suppliers at other levels in the structure.

One interesting thing is about "single source". The early impression of the Japanese supplier structure was its single sourcing. More recent research, however, shows that this is true only for large complex systems requiring massive investments in tools. In other supply situations, however, two or more vendors are used (Womack et al, 1990). Richardson (1993) characterises the purchasing strategy of Japanese auto-manufacturing as "parallel sourcing". This system is observed when the car manufacturer produces a number of models at different plants using a sole source for a component of one model at one assembly plant, while another is used at another plant. A second aspect of parallel sourcing is that some components can be common to various models and may have multiple sources, while still being sole sourced for a particular model. The same situation exists in the Volvo case study.

2.7 Emergence of cooperative manufacturing

One important reason for Japanese producers' competitiveness is the nature of their subcontracting, emphasising synergistic problem solving, rather than antagonistic bargaining, under the prerequisite of a long-term relationship. In this new subcontracting partnership, prime contractors benefit from the subcontractors' enhanced performance, and the result is better design, higher quality, lower cost, and timely delivery. At the same time, the establishment of rules to fairly share the profits from collaborative design and manufacturing encourages subcontractors' entrepreneurship and their symbiotic relationships with their customers. Benefits from the subcontractors' commitments reach their customers as well.

In this process, technologies are transferred among firms. Customers teach a variety of skills to their subcontractors in the interest of maintaining product quality. Asset-specific features of contract-assembly and system-components manufacture contribute to stabilising contractual relations, providing further incentives for the subcontractors increased (e.g., "black box" design), while subcontractors begin to offer their own technologies to their customers.
It seems that the assembly line has been extended from final assembler to subcontractors. It is in the assemblers’ best interest that their products assembled by system suppliers do not lose competitiveness through poor manufacturing operations. Along with assembly lines, the “composite” know-how that contributed to upgrading the subcontractors’ conventional (and frequently deficient) skills was also transferred through the production chains. By drawing them into product development and demonstrating more “composite” skills, this new breed of sub-assembler (normally system or function supplier) can reasonably expect long-term growth through continuing contracts and may better allocate their resources for the future. Therefore, the emergence of a subsystems manufacturer and function supplier noticeably changed the logic of assembler-supplier relations towards “collaborative manufacturing.”

2.8 Development of integration

New relationships result in a new purchasing strategy, which also promotes new partnerships. One distinct effect is on the development of supplier integration. When the number of suppliers is reduced, the customer becomes more dependent on individual suppliers. The underlying reason is that reducing the number of counterparts is a prerequisite for improved and deepened supplier relationships.

Summarising our discussion, two tendencies are identified:

1. Because of “in house” production inflexibility, auto makers increasingly buy components from suppliers instead of making them themselves, in order to reduce the degree of vertical integration;

2. Wide-structured and individual part manufacturers are reorganising as a more systematic and network based supply chain, including a reduction of the supply base, and improvement of co-ordination among selected suppliers, in order to increase the suppliers’ degree of vertical integration within production chains;

Here, it seems there is a contradiction. The primary motivation of supply-base structure is to decrease the degree of vertical integration. Whereas in the final result selected suppliers are integrated into auto makers’ production development much more than before. Going through supply structure, a new form of integration replaces the old one.

In order to explain the difference between these two integrations, it is necessary to compare the traditional and new partnership model. Based on empirical observation of the industry, Lamming describes the proceedings of the relation as a four-phase model (1993). This takes a dynamic view identifying a four-phase development process from the traditional (prior to 1975) to the partnership model (after 1990).

The strategic purchasing context for the partnership is very different from the traditional model, equally for just-in-time exchange versus market exchange. The traditional American buyer-supplier model can be described as larger in-house component operations with a higher degree of vertical integration as well as less co-ordination. This in-house production model proved too rigid to compete in a rapidly changing market. The authors therefore warn companies against too high a degree of vertical integration and advocate a “buy” strategy. In fact, this traditional vertical integration has decreased in recent years.

Miles and Snow (1986) predict that this trend will continue in the future. A strategic shift of this kind can lead both to advantages and disadvantages, the changing environmental conditions and new competitive forms result in industries being characterised by completely new organisational forms. They suggest that the functions necessary to an
industrial system (such as design, production and marketing) will be performed by specialised companies, each one undertaking separate functions. Such dynamic networks are supposed to be fairly loose coalitions intertwined by “brokers” responsible for the integration of the functions. Such an industrial system is characterised by a lack of vertical integration.

In contrast, Kumpe and Bolwijn (1988) argue that the degree of vertical integration will increase in the future, because value chains today are characterised by an imbalance in the distribution of the dual economy. Firms in the final stages of the production chain (assembly and marketing/distribution) usually tend to be profitable, while profits in the earlier stages (such as component production) are generally substantially less. For the value chain as a whole to be competitive, however, there is a great need for investments in these stages. Taking an example from the auto industry, the situation is just as Abernathy said: “The car itself is now a styling concept, the technology is in the components.”4 It is an obvious risk that the investments necessary for long-term competitiveness (in design, product development and component production) may never be undertaken, suppliers being unable to raise the necessary financial resources. Therefore, Kumpe and Bolwijn argue, firms in the final stages of the value chain may be forced to integrate backwards and provide these resources; otherwise suppliers might be driven out of business, implying severe problems for the customer.

It is clear that the two conceptions of vertical integration are quite different. The former degree of integration is traditional, based on ownership ties. As we have seen, vertical integration in this respect has decreased over time, being replaced by informal arrangements that keep industrial networks together. This new network-based model is called “quasi-integration” by Blois (1972). Gadde and Grant (1984) comment:

Quasi-integration is actually a different dimension of integration than tapered integration. It can be defined as a relation between two vertically related firms controlled through long-term contracts instead of full ownership (Gadde and Grant, 1984, p. 8).

The form dominating Japanese industry is just this sort of quasi-integration, where supplier relations are built to a higher degree upon mutual confidence and long-term cooperation. In industry, the various ways of achieving quasi-integration include auto maker investments in production tools, joint product development and various forms of financial support. It is apparent that these informal mechanisms are increasing in importance over time. Through quasi-integration arrangements auto makers can provide suppliers with support, without moving back to ownership relations. However, buying firms will not be free to change suppliers easily. Investments undertaken on either side of the dyad may restrict the opportunities to change supplier. In this way, prime sectors benefit from the new arrangements by being able to adjust, shifting and pulling ahead of the competition; secondary sectors enjoy relatively stable contractual relations, together with more responsibilities and greater commitments from their customer.

2.9 Major existing questions

After theoretical review above, a summary of the major existing questions in the study is listed below:

1. If buyer-supplier relationships are greatly changing, what is happening in the auto industry? How many sorts of buyer-supplier relations are there? What is the developing tendency in the future?

4 Quoted from the title page of Beyond Partnership, Strategies for Innovation and Lean Supply, Richard Lamming, 1993.
2 On supplier integration, why do the changing buyer-supplier relations first depart from reducing integration, and then later return to increasing supplier's integration again? What is the role of quasi-firm integration in auto makers' "product development" process?

3 As mentioned above, if there are two different JIT systems, what is the Swedish JIT style?

4 Within international production chains, do the buyer-supplier relationships change from country to country, and from company to company? If yes, why are there differences?

Based on the answers to these questions, I reflect on the general chain-reaction mechanism to build up a model of a positive chain-reaction driven product, if close buyer-supplier cooperation exists.

Following this theoretical basis, the later empirical case studies are designed to develop these questions.
3 Case 1: Changing Buyer-Supplier Relations in Swedish Auto Industry

This chapter describes the developing process of buyer-supplier relationships in the Swedish auto industry, based on Volvo and its suppliers cooperation. Jan Wiklund, a former General Manager of the Swedish Vehicle Components Group, contributed an important research question: "Why has customer and supplier collaboration not developed further in Sweden"? Developing relationships between Volvo and its suppliers is the key focus in this case study.

3.1 The Swedish auto framework and suppliers involvement

To manufacture a small car, from basic components (excluding raw materials processing) through final assembly, using modern technology, combines a great range of materials, components and systems. Figure 3-1 gives an illustration of the Swedish automotive cluster. Today, no single industry can drive or promote development in so many other industries, as auto manufacturing does.

Making a modern car contains an assembly of more than 10,000 large and small components requiring hundreds of work-hours to produce. Co-ordinating in-house manufacturing with suppliers is especially difficult when hundreds of subcontractors contribute parts, materials, or assembly services. Organising all this efficiently is probably the greatest challenge in motor vehicle manufacturing.

The Swedish vehicle industry consists of two major car manufacturers, and more than three hundred suppliers producing original equipment, parts and accessories, including products for after sales service.

Volvo began in 1927 with passenger cars but soon moved into commercial vehicles with a light truck based on the same chassis as the automobile. Volvo started as a spin-off firm from the bearing firm SKF, set up by A. Gabrielson (a former employee of SKF) and G. Larsson. In establishing the new manufacturer, Volvo was aided by a number of advanced Swedish suppliers with low labour costs compared to other producing countries. Volvo developed a global orientation, including cars, trucks and buses. In cars, increased competition in the standard segment pushed Volvo to develop its speciality towards luxury cars and estate wagons. Now Volvo Car Corporation is known as a passenger car producer.

Saab, a manufacturer of military aircraft, diversified into automobile production in 1940s. The first prototype was shown in 1947, and the first series introduced in 1949. In 1969, Saab acquired Scania-Vabis, forming Saab-Scania which now includes production of cars, trucks and buses, in addition to military aircraft. In the late 1980s, Saab-Scania sold 50% of its automotive manufacturing to General Motors, forming Saab Automobile.

While the importance of car companies is generally recognised, fewer researchers reflect upon the significance of automotive supplier firms, though more than half the value of a car comes from components. The suppliers provide the car companies with almost all the components, such as braking systems, seat belts, exhaust systems, radiators, heating and air conditioning, springs and so on. Many of these direct suppliers in turn have second-tier or lower tier suppliers of raw materials and parts; the largest
component firms deal with more than one hundred different suppliers. The Swedish supply system to the automobile industry is a large and heterogeneous group. Of the about 300 auto components suppliers, more than 100 are organised in Svenska Fordons Komponent Gruppen (SFKG), i.e. Swedish Automotive Component Group. Most of members of the group are small domestically-oriented firms, only a few are internationally competitive suppliers.

![Diagram showing automotive supply chain]

**Figure 3-1 The Swedish automotive cluster**

Source: Sölvell, Ö., et al. (1991), Advantage Sweden, p.102

### 3.2 Recession and new purchasing strategies

After decades of outstanding international success, Swedish industry entered a period of severe recession. In 1989 the ailing car division of Saab was sold to General Motors and since 1990 Volvo has seen its position dramatically reduced. The total production output of both reduced from 557 900 cars in 1987 to 295 000 in 1992, only 53 percent of the 1987 level. From 1993 to the present, a pleasant change approaches with the industry recovering.

Recession pushed Swedish suppliers into "down size" in assembly and component producing plants. The industry reduced domestic suppliers from 30% to 20% at that
time. In 1992, Volvo cut down its suppliers from 542 to 400 first, then to 300. Among these, some were driven out of the production chains; others might restructure themselves as lower tier suppliers.

The tendency of suppliers to "down size" is continuing, as Swedish industry seeks more international suppliers co-operation. Saab purchased only 20% of its components from Sweden in 1992 but 45% in 1990. Volvo's domestic purchasing rate was only about 26.2% in 1994. Among the 20 largest suppliers of Volvo Car Corporation, only 6 are domestic suppliers (Torsmaskiner for exhaust systems, Töcksfors for cable and electric warming systems, Raufoss for bumpers, Autoliv Sverige AB for safety belt and air-bag systems, Perstorp Sunwind for decoration designs). The others are international suppliers.

Recession radically alters traditional views of purchasing. From being a money-saving activity - buying as cheap as possible - it is now a resource-planning function. Purchasing becomes central to the whole cost-reducing, innovation-enhancing, market-competitive positioning of an organisation, evolving into business relationship management within a high-visibility, strategic context. Purchasing moves from a clerical function towards a new strategic role. In Sweden, the new purchasing strategies of auto makers are changing towards reducing supplier numbers.

In deciding whether to make or buy, there is a clear trend towards the increasing importance of "buy". Since "in house" production lacks flexibility in a rapidly changing market, Saab is moving towards single sourcing: one supplier for each part. Historically this is a new phenomenon to reduce fragmentation of already low volumes. Another is to focus resources on supplier relationships, a strategy which sometimes includes long-term contracts and regular audits of supplier performance. This "regrouping" activity has been forced upon component makers through manufacturer demands in areas of price and quality.

Volvo prefers dual sourcing, and certainly so for critical components. One of Volvo's Purchasing Managers explains1,

It is important to have some sort of competition, that keeps them honest and keen. One example is the exhaust system. Volvo has two exhaust suppliers now, Torsmaskiner in Sweden, and Cheswick in Holland. Both supply their products separately to Volvo-Torslanda, Volvo-Skövde and Volvo-Gent. They are competitive yet co-operative with each other. An important principle in Volvo supplier structure is to support sound competitive balance, taking action to avoid monopolies.

System thinking is another way of reducing suppliers. Regarding a car as a product, system thinking means letting suppliers take responsibility for most of the product. It reduces the number of first tier suppliers, only by changing their position in the chain. Henrik Brandes et al. give an illustration of system thinking in figure 3.2.

Traditionally, auto makers purchase parts from several suppliers. Using system thinking, a final assembler orders a system component from one supplier, which is a subassembler who keeps in contact with other subcontractors. Hence, auto assemblers over time convert many of their subcontractors - previously used chiefly for instrumental reasons and for simple processing tasks (such as machining and treating the surface of metals) - into "contract assemblers" and "systems-components" manufacturers called function suppliers and system suppliers. It is system thinking that leads to new supply restructuring.

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1 In respect of interviewees' wishes, I give most of visitors anonymity within detailed question discussions and list all interviewees in an appendix to the thesis.
Car companies are now offering long-term contracts, often for the entire vehicle model life, with one crucial condition however, progressive price cuts every year. A few years ago, the most important new customer demands facing suppliers were quality and frequent delivery. Prices did not seem to be a major issue. Quality and delivery have not lost any significance, but cost has become the number one focus. The name of the game is price reduction, so-called "productivity discounts". Both Volvo and Saab demand initial price cuts of 2-3% . For the long-term contract model, car assemblers acquire vastly increased control of their purchasing costs. Suppliers are forced to be much more disciplined in economic matters than they used to be.

![Diagram of suppliers and final assembler]

Figure 3-2 Reducing number of the first tier suppliers through "system thinking"

Source: Henrik Brander et al., Underleverantörssituationen i Sverige, p.31

However, the supplier does not sign a three year cut-price-contract to end up broke or to return next year and say "I can't make it. ... It is a dilemma for the suppliers". A technical manager at a very well respected components firm explains this situation:

Normally, our contract is for 3 years. This involves continuous price reduction. The reduction rate depends on concrete negotiations, kept secret by us and our customer. Certainly before we sign any long-term contract, we have to decide if it is worth getting into this kind of long-term contracts involving continuous price reductions!

In a recession, there is great pressure on costs, but often this is of a short-term nature. The current situation in the auto industry is different, since it is a combination of a deep recession and new, competitive trading demands, where the cost pressure is both short-term (forcing some of the companies to reduce their prices "on the spot" to prevent their customers from sourcing overseas) and long-term. With increasing vigour, companies oblige suppliers to sign long-term contracts including annual price reductions for the model's duration life.

Open books is another very direct form of cost control within long-term contracts. Traditionally, suppliers provide customers with breakdowns of their prices in three categories: materials, labour and overheads, being the basis for re-negotiating prices after an increase in say, materials costs. Now auto makers demand detailed breakdowns of both labour and overheads, including profit margins on various products. One of the reasons for this zeal is that assemblers have become much more dependent on their supplier, as a result of single sourcing; no longer having any local market checks on the
prices they quote. Consequently they require disclosure of all costing information. Nonetheless, this demand is not so easily accepted by suppliers, especially when this requirement is one way only without any reward.

In this case study, suppliers reactions to Volvo's open books are better than many others, for Volvo do not have strictly single sources, while Volvo makes a good job of exchanging cost information. A Volvo purchasing managers declares,

As a general rule, we ask for common cost information, such as materials, labour costs and overheads from our suppliers. Only when choosing subcontractors, do we ask for more cost details. As a reward for open books, we furnish information they need as a co-operative measure. In general, if suppliers open books frankly, they receive more co-operation from us. Of course, it is impossible that a supplier acquires information on his competitors.

A Volvo specialist supplier comments,

Open books are good for buyer-supplier relations. Normally we open the essential cost information to Volvo, such as raw materials and labour costs etc. We have not been asked to show detailed cost lists. Acting as a specialist supplier, we do not demand open books from our customers.

Another Volvo system supplier adds,

On open books, we do not give the same cost information to all customers. In general, we offer basic categories. Only if customers ask, do we give them more details. For a new product, deciding the price takes long discussions and negotiations with a customer. Since we've had business relations with Volvo for almost forty years, Volvo is rather an open book to us in comparison with Ford and Saab.

3.3 Suppliers rationalisation

3.3.1 The structure of the Swedish subcontractors

Vertical and horizontal integration are radical ways of rationalising supplier structures. Berggren and Laestadius (1993) describe a distinct vertical pyramid model in the Japanese auto industry and typical horizontal networks in Italy, Germany and Denmark. Important features of the Japanese model are: very high integration of production plus close co-operation in product development within long-term relationships. In this pyramid model, industry is organised into a huge structure of subcontractors, vertically related, dominated by large-scale demanding enterprises, where suppliers bear more stress and intensive competition. Whereas, the horizontal integration model is characterised by more creativity with less control or less systemisation, where small and medium size firms enjoy high social mobility and rapid new product development.

The Swedish subcontracting system builds on a clear hierarchy structure (several tiers of production) with stronger vertical relations; however, it also consists of a horizontal network between suppliers at the same level. Berggren and Laestadius (ibid.) analyse the interaction of vertical and horizontal networks, pointing out that horizontal co-operation can increase creativity and reduce firms' loading, while strengthening small and medium firms' positions in the pyramid network. The horizontal network can promote systematising development in vertical integration, because technical help and sharing between same level suppliers may greatly improve a firm's quality competence.
The relation between Swedish suppliers and their customers is based mainly on subcontracting, in that traditionally a customer orders subcontracted parts only from specialists. The structure is accordingly concentrated on many specialists and a few systems or function suppliers.

Swedish auto suppliers are moving towards Japanese co-operative buyer-supplier relationships in industrial development. In comparing Japanese and Swedish buyer-supplier relations, it is important to underline that co-operative engineering relations between nodes in the production chain is not a "typical Japanese style". Swedish industry possesses distinct characteristics of its own.

There are three different types of supplier structures in Sweden, in Jan Wiklund’s opinion (the former General Manager of Swedish Automotive Component Group), i.e. system supplier, function supplier and specialist supplier. Each is defined:

- A system supplier is responsible for the complete system, e.g. a complete exhaust system. That means being responsible for development, manufacturing, assembly and delivery of the system.

- A function supplier is responsible, but only for a limited function. The catalytic converter is not developed by the system supplier but purchased from the function supplier to fit into the complete system.

- A specialist supplier is a company producing simple parts such as flanges, brackets, nuts, bolts and springs etc.

In general, system suppliers (normally being first tier) have enough engineering ability to be completely responsible for product design, maintaining close and long-term relations with their customer (the final assembler). Most of the specialist suppliers are small size and flexible factories, having short information, short lead times, with limited engineering ability. The function supplier is between the system and specialist supplier.

There are more than 300 Swedish auto industrial suppliers at present. Among of them, about 8 are system suppliers, 35 are function suppliers, all the others are specialist suppliers. They constitute a supplier pyramid (see Figure 3-3), where the highest level of the pyramid supplies completed system products to the final auto assembler. For example, the exhaust system is a whole system product in auto production. The second level in the pyramid is a function supplier, producing one function of a system, such as the tubular manifold of an exhaust system. Specialist suppliers, in the lowest position of the pyramid, produce only one sort of special components for assemblers or higher level suppliers, e.g. spring and valve producers are specialist suppliers.

This model is quite similar to the Japanese auto supply system being a hierarchical vertical structure, where, the final assembler dominates a few first tier suppliers within a very tightly controlled co-operative relationship. Every first tier supplier keeps in close contact with a few second tier suppliers, and so on down the scale. In this network, only one assembler stands at the top, with links to many suppliers tier by tier, so that relations between every two related tiers are characterised as long-term close cooperation, stressing intensive competition between each other. As Lamming comments (1990): "This stress to perform without fault is very great and appears to be a critical feature of the relationship: Excellent performance is not achieved without constant pressure which leads to constant stress in the working pattern."
3.3.2 Suppliers restructuring and new situations

Recession has a major impact on suppliers rationalisation, single-sourcing and grouping. This radical consolidation process not only affects the number of surviving suppliers, but deeply alters their structure.

As Jan Wiklund points out: "A manufacturer like Volvo can never be so specialised in every component as it is needed. Therefore it is much better to bring in a system supplier concentrating on these components". It means that many of the Swedish suppliers must restructure themselves into a system or function supplier in order to survive in production chains.

The chief targets of restructuring measures are the many small firms constituting the car firm's long supplier tails. Some of them continue their auto business but now as second tier suppliers, selling to first tier component suppliers. Others will merge with or be acquired by other component makers. Some will pull out or be forced out of the auto business completely. The consolidated first tier suppliers to a large extent become the sole suppliers of their particular products, being complete systems or subassemblies.

According to Blomgren's research (1993, p.5), three factors influence the suppliers position in their chains:
- Their present position in the chain
- Their product
- Their unique competence in manufacture and development.

These three factors, influence five possible "type situations" in suppliers restructuring (see figure 3–4):

1. Transferring down one or more steps in the chain, changing only their customers;
2. Maintaining unique competence so that their products can be sold;
3. Developing and becoming a system supplier;
4. Disappearing from supplier chains completely;
5. Finding a new supplier chain and breaking into a new market.
In supplier rationalisation, it is difficult to say who can keep their position in the chains. Only one thing is clear that many specialists may restructure themselves as a system or function supplier, thus gaining the advantages and competence needed to survive. It is not a must that all specialists restructure themselves. Mefab, a well developed specialist supplier asserts,

In fact, our position is decided by our customer, because they must take parts directly from us. This is why a specialist supplier can keep its position in supplier rationalisation. It is impossible for all suppliers to turn into system suppliers. Over the years, we have broadened our competence and our product range which now spans the manufacture of springs, wire components, clips and sheet-metal parts. As a result, we are now sufficiently developed to supply complete functional units, outside the auto industry and set up long-term business relations, which are profitable to our customers and ourselves.

As a specialist supplier, our proprietary parts are standard products. But with only standard parts, it is more difficult to survive than system and function suppliers. Now, in severe competition, long and trusted business relationships become the
key to success. So we take on a growing degree of responsibility for product development moving towards more interaction in buyer-supplier relations.

All suppliers are facing a choice between "exit" or "survival" in restructuring, not only specialist suppliers but also present system suppliers. Torsmaskiner, one of Volvo's system component suppliers, as a system supplier for ten years, is now facing a severe challenge. There are 15 exhaust system suppliers in Europe. But the number may be cut to 5 in a few years, so that all present suppliers must fight each other to survive. Important factors in deciding this competitive result are competitors profitability and their financial base. When I visited Torsmaskiner, a technical manager explained:

The firm's position is determined by our products. Now, there is no problem in keeping our position in Sweden. But in the whole of Europe, if exhaust system suppliers are cut from 15 to 5, there may be severe competition for everyone. We must struggle to survive through developing and reforming relations with our customers. So Torsmaskiner has the objective of offering customers in the European vehicle market products and services, corresponding to their expectations of a professional supplier and co-operating partner. We aim to be the leading supplier for exhaust systems and manifolds.

In sum, the recession and "down size" process (shrinking supplier numbers) bring enormous pressure on Swedish auto assemblers and suppliers. In order to become more competitive, they have to reform their traditional commercial relationships towards being more interactive, and this process is likely to continue. The elaborate systems of ranking and grouping applied by the leading car firms oblige suppliers, succeeding in business, to be dedicated in complying with specific demands, by achieving excellent ratings on a much broader range of performance measures than ever before.

3.4 Supplier cooperation in Volvo

Two years ago, when visiting one of Volvo's purchasing managers, he explained the importance of "down size" in Volvo. This year, I saw him again and asked "What is of most interest for you at present?" He answered frankly: "Down size is not so important now. We are more interested in enhancing cooperative development with our suppliers actually".

Why does Volvo want to cooperate with its suppliers? Getting information from Volvo, its ultimate goal for supplier co-operation is to fulfil the overall objectives of the Volvo Car Corporation:

- Safety, an important guiding principle in Volvo;
- Reliability, the guarantee of safety and quality;
- Durability, equaling safety, both being distinct characteristics of Volvo;
- Environmental care being taken into account, has priority;
- Return on capital employed as the key of corporation profit;

The primary aims of the Volvo's cooperation with its suppliers are:
- Quality: zero defect
- Cost: continuously increased competitiveness
- Quantity: "zero" lead time and "on time".

Volvo's strategy is to develop and maintain a competitive national and international base of suppliers for long term co-operation. Its principles of supplier relationships are:

- The Volvo Car Corporation - an attractive customer;
- Openness and trust worthy partnership;
- Mutual win/win relationship.

Since the auto industry is essentially conservative, technical change is characterised by incremental innovation, so firms must establish a sound collaborative basis in product technology development: sharing technical innovation. In recent years, Swedish auto assemblers and suppliers have realised the importance of this collaboration in technology. Volvo has drawn their suppliers, especially first tier (e.g. subsystem suppliers), into an "era of rapid product development" since the early 1990s; integrating them vertically into its production chains. The idea of "product development" includes:

- Early total involvement with suppliers.
- Giving suppliers full responsibility for product development.
- The aim is to give suppliers responsibility for complete functions (systems).
- Supplier internal product and process engineering must be carried out by the supplier.

Suppliers are viewed by Volvo as sources of competitive advantage in two ways. First, they may have greater expertise in helping the customer to realise a better product and second they may manufacture the product in a far more effective manner than the customer, particularly with early involvement in the design process.

With integrated production, as Eliasson summarised (1994, p.37), the following advantages may be achieved:

1. With holistic capacity costly mistakes can be avoided (design flaws, bulky engineering designs, badly organised production processes).

2. Styling, product engineering designs and testing (engineering) within production can be integrated synergistically.

3. Among many possible ways of organising the whole, the best can be chosen.

4. Simulation techniques (computational prototype) make it possible to find the best specification at any early engineering stage. Large cost reductions are possible.

5. Quality control becomes effective. Costly ex-post adjustments are avoided.

Holistic integration of many technologies from early product conceptualisation, engineering designs and testing to industrial scale production is decisive for cost efficient production of complex products.

3.4.1 Volvo's ambition - to have world class suppliers

Volvo's vision for supplier cooperation is:

The supplier is a natural and invaluable team member in the mission to reach and exceed customer expectations. Volvo is regarded as the markets most attractive and professional customer. Our product development is driven by this long-term supplier cooperation. Our aim in supplier cooperation is to achieve world class performing suppliers who actively contribute to the Volvo Car Corporation total business success.

When I asked what a world class supplier is, a Senior Manager in Dept. of Supplier Development and Business Support of Volvo recommended the book "Creating World Class Suppliers" (Hines, 1993). The explanation is:
The main overriding feature of world class status is the level of service given to the customer. As a result of this, sales expand and internal processes continue to improve so that customer service continues to increase. Another central feature of these world class organizations is the degree to which external process and links with suppliers are developed.

......the key features in defining a world class organization were in order of importance: Quality, Customer Responsiveness, Designing Leadership, Market Share, Return on Capital Employed, Cost Leadership, Growth, Sales Per Employee and Earning Per Share.

According to this definition, the profile of a world class company is shown in Figure 3-5.

| YOUR SERVICE TO THE CUSTOMER |
| IS CONSISTENTLY FIRST CLASS |
| Your total sales continue to expand |
| your sales per square foot continue to grow |
| your inventories continue to fall |
| Your manufacturing lead times shrink |
| your product quality continuously improves |
| new product introduction is very dynamic |
| Your suppliers consider you a good partner |
| Employee attendance is at least 97% |
| Everyone seems to have time |
| Change is the norm |
| Reponse to the unusual is seen as an opportunity |

| COMPETITORS TRY TO COPY YOUR WAYS |

Figure 3-5 The profile of a world class company
Source: Peter Hines, Creating World Class Suppliers, 1994, p. 4.

3.4.2 Supplier cooperation processes

A company is faced with a simple choice for all the products and individual parts. It can either make them in house or buy them in. Of the bought-in parts there are two different types: made to order parts and off the shelf parts. Made to order parts are those components that have been made specially and uniquely for the customer and are therefore not sold to other customers. This type of component is termed a subcontracted part by the Japanese. These subcontracted parts can be either designed by the customer or by the subcontractor, or more typically have a joint design content. The counterpart of the subcontract part is an off the shelf or standardised part. This type of part, often
also called a catalogue part, is made according to the specifications laid down by the seller and is available to purchase by any number of customers. This type of supplier is termed by the Japanese as a common supplier as it supplies common (or standard) parts. Figure 3-6 gives a classification of subcontractor and common suppliers.

![Diagram of suppliers classification](image)

**Figure 3-6 A classification of suppliers**

*Source: Peter Hines, Creating world class suppliers, 1994, p.53*

According to the degree of supplier involvement "product development", Volvo's new purchasing organization consists of three different departments (see Figure 3-7):

![Diagram of customer-oriented purchasing](image)

**Figure 3-7 Volvo Main principle for the new purchasing organisation**

*Source: Volvo Car Corporation*

- Advanced purchasing corresponding to customer advanced engineering;
- Project purchasing corresponding to customer projects;
- Running production purchasing corresponding to customer production and after market.

During supplier cooperation process, Volvo has drawn suppliers into its product development at different levels. Figure 3-8 shows three levels of supplier involvement in Volvo product development.

![Diagram showing levels of supplier involvement in product development]

Figure 3-8  Levels of supplier involvement in "product development"

Source: Volvo Car Corporation

(1) Production and after market process for proprietary parts
In the process, buyer-supplier relation is a traditional business relation without cooperation. Volvo buys in off the shelf parts from specialist suppliers. Their proprietary parts are standard products and sold to customers through a catalogue. An obvious merit of this approach is economy of scale: the same component design can be shared by many cars (not only for Volvo's), so that its fixed costs are easily spread (examples include batteries, spark plugs, tires and car audio equipment etc.).

Indeed, for those suppliers, a long trusted business relationship is more important than cooperation. For verification, I visited MEFAB, a Volvo specialist supplier producing standard car springs. A MEFAB sales manager explained:

As a specialist supplier, it is not necessary to keep in close connection with customers as system suppliers do. We use our own technological base for production, but not for design. Normally, we get part prototypes from our customer directly. Only three engineers work in product technology and two technicians work in the design department.

On future development, he added:
In order to keep our position in supplier rationalization, we want to supply complete functional units including out of the auto industry and set up long-term business relations, profitable for our customers and ourselves.
(2) Product project process and "black box" parts
In product project process, suppliers are drawn in auto maker's product development with some limited technological cooperation. Normally, Volvo gives a general concept idea and technical requirements to a supplier; then the supplier designs the part prototype. During this process, the product development work is split between assembler and supplier, the result is "black box" parts as termed by Clark and Fujimoto (1991, p.140-142). Functional parts and subassembly systems typically belong to this category. Figure 3-9 gives an illustration of the "black box" parts.

![Figure 3-9 Black box parts](source: Clark and Fujimoto, Product development performance, p.141)

Japanese auto producers have been moving away from detail-controlled parts towards "black box" parts for several decades. The use of "black box" parts enables assemblers to utilise suppliers' engineering expertise and manpower while maintaining control of the basic design and total vehicle integrity. To the extent that a supplier accumulates expertise developing a particular type of part, assemblers may benefit from higher design quality and lower cost. The supplier's accumulation of engineering expertise becomes its competitive edge. Additionally, having one source for both prototype and production parts, facilitates knowledge exchange between the two stages, it allows suppliers to detect potential production problems early and thereby improve component quality. In interviews, a Volvo's purchasing manager notes,

The "black box" part is not a new concept for us. Early in 1927, we bought directly completed electronic components from Bosch which was in the front-line of the German electronic industry. Bosch knew how to do it and was a complete traditional system supplier at that time. Torsmaskiner is a new representative of a "black box" model now. The difference between traditional and new "black box" models concentrates only on the different function requirement. Even in suppliers restructuring, still one main task of our assemblers is to develop the function requirements for suppliers.
Introduction of the black box part system may however complicate assembler-supplier relations and make inter-parts co-ordination within the company difficult. Clark and Fujimoto argue (ibid.) that there are two trade-offs for effective management of the black box part system. First, assemblers have to juggle carefully in long-term relationships with suppliers against the need to keep the market competitive by inviting other suppliers to participate in "development competition." Secondly, assemblers must also balance the need to retain key component technologies (i.e. asset specificity) in order to effectively assess design quality while providing technical support to suppliers and controlling basic engineering for total vehicle integrity.

In collaborative manufacturing process, the black box parts system is advantageous when a car maker wants to preserve detailed technological capabilities in a particular components area, tightly controlling component design and quality. Japanese subcontracting relations are characterised by high asset specificity, compared with their world competitors. In fact, a firm risks loss of competitiveness relative to supplier engineering units focused on specific component technologies.

(3) Advanced engineering process
Many auto makers realize that new product development is paramount in future competition. Hines mentions three major reasons for this (1993, p. 40):

- as consumer tastes become more varied and individualistic it is necessary to produce a greater range of goods without using excessive new product development effort,
- the first company to bring a new product to market by definition achieves a 100 per cent market share and is consequently likely to maintain a larger market share over the product's lifetime, and
- as factors such as defect rates and delivery on time start to become standards, new product development becomes one of the key areas where competitive advantage can be gained.

Volvo recognizes the importance of the design process and the role of supplier as an invaluable team member integrating into new product development. A Volvo purchasing manager comments:

If we want to keep ahead of advanced propositions, e.g. in safety, we need new design and technical innovation in our products. It seems impossible without suppliers integration, because auto manufacturing is concerned in many high technological fields, Volvo can't be proficient in every one. Therefore we need to work together with our suppliers in future car design.

For the future Volvo car, instead of trying to develop complete products, Volvo has divided the products by layers so that a complete system is split into sub-systems and then into individual components. This allows a more sensible allocation of effort and greater design concurrence not only within Volvo but between itself and its suppliers. Indeed some suppliers, normally being system suppliers, have been integrated into Volvo's product development deeper than "black box" level. They are integrated into the final product by personnel who now have more the character of "systems" engineers. There are product teams made up of personnel from several functional areas. Their work, performed in project teams, has the character of problem-solving groups or task forces. They are responsible for a longer period of development from concept to application. These project groups include specialists from auto maker and concerned supplier segments such as production or marketing.
3.5 Two examples of integrated system suppliers

Supplier restructuring has changed original pure marketing relations and stimulated closer technological co-operation between buyer and supplier. In suppliers restructuring, system and function supplier replace specialist supplier as new first tier suppliers. They get more responsibility in product design, quality and development than specialist suppliers had before. Through this collaboration in technology, suppliers, especially first tier (system or function) participate in the design and development of an automobile in a variety of ways, becoming entirely involved in the auto assemblers' manufacturing system. Two good examples of "product development" are Torsmaskiner Plant, a complete exhaust system supplier and Autoliv, a complete air bag producer.

3.5.1 Torsmaskiner Plant

Exhaust manufacturing involves the fabrication of tubes, pressed parts and sleeves from coiled steel. Exhaust plans range from simple assembly - only plants which do nothing other than weld components together to plants which include tube mills and presses. A complete exhaust system keeps processes, such as pressing parts and carrying out tube bending and forming, and muffler construction in house. Figure 3-10 is an illustration of the core processes of one exhaust system production.

![Diagram of exhaust system processes]

Figure 3-10 Illustration of exhaust system

Source: Nick Oliver et al., Worldwide manufacturing competitiveness study

Founded in 1950, Torsmaskiner AB has been Volvo's supplier since 1954. It produced only down pipes, exhaust tubes, and tail pipes until about ten years ago. Then Torsmaskiner developed tubular manifolds in 1984, and catalytic converters in 1988. A new mufflers system went into production in 1994. Torsmaskiner is also a member of United Parts Holding N.V. The latter is a large international component company centred in Holland. Torsmaskiner keeps in good co-operation with DALTON, a design consulting firm belonging to United Parts. Aiding their co-operation, DALTON often sends its resident engineers to work in Torsmaskiner or its customers, to help in Torsmaskiner's design work. In this way, Torsmaskiner copes with the responsibility of engineering design.

In the process of systematising itself, Torsmaskiner carries out not only the design of internal products and engineering processes but also designs some of the special
machinery as well as tools in house. As a first supplier, Torsmaskiner increases its responsibility at three different levels:

- Developing design prototypes
  Torsmaskiner has been involved in the area of product development since the 1980s. The aim is to assume responsibility for a complete system and come up to the target step by step. Almost all part prototypes can be designed by the firm itself now. Recently, Torsmaskiner won Volvo’s exhaust design competition, undertaking to design the prototype of an advanced exhaust manifold in Volvo’s new car project.

- Developing design and production of machine-tools
  New methods of producing and inspecting machine-tools revolutionised manufacturing processes in the 1980s. Since then, Torsmaskiner has designed and produced some special machine-tools which are sold to Volvo and other customers.

- Developing design and production machinery
  Since 1987, Torsmaskiner has made some machines used in a wide variety of engineering applications to sharpen metal parts and other components. These flexible manufacturing applications enable complete systems of machine-tools to manufacture a wide range of products. A Torsmaskiner’s technical manager explained,

  While customer requirements slowly increase, we improve different aspects of our engineering capability.

  - By thinking of people as our most important competitive resource, there are 6 engineers in charge of product design and development in AB Torsmaskiner. All of them work in a large office, where working conditions are just like Japanese style encouraging discussion and co-operation between engineers.

  - By using CAD (Computer Aided Design) in production performance set up in 1987, it facilitates engineers design tasks more efficiently and with higher quality. The CAD is partly linked to Volvo’s CAD system. In this way, we obtain useful information from Volvo at times. We have developed the Japanese Kanban system in our materials management. Now, with CAD and Kanban as a computerised economic system, product design and development becomes an important department in our company.

  - Developing a testing programme
  Torsmaskiner installed a set of testing equipment to verify end products in 1987, including computer simulating, accelerated testing and long duration testing. Our product development system is not only for design and production, but also for inspecting production results. Now about 80% of our contracts are signed with customers including prototype design, production and inspection.

In the process of "product development", Torsmaskiner has increased investments of R&D since 1988. The amount was 15.4 MSEK which was about 5% of the firm's sales in 1992.

In order to integrate into an assemblers' design system, it is necessary that suppliers maintain frequent contact with assemblers. Therefore, Torsmaskiner sends guest design engineers to the assembly factory for a short visit (about 1-2 weeks), while its customers also visit the firm irregularly. Through visiting each other, supplier and auto maker discuss purchasing, cost, quality and product development together quite often.
3.5.2 Autoliv

Autoliv has been designing and producing passenger protection systems for more than 30 years. The history of Autoliv began in 1956 with the production of the first two-point static seat belts. Within a quarter of a century, this simple restraint system has been developed into a comprehensive protection system for all passengers in a vehicle. Accident research, the auto industry and innovative system suppliers such as Autoliv have together contributed throughout the years to making restraining systems what they are today. Automatic seat belts, webbing clamp systems, seat belt pretensioners, driver and passenger airbags, restraint systems integrated into the seat with knee and side-impact protection systems all evolve from the simple static seat belt of the past. In combination, these components provide the most comprehensive passenger protection in automobile history. Adhering to the maxim of "safety first", Autoliv cooperate with their customers from the early stages of product development, through to final road testing.

Autoliv has advanced to become a renowned and much-respected partner in the auto industry throughout the world. It is represented in 17 countries by 20 company factories and 13 joint ventures in the vicinity of the customers. Visiting Autoliv Sweden AB in Värgard and its head office in Stockholm, one deep impression is that close cooperation with the car manufacturers is essential in Autoliv - in keeping with its core philosophy: close to customers.

Autoliv’s objective is to become the producer of unique safety systems in close cooperation with car manufacturers. It reaches its target through:

- New innovations
- Customer oriented development
- Partnership
- Project management
- Flexibility
- Network.

One good example of Autoliv integrated into Volvo’s product development is the invention of a side air bag. In general, a passive restraint system means that the safety system functions without any measure taken by the occupant. Autoliv product programme includes this type of restraint system, namely air bags of different configurations. Since the first air bag in 1986, Autoliv has developed complete air bag systems as well as components like gas generators, bags, control and diagnostic units, crash sensors, modules and covers. An Autoliv manager mentions that Volvo is proud of producing the safest car in the world. In order to keep its leader position in safety in the global industry, it is necessary to develop new safety products. Because car occupants are relatively unprotected in side-on collisions, the idea of installing side air bags was put forward by Volvo. To realize this, a co-operative project team worked together for prototype design, testing, and improvement etc., functioning as a "quasi-firm" mentioned in Chapter 2. This close cooperation produced the first side air bag system in 1994.

Why is Autoliv involved in Volvo’s advanced engineering process, even integrated into its R&D process? One vice president of Autoliv says:

As one complete auto system supplier, our development must become an integral part of the auto maker’s product development. We therefore try to obtain long-term cooperation with our suppliers.

In Autoliv Sweden AB, a marketing and sales manager explains,
Joining product development with Volvo, we are not staying in "black box". Our relationship is far beyond this level. With advanced engineering cooperation in R&D front-line, it is clear what and how we will do. Getting to know our customers' future requirements, we gain the initiative in developing ourselves.

During product development, quasi-firm relations provide more close cooperation than "black box". For auto makers, it is making better use of supplier's competitive advantage; for the supplier, it stimulates self-development. However, it does not mean that all suppliers have to integrate into auto maker's production chains with quasi-firm relations. Even through it is a recent tendency of auto makers and their system suppliers cooperation.

In Autoliv, some new definitions of system supplier appear:
- Autoliv fulfils the whole process of part idea - design - prototype - testing - production - system supply;
- A system supplier should be good at JIT delivery, IT (information transfer), production optimized package, pre-assembled delivery unit as well as system integration;
- System supplier means system function, system development and system delivery unit.

All these concepts concern the capacity of the supplier's engineering expertise. Autoliv's technological capacity is provided by approximately 450 highly qualified engineers in the areas of design, construction, analysis and testing. They ensure that the stringent demands of passenger protection systems are met, shaping the present and planning the future of passenger protection, where innovations, experience, creativity, dynamism and professional attitudes turn ideas into reality. In Autoliv's own training centre, trainees are instructed by experienced employees: continuously keeping them abreast of current technological developments. In this way, Autoliv keeps pace with the new and increasing demands in technical, economic, ecological and project management areas. Cooperative engineering makes Autoliv efficient in communications between their development partners - the auto manufacturers.

3.6 Key elements of new buyer-supplier partnership

Briggs (1994) summarises the key requirements of buyer-supplier relation in figure 3-11, which displays a supplier-assessment process. Assessment identifies the key attributes of the relationship and the potential for success or failure. All key areas of a supplier's business are assessed, not just the quality systems. Assessment identifies key attributes of the relationship including success or failure potential. Key areas of business include: purchasing, supplier quality, production quality, research and development, finance, production control and administration.

Womack et al. summarise the above criteria defining price, quality, delivery reliability, and contract length as four key elements of the assembler-supplier relationship (1990, p.141). The type of response and performance Swedish auto subcontracting is seeking, in general terms, is as follows, as Jan Wiklund explains,

"Yes, I do agree with Womack's opinion. But creativity or product development skills should be added."

Volvo's purchasing manager comments,

"......
Contract length is not so important but flexibility and engineering skill can not be neglected. Price, quality, delivery reliability, flexibility and engineering skill are"
five key elements for today's assembler-supplier relationship. These five key elements plus the function requirements are essential requirements for the suppliers. They are also the most important facts in establishing good co-operation between assemblers and suppliers."

Summarising different perspectives in the cases studies, the key elements of new buyer-supplier relations can be characterised as follows.

Figure 3 - 11 The key requirements of a supplier partnership: optimum cost is the key result

Source: Paul Briggs, Vendor assessment for partners in supply, 1994

3.6.1 Price and cost (contract length, open books and continually increased price competition as well as price reduction)

Since "cost comes first" is the byword, the assembler's procurement office is under tremendous pressure to reduce costs. As more than half of the value of a car comes from its components, quoting a low price per part is absolutely essential. However, a profitable price per part is the basis for a supplier surviving severe competition. This is why Volvo declares a win/win partnership as its supplier relations principle. Although the win/win partnership may depart from price, it is more dependent on long term co-operative relations, as long-term contracts become essential to component price control, where open books and price reduction (or annual cost adjustment) become additional conditions for long term contracts. Therefore continuously increased competitiveness in cost is a principle of co-operative aims with its suppliers. As one Volvo's purchasing manager declares,

We have long-term contracts with our suppliers as long as 3 years, even 5 years under certain conditions. It means that suppliers must have our confidence, i.e. owning experience, having a good reputation among other colleagues with good working relationships and so on. Of course, the long-term contract includes open
books and price development. Certainly, when new technology appears, or productive volume increases prices decrease. But it only happens when production volume, materials, and currency change. Generally, we demand reduction rate of 3% at least.

3.6.2 Quality - zero defect strategy

In Sweden, one of the important quality criteria is attaining of ISO 9000 approval. In Volvo's view, it is not enough to meet its own quality standard. Because this qualification does not guarantee excellent quality, it just provides evidence that the supplier operates within a set of well-defined quality procedures, providing the basis for excellent quality control and management.

In general, quality is measured at various points along the supply chain, where quality is measured by the number of units claimed to be defective by the customer, expressed as parts per million (ppm). Based on customer satisfaction, Volvo's quality objective is shown in Figure 3-12.

![Graph showing PPM - Production material, 0 km over the years 1994 to 2000 with warranty claims decreasing by 25% per year.](image)

Figure 3-12 Illustration of Volvo quality objective

Source: Volvo Car Corporation

In a supplier's opinion, Autoliv comments:

The safety and quality demands of our products are - and should be - just as high as the auto industry demands, as we demand from our suppliers. We have a QA-system enabling us to fulfil our customers requirements to our own international standards, for example ISO 9000. Each Autoliv company has its own organization for quality follow-up throughout the entire production chain, from materials purchasing to deliveries of finished products. Defect analysis is included in all product development work in order to identify and eliminate possible defect risks in future mass production. Quality is built-in to Autoliv products at the development stage.
Quality demands that zero defect is transferred from assembler's requirement to suppliers' aim and philosophy through their co-operation. As one purchasing manager of Autoliv Sweden AB explains:

A zero defect strategy may sound like utopia, but we firmly believe that it is possible to achieve. We have already arrived at parts per million (ppm) as a relative figure for defect frequency. This confirms our belief that it is possible to achieve our goal - zero defects.

Undertaking zero defect demands efforts from assemblers and suppliers in turn stimulating closer cooperation. For a supplier, effective quality control and appropriate manufacturing methods are the cornerstones of production. How can a company become a 'zero defect' supplier, Torsmaskiner's experiences are as follows,

- Increasing in-house designing ability which not only designs parts but also special tools and machinery;
- Well educated personnel;
- Well implemented maintaining program;
- High quality observation at all levels in the company.

In Torsmaskiner, all departmental managers are responsible for making quality policy known to their staff ensuring that it is put into practice. Every employee can then be responsible for the quality of his or her own work. Quality grade as one important index in the wage system is about 15% of all wages. The quality grade is calculated after every batch and depends on the scrap rate percentage; products and system audits as well as defects.

Since zero defect is a common target of assembler and supplier, if one product is judged inferior, the customer does not sanction it but analyses the reason for inferiority with the supplier. A Volvo's purchasing manager explains:

First, we have a meeting with suppliers, and analyse problems together; Second, if the defect exists continually, it is possible to reduce orders imposing pressure on the supplier; The final step is a punishment policy such as threatening to stop purchasing from the supplier. In fact, we rarely threaten the supplier's business survival. On the contrary, in order to target "zero defect", we keep in contact with suppliers frequently exchanging information and technical support. In general, we visit our system suppliers about 5-6 times a year. We also accept guest engineers to work in our engineering department, training them in technical knowledge and "know how" etc.

3.6.3 Delivery reliability: Just in time or not?

The essence of JIT is to provide only the necessary amount of items at the right time and place - no more, no less. This ultimately points to synchronised manufacturing, not only within each plant, but also between assembly plants and their suppliers. The ultimate goal of true JIT “manufacturing” is to eliminate buffer stock on both assembler and supplier. It is clear that JIT must not be regarded only as a purchasing strategy affecting lot sizes and delivery frequencies. In fact, JIT is a basic determinant of the efficiency of a wholly collaborating manufacturing system.

According to Jan Wiklund, the role of transport cost has been overestimated, not being more than two per cent of the general cost. So neglecting transport cost, Swedish assemblers seek new partners abroad and most suppliers are already exporting. Although delivering components on a weekly or daily basis is no problem, Swedish auto makers, like other European car manufacturers, are not completely adopting the
Japanese JIT system, except for parts like bumpers, seats and similar components. On JIT in Volvo, a purchasing manager in charge of engine and transmission comments:

(1) Flexibility - If you want flexible production, you must fulfil delivery without inventory for customer and supplier. Otherwise, it is necessary to have stock for both.

(2) Location - Many researchers mention that JIT originates from one extreme example of Toyota in Japan. Indeed, Toyota forced all of its suppliers to move close to Toyota's assembly factories. It seems difficult for other auto assemblers to acquire this method, especially for some low volume auto producers, e.g. Volvo.

(3) Quality - JIT development moves towards direct delivery to the assembly lines leaving no room for mistakes in quality. Without quality assurance of zero defect, just in time delivery is also impossible.

On the discussion of "JIT Warehousing" and "real Japanese JIT", a manager of supplier development and business support at Volvo mentions two sorts of just in time situations used in Volvo (see Figure 3-13):

![Diagram](image)

Figure 3-13  Two JIT concepts in Volvo

(1) Just in time production
For local suppliers, Volvo orders 7 hours in advance through Electronic Data Interchange (EDI) system. Then the supplier takes one hour to assemble and one hour to load, three hours on the way, and a two hour margin for unloading and inspecting etc. In this case, both assembler and supplier keep sequence production without inventory as typical Toyota style.

(2) Just in time by delivery
Volvo's overseas suppliers first transport parts in batches to a local warehouse near the Volvo assembly factory; then just in time deliver to Volvo.

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No matter which JIT style is used, handling times must be reduced as far as possible to guarantee high flexibility. In Volvo, EDI is linked to the ODETTE system and employed between firms to cut down on time-consuming paperwork sent between firms. Here, the major functions of EDI are as follows: Production plans and delivery orders; Invoices and payments; Computer Aided Design (CAD)

3.6.4 Production flexibility (learning and reflecting process in continuing partnerships)

Modern auto industry seeks more flexibility and better quality. As Piore and Sabel (1984) point out, it faces the challenge of adopting "flexible specialization" technology. In order to accommodate far more production mixes and variants (through quicker and more frequent changeovers), it must respond quickly to design changes (due to a shorter lead time for new dies), to better manage different production volumes (owing to flexible workers and inter skill mobilisation), carry the lowest inventory levels, and make the most frequent JIT deliveries, all the while maintaining the highest quality.

In the traditional framework, the original auto buyer-supplier relation contributes to flexible operations. One important message of flexibility is, as Nishiguchi mentions in "Strategic Industrial Sourcing" (1994), that ultimately a prime contractor (e.g. an auto assembler) can develop a flexible production system, if its suppliers are flexible in their own internal operations.

During the 1980s, in Asia, North America, and Europe, it becomes clear that the principle focus of flexibility in contractual relations is shifting from instrumental risk dispersion to collaborative manufacturing. To a significant extent, exploitative subcontracting relations (as practised in the old days) is no longer viable. Instead, collaborative manufacturing, in which various players undertake new complementary roles, is now crucial to manufacturers' survival.

Following the completion of the assembler-supplier partnership through collaborative manufacturing, there is an important learning experience during its development. In auto production chains, when suppliers are drawn into assemblers' product development, "learning by using" is inevitably involved.

The feedback from the user to the producers is denoted by Rosenberg as "learning by using". It identifies an important source of learning that grows out of actual experience in using products characterised by a high degree of system complexity. In contrast to learning by doing; "learning by using" deals with skill improvements that grow out of the productive process. It involves an experience that begins, where learning by doing ends. "Learning by using" may become a more pervasive phenomenon in high-technology industries.

As Imai et al. note with a specific reference to learning, growing from product development (1985, p. 372):

Everyone participating in the development process is engaged in learning, even outside suppliers. Learning also takes place across all phases of management and across functional boundaries. It is this kind of "learning in breadth" that supports the dynamic processes of product development among Japanese companies. This learning emanates from the development process, in turn serving as the trigger to set total organisational learning in motion. In this sense, new product development is the particular device that fosters corporate-wide learning.

In the process of learning by using, it is clear that suppliers need to keep in sound contact and collaboration with their assemblers, sending guest engineers to work in the assembly factory, getting the assembler's evaluation for their products periodically,
while meeting the increasing needs of function requirements from assemblers which are developing continuously. In the area of assembler's product development, suppliers should learn from what they observe, to recreate, improve and eventually innovate.

In sum, as Berggren notes in "Toward Normalization": Even in the Japanese auto industry, "profits were hurt by the ever expanding number of models, increasing development expenses and the production of many models in small numbers" (1993, p.16). The same situation has evolved in the world auto industry. Therefore, after craft production, mass production as well as Japanese "lean" production, "flexible specialization" is becoming a new production concept and strategy in industrial development. Volvo's "Reflective Production", as tried in its final assembly factory - Uddevalla Plant, has practised this new production system well. Certainly this innovative production model directly affects its first tier suppliers and whole supply chains. Furthermore, how "Reflective Production" influences present buyer-supplier relations in production chains may provide interesting problems for further research.

3.6.5 Engineering skill (zero lead time and technological capability)

One important index of a firm's skill ability is lead time, being the time from concept development to market introduction required by the average company in each region/group to complete the average project. Lead time is defined as a measure of how quickly a firm performs the many different activities to accomplish the advance from concept to market" (Fujimoto and Clark, 1991, p. 76). Obviously the auto maker's lead time concerns its suppliers' engineering skill. The final assessment concerns the suppliers' design resource, core technologies and reinvestment strategies. This section is becoming a more important criterion in evaluating supply systems, which includes supplier's "forward engineering" (the supplier's contribution to a product design, either in an advisory role or by completing a total design against a product specification); "self-sufficiency" in problem solving (being able and responsible for the resolution of technical problems without assistance from the customer), plus "value engineering" (the ability to analyse and redesign a product to provide a more cost-effective solution) and continuous improvement.

One of Volvo's objectives in 1995 is to achieve a lead-time reduction rate of 50%, i.e. the time from sale contract - assembly - distribution reduced from 28 to 14 days (in Europe). For this reason, the time from production plan to car on line is cut from 10 to 7 days, where suppliers' activities within those 7 days are: administration of call-off, material supply, Production, dispatch and administration, transport to Volvo.

It means that Volvo has a higher requirement for suppliers' lead time than before. Zero lead time therefore becomes one of the very important primary aims of buyer-supplier co-operation. In order to promote zero lead time, assemblers have to bring in suppliers at a very early stage of the process. In Sweden, there is a very tricky situation here; how can you promote the process when you are not well equipped with engineering skills and when these skills are a must for cutting the lead time. In the Volvo case, the "product development" process quickly increases suppliers' participation in design. This change not only occurs in system suppliers but also for some of Volvo's specialist suppliers. For example, Mefab, one of Volvo's special suppliers producing all types of springs, is quite good at developing its engineering ability. In an interview, a Mefab sales manager explains,

Mefab possesses an essential technological base for the production performance now. For most products, we get a prototype part from customers and use a CAD system to prepare the necessary drawings. This is linked with Volvo. Great emphasis is placed on continually expanding expertise offered by computerised design and production. Apart from designing parts, special machine-tools are designed and developed steadily to perfect the production line. In Mefab,
numerical control of machine-tools has made automatic production of extremely intricate shapes possible. It makes production more flexible and cuts down the resetting time from one product to the next.

3.6.6 Supplier assessment

An important measure established during the 1960s among many Japanese manufacturers was subcontractor grading. Regular supplier assessment was begun by Toyota in the early 90s. Then it spread to the world auto industry, becoming an important element of the new buyer-supplier relationship. Supplier assessment developed a broad evaluation of supplier performance in terms of product quality, price, and delivery based on a rating of management and engineering skill etc.

In Japan, auto assemblers scored each indicator of performance, for example, 20 points each for quality, price and delivery; 15 points for management competence and long-term business viability; and 10 points for other special factors. Each subcontractor was then graded according to the sum of these scores: grade A for those with a score of 80 to 100. B for 65 to 79, C for 40 to 64. D for 30 to 49, and E for less than 30. In general, suppliers were told their grades and were periodically given detailed scores (e.g., every three months, every half year, every year, etc.), with indications of weak areas to be improved. Not infrequently, the auto assemblers extend technical help - and further financial and managerial support if deemed necessary - to those in trouble.

In Volvo, the motive for supplier assessment is to:
- Make known the demands that Volvo places on the supplier's performance.
- The evaluation shows how well the supplier meets these demands;
- Contribute to a continuous process of improvement;
- Strengthen the mutual joint competitiveness

The evaluation is directed towards the supplier's pre-conditions for an efficient components supply. There are three sections assessing different contents separately: general evaluation, material control and quality system. The supplier evaluation considers quality, logistics, product development, management and organization, finance, productivity, competence and experience, environmental concerns, as well as sourcing.

Normally, the general evaluation is performed while the assembler selects suppliers. After selection, the quality system evaluates components quality every two years, sending special occasional information on product quality. Volvo wants supplier assessment for every year. But as one supplier sees it: "It is still a long way off in Europe, when assemblers provide monthly updates to suppliers, as Japanese auto makers do”.

3.6.7 Win-win relationship

Under traditional buyer-supplier relations, the auto maker, as a core company, predominated over their part suppliers as peripheral firms. The latter passively accepted auto makers' control and business, because they lacked self-development ability. Emergence of new buyer-supplier partnerships has changed this situation. With the auto maker's product development and long-term close cooperation as well as suppliers restructuring themselves, supply chain integration is becoming an important competitive advantage in modern industrial society. The result of this cooperation benefits both cooperators. For auto makers, e.g. Volvo, the integrated supply chain as a natural and invaluable team facilitates success in total business as well as achieving or even exceeding customer expectations. For suppliers, integrating totally into auto maker's product development enables them to become active contributors to core
company's business, increasing their engineering capacity and self-development potential.

During interviews, both Volvo and Autoliv admit that close cooperation brings them mutual profit. As one example, after the side air bag developed through joint efforts, both Volvo and Autoliv applied for product patents together. Volvo has a licence to make and use the side air bag as its monopoly product for two years. Then Autoliv can sell it to other customers. Here, the profit to Volvo is quite evident. When asking Autoliv: "What do you get out of this cooperation?" The answer is: "We gain a chance to develop the firm plus the opportunity to create more products and new projects". The marketing manager adds: "Cooperation in product development costs a great deal. But in the view of the development, the cost, as an investment in the future, is worth paying".

3.7 Conclusions

As recession and "down size" process bring enormous pressure on Swedish industry, both assemblers and suppliers become more competitive, reforming their commercial relationships towards being more interactive, even though the situation in the industry is fraught with ambiguities and risks. Auto makers have reduced and moved to single or dual sourcing but seem to be uneasy in this situation, counteracting their increased dependence by intensifying control over their suppliers. At all levels in the production pyramid firms are changing. Some of these withdrawals can be seen as necessary structural rationalisation. Others may represent long term absence from the auto production chains. Generally, relentless cost pressure is causing a lot of stress in buyer-supplier relations. What is now needed is a climate conducive to long-term efforts, so firms can build trusting relationships, acquiring new skills and invest in new equipment while developing new markets.

This is a fine balance to strike. Firms need pressure to improve and upgrade, but if the pressure is too hard and too immediate they may revert to a sheer struggle for survival. Of central importance for the future of the Swedish auto industry is the strength of the production chain and seeking possible positive chain reaction through more co-operative buyer-supplier relations. In increasingly severe industrial competition, the supplier must meet the needs of customers, while creating self-confidence and long-term development. In the case study, there are indications that the more co-operative buyer-supplier relation is a good way to achieve this trade-off.

(1) The importance of trust and the need for a long-term perspective in the transformation of buyer-supplier relations

In recession there is always pressure on costs. Suppliers account for more than half the value of total production cost, so auto makers have a strong interest in seeking immediate cuts in their supply costs, while developing entire relationships between assemblers and suppliers to forms of interaction that are more productive in the long-term. Trust is an important part of such relationships, but trust can only be built in a gradual way during an extended period of time. "Open books" is easy to accept once trust is in place, but categorical demands for cost disclosure only in one way agreements without reward can damage the process of building trust. In Sweden, most of the contracts are for one year and are prolonged each year. But three to five year contracts are being introduced especially with Volvo and Saab.

Swedish assemblers have to devise new career patterns and a reward system that supports long-term and co-operative relationships, in-depth communication and joint projects with their suppliers.

(2) Suppliers restructuring - a new supply chain

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Recession results in supply restructuring into a more strictly tiered and integrated organisation. Such a structure is developing but the process is not faster than the customer adapts to it, because the cost of systematising traditional specialist suppliers is very high. In comparison Volvo has around 500 suppliers and Toyota in UK has only 160. The new supply chain is also developing with the reduction of suppliers. A few first tier suppliers (mostly system or function suppliers) serve the assemblers directly in the chain. These suppliers have exclusive responsibility for a large group of second tier suppliers, so the component firms need much more sophisticated tools to evaluate and communicate with their suppliers. Further, they must develop new ways of interaction with suppliers and acquire new skills to support the new emphasis on partnerships, in much the same way as the auto makers do. As the "tier-structuring process" gathers momentum, that becomes much less frequent, and first tier suppliers have exclusive responsibility for upgrading their own supply base.

(3) Advantages, disadvantages and new markets
Sweden is a highly developed but small size domestic market country. Swedish auto makers and suppliers are small with low volume demand, restricting efficient utilization of productivity. And location in the margin of Europe is another disadvantage also. But, high advanced technical levels and high technical know-how are two important competitive advantages of Swedish manufacture. Owning these competencies, the Swedish auto industry once achieved several decades of outstanding international success, particularly in the areas of high quality production and new forms of work organisation. Now, with recession of the whole auto industry, Swedish auto makers and suppliers are seeking more co-operation and development abroad. As Volvo's purchasing managers note: "The general tendency is that we are shrinking in Sweden and expanding abroad". Mefab, as a Volvo specialist supplier, asserts,

Considering that the Swedish car industry is in recession, we are developing towards some new industries such as medicine and weapons industry. While expanding business abroad step by step. We exported about 55% of our products in 1992 and hope to arrive at 70% in 1996.

Exports are of crucial importance to Swedish auto suppliers and car makers for achieving better economy of scale (or just maintaining the existing level after domestic market recession). So Jan Wiklund says: "The general rule in seeking new partners for car manufacturers is based on economy of scale in product development and purchasing". For car makers, joint venture seems to be a better way than directly exporting cars abroad, e.g. Volvo's joint venture assembly plant in Thailand.

For suppliers, exports are a part of a broader process in becoming more outward oriented. It is believed that the Swedish supplier system must become linked to US and Europe in the future, where the first possible zone for Swedish suppliers' development is the EC. Another aspect is to foster international alliances. For example Torsmaskiner is in a consortium company. Keeping in close co-operation with DALTON, a international design consulting company, to increase and develop its engineering skill ability. So if international co-operation and consolidation is successful not only for a few companies, such endeavours can enable Swedish suppliers to go into substantial operations overseas, thereby gaining technological and managerial expertise to develop themselves.
4 Case 2: Auto Makers and Their Local Supplier Relations in Thailand

Based on the case study in Sweden, I investigated relationships between foreign auto assemblers and their local suppliers in Thailand to see how auto production chains do cross national boundaries, what differences of buyer-supplier relations there are from country to country and from company to company.

4.1 Background

World-wide, the auto industry is undergoing profound changes, affecting firms and suppliers. From Japanese "lean supply chain" to Swedish suppliers restructuring, great changes are rapidly evolving in buyer-supplier relationships. In Thailand, perhaps for geographical and historical development reasons, Japan is the central reference point in Thai manufacturing.

The Thai industry has a central role in the industrialization processes of that country. By consuming the output of other major manufacturing industries, it has an important influence on their quality, service and productivity.

Thailand started its auto industry in the early 1960s, through joint venture (JV) by directly introducing foreign auto makers. Now, there are 13 auto assembly companies producing about 20 different foreign brand vehicles (mostly passenger cars, see Table 4-1). These auto assemblers constitute the Thai Automotive Industry Club, where the total vehicle production was 419,891 in 1993. Toyota is the largest member, assembling 47,636 passenger cars in 1993. Volvo is a smaller auto assembler with a production output of 6000 cars in 1993. At present, Japanese cars occupy more than 85% of market share, while Volvo has only about 4%.

4.1.1 Local content process

Growing protectionism probably means that companies may be increasingly compelled to locate activities in those countries where they have a market. This is probably the case not only with manufacturing activities but also with product development, R&D and other more advanced functions, since governments now expect that qualified jobs are transferred to their countries to stimulate industrial development, not to be exploited only for low cost production.

In 1971, Thai Ministry of Industry (MOI) introduced regulations to develop local production of passenger cars, stipulating that passenger car assembly plants must use locally produced component parts and accessories comprising no less than 25% of the complete car. Assemblers were permitted to choose which parts to source locally and others from outside suppliers.

In 1972, the formula for calculating local content, based on cash figures, was agreed as follows:

\[ \text{PLC} = \frac{A}{A+B} \times 100 \]
where PLC = percentage of local content  
A = the total value of locally produced parts plus business tax
B = the CIF (cost, insurance, and freight) value of the CKD (completely knocked down) package (i.e. imported parts) plus import duties and business tax

In 1978, a new policy was announced increasing local content to 50% within five years, the formula for calculating local content changed, allocating points for each specific component based on technical rather than cost considerations was introduced.

Throughout the first half of the 1980s, there was considerable debate within industry and government over how to develop the automotive sector. In 1983, the government agreed to amend the local content requirement from 50% to 45%, effective from 1 January 1986, to give local assemblers time to come to terms with the higher levels of technology required.

In 1984, a scale was introduced listing compulsory parts that must be incorporated into locally assembled cars as follows: 67 items in 1986; 109 items in 1987; and 165 items in 1988.

In 1986, this local content policy was modified with the introduction of two separate lists, List A for compulsory parts and List B for non-compulsory parts. At the same time, the government increased the minimum local content requirement to 54 points (PTS).

- List A compulsory 28 items 27.07 PTS
- List B free choice from 146 items 43.18 PTS
- Choice from old main list 107.07 PTS
- Items on list A and list B are included in this list.
- To obtain PTS from this list needs a special permit from MOI.
- The old main list consists of 399 items which divided a car to 21 groups (base engine, electric, fuel, exhaust, chassis, body, etc.).

At present, Thai local content is summarised in five main products groups:
- Seats 22%
- Electrical components and air conditioners 20%
- Cable harness and radio 21%
- Metallic parts (stamping, metal forming, casting, machining) 25%
- None-metal parts (glass, tyre, plastic, rubber) 12%

Both the compulsory and non-compulsory parts lists were revised in 1989 to take account of an increase in 3-4 items included as compulsory local parts. The list remains unchanged in 1994.

Although import duty reductions in 1991 have reduced local assembly costs somewhat, assemblers continue to insist that the 54 points of local content requirement is largely to blame for high production costs. Although often inferior in quality, locally produced parts can be anywhere from 50-400% more expensive than imported counterparts. Given this fact, local assemblers are continuing their efforts to persuade the government to amend its local content regulations.

Recognizing that the government faces pressure from local parts' manufacturers not to reduce local content requirements, assemblers have offered the government various compromise proposals. One is that assemblers should be permitted to chose parts to import and others to source locally. Currently, items on the compulsory list have to be purchased locally regardless of their quality. However, despite attempts to revise the
local content regulations, it does not appear that the government may take such a step in the near future. Since the Thai government recently announced its entry into GATT, its local content process has been speeded up.

4.1.2 Brief of two auto assemblers and one supplier

(1) Toyota Motor Thailand Co. Ltd.

Considering the outstanding Japanese success in the car industry, Womack et al (1990) find that the source of this competitive advantage lays in their production process. The archetypal Japanese production process is that used by Toyota, namely the Toyota Production System (TPS).

TPS is world-renowned for efficient management producing high quality at minimum cost, achieving on-time delivery by maximizing the use of manufacturing factors that include machinery, raw materials and human resources. Toyota’s production system comprises the following elements:

- Just In Time (JIT) is a system that does not simply place importance on doing something on time. It is also absolutely essential to be precise in terms of quantity and not in excess since excess amounts to waste. For the customer it means that they receive what they want, when they want it.

- Jidoka is the self-regulation of the entire process. Jidoka gradually resulted in the building of quality into each and every process. Every Toyota production worker is a self-inspector. If a worker discovers a defect, he immediately alerts his supervisors. The vehicle is not passed on to the next station until the defect is corrected.

- Kaizen (endless improvement) is a philosophy to continually strive for better product quality. Employees are encouraged to keep good quality in mind at all times and to offer their ideas on how to improve operations.

After more than 30 years on Thailand’s roads, Toyota has maintained its leadership in the auto industry as the top seller of motor vehicles in Thailand. The essential facts of Toyota Motor Thailand Co. Ltd are as follows:

- Registered Capital: Bht 520 million
- Operation Commenced: May 1964
- Products: Toyota passenger car and pickup, CKD (locally assembled): Corolla, Corona, Hilux, Dyna 4 WD
- No. of Employees: 3780
- Manufacturing Plants: 3
- Distributors: 82
- Local Part Producers: 65
- Present Production Capacity: 150,000 units per year
- Total Sales: 120,000 units per year

(2) Volvo Thailand Ltd

Volvo has been making high quality cars for over 60 years. In the early 1970s, Volvo had a successful CKD operation. The first Volvo factory in Asia was built in Malaysia in 1967. Since 1975, a significant number of Volvo cars have been put together, in the

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1 See booklet "Toyota Motor Thailand Co Ltd".
TSA plant on the outskirts of Bangkok. The plant was a joint venture between AB Volvo (Sweden) and the Swedish Motors Corporation of Thailand until 1992, when Renault France joined the partnership. It assembles Volvo's top range cars and two Renault models. In this way, Volvo is ahead of European competitors in Thailand. In fact, Asia has become Volvo's third leg (Europe, North America and Asia), possibly being an important cornerstone of Volvo's global strategy in the near future.

Volvo Thailand Ltd comprises two sections: Thai Swedish Assembly (TSA) and Asia Auto Component Centre (AACC). The major data of TSA are:

| Registered Capital: | Bht 20 million (Thai 49%, Volvo 51%) |
| Operation Commenced: | 1975 |
| Products:          | Volvo 850, 850 ESTATE |
|                     | Volvo 940, 940 ESTATE |
|                     | Volvo 960, 960 EXECUTIVE |
|                     | Renault R19, R21 |
| No. of Employees:  | 450 |
| Manufacturing Plants: | 1 |
| Local Part Producers: | 65 |
| Materials:          | CKD (completely knocked down)-sets |
|                     | L/C (local content) parts |
| Present Production Capacity: | 6,000 cars/1 shift, 2 x 5,000 cars/2 shifts |
| Marketing:          | for sale only in Thailand |

AACC founded in 1990 is a special department of Volvo Thailand Ltd to deal with securing a future in the Asian component market and local part development. As Jan Eriksson says: "Greater integration of the industrial system is required. Packing and assembly alone are not enough". The objectives of AACC are:

- Rationalist parts development for VCA factories, including joint development, tool sharing, and human/technical resources;
- To take advantage of the ASEAN schemes;
- Developing parts for special cars e.g. limousines;
- Joint ventures or technological transfer to local suppliers;
- Export to Volvo Car Corporation, Sweden.

Interviewed Christer Olsson, GM of AACC and also Managing Director of the Part Development Department (PDD) in AACC, he introduced the main tasks of PDD as:

- To follow up and fulfil local Ministry of Industry (MOI) and legislative requirements.
- To undertake developing new parts, so that Volvo specifications are fulfilled at reasonable cost and investment.
- To follow up design changes.
- To meet with AACC's objectives: rationalization of local parts for VCA factories, BBC (brand to brand complement) schemes, exporting, etc.

The local content of Volvo started at 25 PTS in 1976. Now it has reached 54 PTS. It means that Volvo has been free from the pressure of the Thai government's regulations.

(3) Nippondenso Thailand Co. Ltd

More than a hundred supplier companies produce components for the 12 auto manufacturers, contributing about half the value of a finished vehicle. Nippondenso is one of the biggest suppliers in Thailand.

| Registered Capital: | Bht 150 million (Thai 56%, Nippondenso 36%) |
| Operation Commenced: | April 1973 |
4.2 Present situation on the Thai auto buyer - supplier relations

As mentioned, Thai auto suppliers are well protected by stringent government demands for local content. What is the character of auto buyer-supplier relation in Thailand? How do foreign assemblers transfer technology and managerial “know how” to the local suppliers through buyer-supplier cooperation, if the cooperation exists? What is the difference between Toyota and Volvo methods of supply management? During the course of my study trips in Thailand, I contacted Volvo and Toyota, two different auto assemblers in Bangkok. At the supplier companies, I interviewed managing directors and marketing managers. In most cases I got the opportunity to visit the plants, too. At auto making companies, I talked with general managers of parts development departments, purchasing and production managers. All were immensely helpful in providing me with a broad understanding of the changes of buyer-supplier relations in Thailand. The companies I visited in Thailand are listed as follows:

- Auto assemblers
  (1) Toyota Motor Thailand Co. Ltd (for Toyota car)
  (2) Volvo Thailand Ltd (for Volvo and Renault car)
  (3) Thai Hino Industry Co. Ltd (for Hino truck)
  (4) Daihatsu-Phranakorn Motor Co. Ltd (for Daihatsu pickup)

- Local suppliers
  (1) Nippondenso Thailand Co. Ltd (producing electronic equipment and car air conditioners)
  (2) TRW, Fuji, Serina Co. Ltd (for car valves)
  (3) Thai Arrow Products (for wiring harness)
  (4) Thai Radiator Mfg. Co. Ltd;
  (5) Thai International Die Making;
  (6) Yarnapund (for exhaust system);
  (7) Sahakol Chassis Co. Ltd (for die making and pressed parts).

Japanese supplier relations are characterized by intensive interaction and flows of information. At the same time they are very competitive, but this competition takes place within a context of long-term commitment. Since the mid 1980s, there has been a powerful push in the world auto industry to adopt Japanese practices, putting a lot of pressure on the Thai supplier firms. Then the penetration of many foreign JV auto makers strongly affect and change traditional Thai buyer-supplier relations.

(1) Contract length

Traditional Thai business has no custom of signing contract. Mr Prakitti Siripraiwon, manager director of Thai Radiator Mfg. Co. Ltd, told me that many supply companies had no written contracts with their customers initially. But this is now changing in Thailand. Local car companies are starting to offer formal contracts to their suppliers. To my question: “How long is your contract length?”, the Volvo answer is year by year; whereas Japanese auto makers, Toyota, Hino, Daihatsu declare that their contract length is often for the entire vehicle model duration. Normally, one model life cycle is about 4-6 years. With the contract, car assemblers require vastly increased control of their purchasing costs. Suppliers, in return for security, are forced to be much more
disciplined. The positive consequence may be that suppliers, now have to take a hard look at their operations and launch longer-term projects for productivity improvements.

On the length of contract, among 7 component supplier firms in this study, one declared no written contract, one was about 6 months, and others reported about one year extending automatically if there is no change. Nippondenso, a big Japanese joint venture supplier, declared also one year contract. Sampan Phanpanit, managing director of Yarnapund added,

In general, our contract length is about one year. Then if any change occurs between our customer and us, we send or receive the information before 6 months of the contract expires. Otherwise, the contract continues automatically.

In general, there is a crucial condition accompanying a long-term contract, namely progressive price cuts every year. These are mostly in the order of 2-5% per annum. It is called "price reduction". But, among the 7 interviewed suppliers, only one concerned "price reductions", because no firm signs a contract for longer than one year actually. But in renewing contracts, "price reduction" is still a sensitive point for both buyer and supplier. In Thailand, the price of components is determined by three major facts: import duty of raw materials, technological process and negotiations between buyer and supplier. Local Volvo people tell me that they are planning to ask for "cost reductions" in the near future, as Volvo has in Sweden.

(2) Opening books and cost control
Long-term price contracts are important for car assemblers to increase their control over future costs, this is only just beginning in Thai industry. Another and very direct form of control is the assemblers' demand for completely open books from their suppliers. Traditionally, suppliers provide customers with breakdowns of their prices in three categories - materials, labour and overheads. That is the basis for re-negotiating prices after an increase in for example materials prices. Now many auto makers demand much more, including detailed breakdowns of both labour and overheads, plus profit margins on various products. That is becoming the norm in Japan, Sweden and most industrialized countries.

What has happened in Thailand? Christer Olsson, General Manager of Parts Development Department, Volvo Thailand Ltd, answers:

We have "open books" with local suppliers. In Thailand, most of the raw materials of auto components are imported with a very high and variable import tariff. Any price change of imported raw materials directly affects local production costs. So, for our "open books" requirement, we are mainly interested in the change of landing price and import tariffs on raw materials.

In response to Volvo's opinion, one local supplier's comment:

Among our 18 local customers, Volvo is quite reasonable in not demanding a list of our products costs. We enjoy Volvo's trust well.

Another local supplier asserts,

According to our philosophy, "buy with confidence, sell with pride", we adhere to the principle of excellent quality and service for our customers. We have open books with our customers. But I am sure, if you supply good quality products, there are no price problems.

In verification, one local Volvo manager says: "On quality and cost, we prefer the former, especially for safety quality". He adds, "In Thailand, local parts industry is based on low costs so some local products are not only cheap but also top quality".
In Volvo's case, it seems that the "open books" demand does not provoke a strong reaction from suppliers as mentioned by Berggren: "unnatural, like parachuting" (p.55, 1992). That is the first impression I got during my first study trip in Thailand. I wonder whether it is a common situation in the Thai auto industry. During my second visit to Bangkok, I visited Toyota Thai Company and talked with one local parts purchasing assistant manager. About cost control, he said:

"Cost comes first" is Toyota's philosophy. For cost control, we work out a clear cost target per year and for the whole model life. In order to reach the target, we normally ask for 2-3% cost reduction rate from our suppliers, while demanding a detailed cost list for every part.

Then, I visited the same supplier who once mentioned Volvo as being reasonable in "open book" last year. The manager explained:

Among all our suppliers, Volvo is reasonable and Toyota is the toughest in open book. Volvo is more interested in quality, but Toyota in cost. Toyota not only demands a strict cost reduction rate, but also limits our profit margin to 5%. For every component supplier, Toyota wants to check every detail in the cost list including working time and direct labour costs in every machining process. They come to our factory to time every technological process. So price negotiations with Toyota become most difficult in fact.

An example of Toyota's part process cost control see Table 4-2.

(3) Delivery - More frequent but no Just-In-Time (JIT)
"Just In Time", as a distinct characteristic of Toyota's Production System, is one of the major factors underlying the competitive advantage of Japanese industry over the past three decades. Now, frequent deliveries and JIT supply are a popular theme in discussing new supplier relations. Certainly, present deliveries are more frequent than ten years ago, but the overall change is not impressive. In Thailand, Volvo's overseas suppliers usually deliver once every 2-3 weeks, as Volvo does not demand JIT delivery. Interviewed suppliers report varying delivery frequencies, from daily to weekly for different customers.

A completely JIT delivery seems difficult in Thailand for many reasons. Some suppliers say that their customers do not demand JIT. A further obstacle, mentioned by several suppliers and Volvo assembly, is that their low purchasing volume does not necessitate daily deliveries, which would increase transport costs. The last obstacle is that serious traffic jams in Bangkok make JIT deliveries impossible.

In point of fact, many local suppliers deliver to local Japanese customers daily but to Volvo and other European auto assemblers once a week.

"Do you ask real JIT delivery in Thailand"? All answers from three interviewed Japanese auto assemblers (Toyota, Hino and Daihatsu) are positive. And the normal delivery frequency is daily. When I asked them: "How do you perform your JIT in delivery?", all of them mention "Kanban system" for both buyer and supplier. The local parts purchasing manager of Toyota explains:

We demand JIT delivery daily applying "Kanban system" to our suppliers and began Kanban management here in 1989, linked to our computer system. Now, we are conducting a new delivery system, called "part by part". In former Kanban management, one Kanban card was a parts group, including more than one part,

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2 According to the booklet "Toyota Motor Thailand Co Ltd", it says: "Toyota is steered by the philosophy that the 'Customer Comes First'".
e.g., 3 parts comprising about 20 units. The new Kanban card is one card for one part, and the number of units is about 8-10 units. The new delivery system is more efficient reducing our part store from one to half a day. It has been applied to four of our suppliers. We are planning to spread the new method of JIT management to all of our suppliers by the end of this year. It is easily accepted by suppliers. The new ‘part by part’ delivery needs only changing the size of the delivery container.

One important guarantee of JIT in Toyota’s mother company is that Toyota forces its suppliers to locate as close as possible to its assembly factory. Almost all auto suppliers are located in Bangkok. The longest distance from a supply company to Toyota’s assembly factory is only 100 km. Considering the heavy traffic jams in Bangkok, interviewed Japanese auto assemblers keep a part store of 1-2 days.

(4) On single sourcing or dual sourcing
A striking feature of the new purchasing practices is "single sourcing". It means only one supplier for every part. In general, car assemblers have three reasons for their preference of single sourcing: to reduce the number of suppliers, to avoid fragmentation of an already low volume, and to focus their resources, in deepening the relationship, being most important for new buyer-supplier relations. Somnai Suvanapim, general manager-assembly advisor of the Ford Board confirms this:

Why do we want single sourcing? One important reason is to save investment. More suppliers mean more investment in tooling. That is why Ford has reduced 30% of its suppliers in recent years.

On single sourcing, one local Volvo manager points out,

In theory single sourcing is good, but in practice it is much more difficult. We prefer dual sourcing, and certainly so for critical parts. It is important to employ some sort of competition, to keep them honest. That is why we normally have two suppliers for each part.

Toyota has the same opinion as Volvo. One of its purchasing managers explains:

Our principle is two suppliers for most parts. If one of them is worse in quality or delivery etc., we give more orders to the other. This stimulates good competition between them.

(5) On supplier selection - Why select suppliers/customers?
This question, is easily answered by Japanese assemblers and their suppliers. As Japanese cars dominate more than 85% of the market share, among 13 local auto assemblers, at least 10 of them are owned by Japanese or are in joint venture with Japanese. As a natural result, many Japanese auto component producers follow their customers to Thailand also. Nippondenso, a big Japanese car supplier and a partner of Toyota group, is a good example. Among 7 interviewed local suppliers, only 2 are Thai owned, 5 are Japanese joint ventures.

Volvo’s suppliers comprise principle and local suppliers. The former are Swedish suppliers, e.g. Skövde, a motor supplier. The local suppliers are about 65 (including Volvo - Renault). To my inquiry: “Why did you select these local suppliers”? Local Volvo people explain,

We had no other choice initially, so we selected on the basis of quality, quantity and price etc. Normally quality and safety are the two most important elements in selecting suppliers. For the Volvo car, we have only one quality standard, no matter where it is produced.
When I asked the suppliers: "Why did you select Volvo as your customer"? or "Are you satisfied with your Volvo cooperation"? Some representative answers are:

Volvo became our customer when it started here (in 1976). Among our customers, Volvo is one of the best and most reasonable. For instance, Volvo transfers all of technical information to us in English. Although its buying volume is small, the single price is higher than high volume customers, e.g. Japanese. In Thailand, the Volvo car is in the higher quality market; Japanese cars are at a lower quality level. It is Volvo's high technology that results in its high quality (Answer from Thai Radiator Mfg.).

Because our parent company TRW has had OE (original equipment) business with Volvo in Sweden, we naturally selected local Volvo as our customer in 1986. Since then, although Volvo only a 2.0 per cent shared of our business in sales, our cooperation is quite pleasant. For example, new valves used in Volvo 850 are more complex than others. When we have problems, Volvo always gives us the necessary technical help at once (Answer from TRW Fuji Serina).

Most of Volvo's local suppliers are also local Japanese car makers' suppliers. When interviewed many of them declare that they enjoy Volvo cooperation much more than Japanese customers, because Volvo is more open with their technology compared to Japanese auto makers.

Normally suppliers get technical assistance through three different ways, from its parent company (JVs' foreign partner), a technical licensing operation or directly from its customers. The last is more frequent and important in new buyer-supplier relationships. Volvo people told me: "We like helping our suppliers in technology with the best, if they need it". As an example, Volvo once sent its engineer to Sahakol Chassis to support their CAD and CAM system used in die making. Sometimes, suppliers also send their technicians to the assembler. Through this technical cooperation, closer buyer-supplier relationships develop.

(6) Supplier assessment
Regular supplier audits, begun by Toyota in Japan are likely to spread to most auto makers, being an important element of the new relationship. This assessment is based not only on quality, delivery and price, but also on rating of management and technical support.

Volvo does not periodically evaluate their local suppliers. Whereas three interviewed Japanese auto makers make a broad evaluation of their suppliers, updated monthly. In Nippondenso, I saw two typical evaluation papers. One is "Evaluation Sheet for Vendor" from Mazda. It includes 4 items: delivery, service, quality and cooperation. Every item contains several guide lines with a four grade score. Score: 4 is excellent; 3 is good; 2 should be improved; 1 must be absolutely improved (see Table 4-3). The other is an "Award System Monthly Report" from Toyota. The evaluation contains two parts: quality and delivery. Quality includes factory defects (50 points), after sales defects (20 points) and quality countermeasures (20 points). The delivery part consists of 5 items with altogether 80 points. It seems Toyota's evaluation is more complex than Mazda (see Table 4-4). One visited supplier comments "The assessment is very helpful for improving production quality and management.

(7) Technology transfer and cooperation
Technology transfer along the international auto production chain is divided into two steps. The first is transfer from parent company to local core company (auto assembler), crossing national boundaries but normally within the firm. Many foreign auto makers are successful here. The second is concerted technology and "know how" transfer from the core company to local peripheral firms (local suppliers). The latter is within the same country but between different firms and hence more difficult.
Being without ownership, cooperative partnership between buyer and suppliers becomes necessary and important. Unfortunately, this cooperation is still weak between Thai buyer and supplier. Most buyer supplier relations are pure buying and selling without much technological cooperation. In my investigation, I observed one case of cooperation in product development. This is co-developing a new air conditioner between Volvo and Nippondenso. In general, car air conditioners have two functions: cooling and heating. In the Thai climate, one cooling function is enough, so Volvo car needs a special air conditioner in Thailand. Based on Volvo' general concept and requirements, Nippondenso designed the prototype of the air conditioner. After Volvo tested, it was improved by Nippondenso again. That is the only example of Volvo's prototype being designed by local supplier. The common situation in Thailand is that the auto maker gets the part prototype from its parent companies and local suppliers only copy it.

A Volvo manager was asked about future local part development planning, he explains,

> Our work comprises three tasks: selecting evaluating and supporting local suppliers in technology. But, as a low volume auto maker in Thailand, Volvo has no possibility of investing as much in the local parts industry as the Japanese.

Local people offer different opinions on this point. One Thai working as Parts Development manager in Volvo explains:

> If Volvo pays attention only to assembly without investment in component manufacturing, it may be dangerous, e.g., the supply of many Volvo parts is more dependant upon the local Japanese JV suppliers. This is not a good thing. The fact is that Volvo has lost some local suppliers in recent years.

Reviewing the real situation of Volvo's local suppliers, perhaps the Thai manager's worry is not unreasonable. Among six interviewed Volvo's local suppliers, half are Japanese JVs, and half are wholly owned by local people, but get technological support from Japanese companies. Of course, this cooperation and support is not only for pure technique, but includes managerial "know how" and experience etc.

Toyota makes great efforts in technology transfer and Thainization. In the light of its determination to become a "Good Citizen Company in Thailand", Toyota has undertaken a complete reorganization of its administration and organizes training sessions in order to prepare and provide opportunities for its employees to advance to higher positions in the administration hierarchy. As the first step, it has strictly applied Toyota's production system method in its assembly factories. In order to transfer engineering technology to local supply industry, Toyota helps in establishing a department of automotive engineering, at the Faculty of Engineering, Chulalongkorn University, providing educational tools as well as various automotive equipment, chassis dynamometer, exhaust testing equipment and two engines totalling 55 million Bht. With this support, it will not be long before Thailand produces its own auto engineers. In order to adopt the Toyota system, guest engineers from local supply companies are trained at Toyota for 1-3 months.

4.3 **Analysis: How do auto production chains cross national boundaries?**

The aim of the project is not to write case histories, but to analyse problems and potentials in the auto industry as a whole. My interest in this research is to investigate some skill formation and observe technological transfers along production chains outside national boundaries, seeking answers to the following problems,
- The importance of a educational values for a reflective and problem-solving style of thinking in international technology transfers, especially, the influence of a different cultural background;

- On the interaction between skill formation and "know how" transfer. Among other questions raised is: can cooperative efforts in the production chain lead to more successful skill formation in subcontracting plants compared to common business buyer-supplier relations?

- Making a comparison between Toyota's and Volvo's supplier relations in Thailand, seeking differences between Japanese and Swedish methods of buyer-supplier relations management.

Based on these objectives, this section deals briefly with the observation results mentioned above and analyses some related problems.

4.3.1 Influence of background

Technology transfer, as an essential economic phenomenon, relates to the structural environment of social actors. Especially when this transfer occurs in different countries. In Thailand, the influence of background factors are evident.

(1) Institutional factors - i.e. government policy
Thailand is a developing country and not a member of GATT. The whole Thai auto and the parts industry are protected by Thai government regulations. Import taxes (import duty plus value added plus excise taxes) on CBU (completely built up) car of 2,400 cc or less is as high as 137.23%. The same size CKD kits is 86.75%. Thai Ministry of Industry has a set of strict regulations for local auto parts production, including 28 items listed as compulsory products.

Local government policies are positive in pushing and stimulating firms to increase their exports. Thai auto makers or part suppliers, when exporting, receive preferential treatment, such as duty free raw materials, free or reduced local content limits etc.

According to Thai Board of Investment Promotion for Industrialization (BOI)'s policy, foreign JVs in different zones divided according to their degree of industrial development have different tax incentives.

On local content rules, there is a special BBC (brand to brand complement) item in Thailand. It is a triangular treaty signed by Thailand, Malaysia and the Philippines. According to the treaty, parts produced in any of the three countries can be freely used by their auto makers without local content limits. Obviously the BBC rule benefits local industries.

As a lower volume auto maker, Volvo is the biggest user of BBC in Thailand. In fact, two Volvo assemblers, Thai-Volvo and Malaysia-Volvo, share the same supplier's parts without limits. But on BBC profit discount, Volvo people complain that the work of Thai local government is not as efficient as Malaysian.

One Malaysia-Volvo departmental manager suggested extending BBC cooperation to the whole Asia region. The question is: how can governments of this region achieve a consensus?

(2) Infrastructure conditions
The ability of national education and training systems to adapt to new technological development is extremely important in the present era. One prominent problem is the
Thai national education system. At least three interviewed assembler and supplier firms mentioned this problem. Just as one supplier manager who is Thai and graduated in an American university pointed out,

Thailand has seen tremendous growth in the past few years, but we need more qualified engineers and technicians. There is a critical shortage of education. As an example, there are only 3000 graduates from Thai universities every year. This number is too low to meet the needs of Thai industries. South Korea and some of Thailand’s neighbours have many engineers. Why don’t we import some of them for pressing needs?

To my inquiry: “What is the difference between Swedish and Thai workers”? A Volvo manager answers,

Their motivation is quite different. Swedish workers are dedicated. For many young Thai people, working motivation is for a house, a car and money. In TSA, a lot of craft work gives the young people more reflective opportunities in production. But this is based on their education level. At the same education level, there is no difference between Swede and Thai. Swedish compulsory education is 9 years, and Thai is 6 years. But Thai compulsory education does not cover poor children in the countryside for economic reasons. Traditional customs prevent young girls and women from getting education and working outside the family.

An American supplier managing director who once worked in Malaysia comments:

Thailand is poor at the national education level. Labourers’ education levels in Malaysia and Singapore are higher than in Thailand. The education base is too weak to support Thai industrial development. With only 15 universities, numbers should be increased ten times at least. Furthermore, the Thai education system creates its own problems, university teachers often work outside of campus to earn extra money etc.

(3) Competitive structure and engineering technology
Obviously, the shortage of technicians and a lower general education level directly affect a firm’s competitive competence. It is necessary to improve this situation as soon as possible. One local supplier manager expresses,

Education is the foundation of economic development. It is worth paying more investment to improve the national education level. Present development opportunities are good, but the country needs to develop and extend its education to capitalize on these. In the coming years, it is a very important long-term task for Thai firms to improve the labour forces’ training and skill formation ability.

Education being the base of technology, the limited national level restricts the development process, so that a capacity to generate new or adjusted technologies around existing ones is often lacking in Thailand. Today, its auto industry is largely dependent on outside technological help, e.g. there is no designing in Thailand. Most high tech components are imported. Local producing prototypes have to be sent to foreign auto assemblers’ parent companies for inspection and testing. Nippondenso declares that prototype designs are from its mother-company and all tested in Japan. Thai auto companies are only assemblers, not manufacturers; as there is no established real system supplier in Thailand yet. Thai auto supplier development does not form a competitive structure as in Japan and Sweden.

(4) Cross-cultural management and language barriers
People from different cultural backgrounds have difficulties in working together, as misunderstandings and misinterpretations occur. In case investigations, many people mention the influence of different cultures in Thailand. A Thai supplier manager
educated in America explains: "Thai people are easily affected by foreign culture". In Thailand, we can see Western and Eastern cultures coexist in the society. As an Asian country, except for its own distinguished cultural traits, it is deeply influenced by Chinese culture. Foreign auto makers bring in their cultures also. All these result in different thought styles and managing methods in Thai industrial cooperation and organization.

During exploratory studies, I noted that the language barriers between foreign partners and Thai staff created considerable drawbacks. In an interview with a Thai-Japanese JV firm, inquiries in English are translated first into Thai, then into Japanese for a senior Japanese manager. The answers return in the same way. How difficult and imprecise was it? A similar view is expressed by Christer Olsson:

Language, as a tool of communication, is very important in Thai development, being the basis for everything. Local people, especially engineers and technicians in joint venture companies, with no language ability can not communicate anything.

4.3.2 The problems of trust and partnership

Trust is a concept traditionally ignored by economists, and difficult to identify in existing relations. Nevertheless, during recent decades it has attracted a lot of interest as an important element in new industrial patterns. A useful introduction to this discussion is provided by Edward Lorenz, in the paper "Neither strangers nor friends" (Lorenz 1988). His analysis is not based on studies of automotive corporations but on observations of changing relations between small and medium-sized engineering firms in France. That is of particular relevance, as this study concerns not only relations between common auto makers and their suppliers, but foreign JV assemblers and local component specialists.

Toyota established the Toyota Cooperation Club (TCC) in response to government policy, increasing the use of locally produced parts for promoting local industries. Thai 'TCC' was established in 1982, comprising 54 of Toyota's local suppliers. Its objective is to promote regular exchanges of views and information among members, as well as sharing administrative and production experiences and ideas. To enhance mutual understanding and trust, TCC also organizes other activities, such as seminars, training on various subjects of common interest, visiting each other, and playing golf etc.

Initially, it is not easy for partners from two different backgrounds to trust and work together well, as mistrust can cause obstacles in cooperation. During investigations in Thailand, I noted that Volvo people tend to describe their relations with the local subcontractors as partnerships not simple market relationships. Local suppliers often use language containing strong emotive elements, emphasizing the importance of loyalty, the existence of a moral contract and the need for mutual trust. Almost all interviewed suppliers declared good relations with Volvo. One interesting comment from the purchasing manager of Nippondenso: "Although Nippondenso belongs to Toyota's group (Toyota owns a 20% share of Nippondenso), we have closer relations with Volvo than Toyota actually". It seems Volvo is better skilled in increasing trust with their local partners, compared with other foreign auto makers in Thailand.

4.3.3 Buyer-supplier relations in transformation

Clearly, Thai buyer-supplier relations are evolving from traditional exchanges to possible technological sharing and cooperative relations. Some tangible evidence is: having written contracts, frequent deliveries, open books etc. But still there is no clear tier structure among Thai suppliers, nor any supplier restructuring. Almost 99% of local
suppliers are specialists, only a few suppliers are developing towards system and function suppliers, e.g. Nippondenso and Yarnapund.

Comparing Thai and Swedish suppliers, one sees quite different technical cooperation and R&D ability. In Sweden, suppliers (especially are system suppliers) have integrated into auto makers’ "product development", and shared technical changes together. Many acquiring enough engineering capacity in product designing and development to become first tier suppliers. In Thailand, many local suppliers are only component producers not manufacturers. They are not yet able to design part prototypes and develop products themselves. Apart from getting prototypes from their customers, most joint venture suppliers are totally dependent on their parent companies for technical support.

Perhaps for reasons of scale, there are few dedicated suppliers in Thailand. Most interviewed local suppliers have more than ten customers, the general situation being that one supplier serves some Japanese auto makers and Volvo at the same time.

In comparing local suppliers, one sees two different buyer-supplier relations. They may be called "the Toyota system" and "the Volvo method".

In "the Toyota system", fulfilling strict Toyota Production System, suppliers are used to being pushed. During interviews, one hears often suppliers complaining, as that "the Japanese give strict orders to deliver JIT, open books and cost reduction or else".

Whereas with "the Volvo method", suppliers are autonomously aware of what is precisely required. For example, all visited suppliers admire the high achievement of Volvo car's quality. Just as the Managing Director of Volvo Thai Company asserted:

Quality is everything. We are committed to providing top quality in everything from basic staff characteristics to supplying customers and partners with cost-effective solutions vital in today's highly-competitive industry.

It seems more important to transfer tacit understanding than specific orders in contracts. Volvo succeeds by transferring intensive quality consciousness to its local suppliers with a clear concept: "If quality is excellent, the price is no problem".

Other important transformation from Volvo to local suppliers is to trust each other and to be open in technology discussions, which are main obstacles of good cooperation.

All interviewed suppliers comment on their relations with Volvo as "warm" "best" and "pleasant" etc. As one supplier says proudly: "We enjoy Volvo's trust". Having this trust, suppliers reward it with reciprocal enthusiasm to treasure and develop their cooperative relations.

While interviewed suppliers hold identical views that Volvo is quite open in technical exchange and help for local suppliers; Japanese assemblers are more conservative in approach. During a visit to a Japanese joint venture firm, before our inquiry, we were interrogated by a Japanese manager: "Why do you come here?" "What do you want to know"? (In fact, Volvo sent information to the company by fax in advance of the visit). It seems we were considered as technical spies at that moment.

4.4 Conclusions

Recession and foreign auto makers' penetration have put enormous pressure on the Thai automotive industry. Both assemblers and suppliers are being forced to become more
competitive reforming their commercial relationships into cooperative relations. A lot is happening in Thailand.

1 Role of Government
In the new era of international competitiveness, government still plays an important role.

Government policies can affect security and stability in industry. This is certainly true for the tariff regime: the vehicle industry widely believes that a zero tariff policy will end the industry. Yet others believe when Thailand becomes a member of GATT, tariff protection must decrease.

The government's local content regulations plays an important role in protecting and stimulating the local component industry. Yet there is a need for more investment to support and develop national industrial competence. For example, by introducing foreign engineers and technicians in the near future, reforming and revitalising the education system thus raising national education levels in the long-term.

2 Local part development
Thai suppliers must spend more on R&D to enhance their basic technological capability. Only a strong local design presence means that suppliers can participate in the development process from an early stage.

On this point, foreign assemblers, e.g. Volvo and Japanese JVs, have different developing strategies. Japanese invest in and control most of related supply industry building up "typical Japanese buyer-supplier" relations. Local people working in Volvo complain that Volvo lost some suppliers in recent years by not paying much attention to the local parts development. In fact, Volvo is a home-organization in Europe and a minority producer locally sourced. Therefore, as two Swedish students mentioned in their dissertation:\(^2\) "One of the major problems facing AACC today, is how to significantly increase the local suppliers production volume, thus, due to economies-of-scale, lowering the price on their products. The long-term advantage would be to establish, to a large extent, a self-supporting supplier base on the south-east Asian market". Therefore, except for fulfilling the strict local content regulation with high quality parts, Volvo Asia Auto Component Center (AACC) is looking forward to hopefully supplying value-added components and accessories to Volvo/Renault for their world-wide car production. They are also on the threshold of expanding exports from Thailand, Malaysia and the Philippines to Sweden, USA and France.

3 Buyer-supplier relation changing but in uncertain conditions
When discussing developing processes in Swedish auto buyer-supplier relations, they are divided into three relationships at different levels: traditional business relations without cooperation; the "black box" parts with some cooperative manufacturing; and supplier chain integrated auto maker's "product development" as a "quasi-firm" relationship during advanced engineering process. The latter is quite good for developing buyer-supplier cooperative relationships. The tendency occurs in Sweden between auto makers and some system suppliers. In Thailand, buyer-supplier relations are quite different. As local Volvo people mention: "Thailand is only a production not a technological centre". There is no complete system supplier, no close technological cooperation occurs between buyer and supplier. In interviews, both local assemblers and suppliers declare that their relations remain at the first level as a simple business relation. Only a few suppliers are involved in auto maker's product development and technical cooperation process. One example is cooperative manufacture of the air-conditioner between Volvo and Nippondenso.

\(^3\) Mark Averskog och Martin Edsper: "Internationalising avlokal materialförsörjning för Volvo personvagnar Thailand", Examensarbete, Industriell ekonomi och organisation, KTH, 1994-08-26
Buyer-supplier relationships in Thai industry are changing. Contracts are becoming more interactive and broadly based. Visiting each other is increasing. But from traditional conservative stability to more dynamic buyer-supplier relationships, is still a long way off.

The changes of buyer-supplier relation create not only tangible, but also many invisible changes, for example for some new concepts and thinking in industry. In this case, Volvo succeeds in transferring new thought styles to the local suppliers. As a sort of tacit knowledge transformation, this is more meaningful than other obvious changes, to some degree. During cooperation with Volvo assemblers, local suppliers become aware of things they need to learn and change without being forced.

Up to now, the changes are a good start. In fact, from signing contracts to long-term agreements, from dual sourcing to single sourcing, from infrequent delivery to JIT, from weak part design ability to participating in assembler's "product development" including related suppliers restructuring, the transfer is still uncertain, requiring long-term efforts from assemblers and suppliers.

4 Joining GATT: challenge and opportunity

Last year, the Thai government announced a plan to join GATT during the next five years. If it becomes a fact, the government has to amend its present policies in industry, by cutting protective import tariffs. It will be a serious challenge for the auto industry, especially for local part producers without the government’s protection. The new question is whether both local assemblers and suppliers could survive in the future, if we think of the fact that both car and part prices are much higher than in international markets. A Volvo 960 in Thailand sells for 2,500,000 Bht (about 800,000 Skr), whereas the same car in Sweden is only about 300,000 Skr. If the Thai government abandons tariffs, could Volvo perform its unusual price policy and keep its position in the local market?

Of course, after Thailand becomes a GATT member, imported raw materials and components may become cheaper. No local content limits, releases local auto makers to seek international part suppliers freely. The government therefore is promoting 100% local content by supporting rapid development of local industry, which may be a good opportunity for local suppliers. During the next five years, if the Thai part industry can develop its engineering technology as closely as possible to international levels, it might possibly survive not only in local markets, but also participate in international competition, especially in any future Asian auto market.
# Automobile Assembly Companies

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<tr>
<th>Company</th>
<th>Operation Commenced</th>
<th>Licence Granted</th>
<th>Registered Capital (THB mill)</th>
<th>Output Capacity (unit/year)</th>
<th>Auto Type</th>
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<td>7. Sukosol and Mazda Motor Industry Co Ltd</td>
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<td>8. Thai-Swedish Assembly Co Ltd</td>
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<td>Volvo</td>
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<td>10. Honda Cars Manufacturing (Thailand) Co Ltd</td>
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<td>Passenger Car</td>
<td>Honda (Station Wagon)</td>
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<td>11. Thai Rung Union Car Public Co Ltd</td>
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<td>Pickup and Van and Truck</td>
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<td>12. Issuu Motor (Thailand) Co Ltd</td>
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Notes: 1 As at 31 December 1993

Sources: Office of Industrial Economics, Ministry of Industry, Tana Siam Business Information Ltd
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**MACHINING PROCESS**

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*INDUCTION & PACK:* 0.1666667
**EVALUATION SHEET FOR VENDOR**

**TO:** MANAGING DIRECTOR  
**VENDOR NAME:** NIPPONDENSO THAILAND CO., LTD.  
**MONTH:** JULY '94  
**FROM:** SUKOSOL AND MAZDA MOTOR INDUSTRY CO., LTD.  
**DEPARTMENT:** PART CONTROL

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**SCORE:** 4 = EXCELLENT, 3 = GOOD, 2 = SHOULD BE IMPROVED, 1 = MUST BE ABSOLUTELY IMPROVED

GENERAL MANAGER  
PRODUCTION CONTROL DEPT.

---

Table 4-3 One example of supplier assessment from Mazda
## Quality

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<th>DEFECT RATE</th>
<th>TARGET %</th>
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<th>ITEM OF PROBLEMS</th>
<th>RE-PROBLEM PROTECTION</th>
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FOR MORE DETAIL PLEASE CONTACT:
Purchasing Administration Staff, Tel. 3651522, 3651581

KEJIA SADAYAFONGSE
General Manager
Purchasing Department

Table 4-4 One example of supplier assessment from Toyota

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5 Case Analyses and Methodological Discussion

5.1 Why are there such differences between case studies?

Global manufacturers have an unique opportunity to combine technology transfer and extend production chains to different countries. In addition, however, they need to find appropriate practices for the situations in which they operate. The tension between "corporate" and "local methods" is so apparent in the Thai case, that even Japanese plants generally are not doing as well as their principle plants in Japan. Equally, Volvo's experience in Thailand indicates quite different supplier relations to its domestic operation. Why are there such differences? Are the reasons closely linked to the social and structural environment, company characteristics, including perhaps case study methodology?

5.2 Concepts of technology and technology diffusion


"The word 'technology' used in a very comprehensive sense often includes many important phenomena of a social character, such as knowledge, management, organisation of work, other elements of social organization etc. It then becomes problematical to study the relationship between technology and social conditions. For this reason, the term 'technique' denotes only the material elements of what is often called technology. Thus, by production techniques we mean tools, implements, instruments and machines which are used to produce goods and services (1988b, p.13)

Regarding technology, ... it includes not only technique as defined above, but also non-material elements, such as technical know-how, management, organization of work etc.

Management of cooperative buyer-supplier relation is a sort of managerial "know how". It concerns many non-material elements of technology. Therefore transformation of buyer-supplier relationship is also a sort of technology transfer. According to Edquist and Jacobsson's definition, the technologies "are adopted by other producers, perhaps in foreign countries, i.e. diffusion is taking place" (1988, p.8).

At a less abstract level many factors may influence technology transfer. Rosenberg (1976) argues that there are at least seven factors affecting the diffusion of technology as follows:
- The continuity of inventive activity;
- Improvement in inventions after their first introduction;
- The development of technological skills among users;
- The development of skills in machine-making;
- Complementarity;
- Improvement in "old" technology;
- Diffusion and its institutional context.

In the later study, Edquist and Jacobsson cluster the specific factors into three categories which are related to:
- The character of the technique;
- The nature of the structural environment of the actor;
- The characteristics of the actors themselves.

During the transformation of buyer-supplier relationships, the influence of the second category is more obvious, because the buyer-supplier relationship is not simply a technical element, but one of management thought and methods. In fact, the structural environment of the social actors is just one important reason leading to different buyer-supplier relationships in different environments.

Edquist and Jacobsson illustrate the relation between the character of the actors and the structural environments of the diffusion process with a four-field chart: as Figure 5-1. The two squares to the left concern diffusion within countries. The first (1) is when technologies are diffused within a large company with many branches in the same country and the second (2) concerns organizational diffusion but not diffusion between countries. The two squares on the right concern international diffusion. In such situations the "obstacles " to diffusion are often more severe than diffusion within a country. Institutional and cultural differences between countries become important while the relative factor prices may be different. The quarter (3) is for international diffusion within transnational corporations and (4) is the diffusion between independent corporations in different countries. Obviously, the fourth diffusion model is the most difficult. In my case studies, Volvo and its domestic suppliers belong to model (2), and Volvo's, Toyota's supplier relations belong to (3).

![Figure 5-1 Diffusion of techniques](image)

5.3 Background in country

5.3.1 Technology and institutions

It is clear that the level of a nation's technological development determines its auto industrial development. Japan and Sweden, two high-developed countries, own competitive advantages in technology and management. Thailand, a fast-developing country, is becoming a new industrial country with the help of direct foreign investment. Being still poor in technological generating capacity and base, in turn restricts technology transfer from multinational enterprises (MNEs) to the local market. The Chesnais (1992) study identifies the influence upon national technological capacity of embedded multinational enterprises:

In the case of countries with a high technological capacity the effect of the international allocation of R&D by its MNEs is to strengthen this capacity and consolidate their position.

......The low capacity countries were the ones where MNEs limited themselves to R&D activities of a supporting nature and to product development for the local market.

In host countries' opinion, however, although it is often much easier to transfer technology from another country than to develop it oneself, technological skill does not float freely across national borders. It takes time and effort to emulate best practice techniques from their country of origin. So high transaction costs and low learning capability at the national level are serious problems during the international technology transfer process, for example in the Thai case. Yarnapurand Co. Ltd. is fully-owned by local Thai but all technology derives from one Japanese company under licence. When I asked the Managing Director: "Why do you not take joint venture to acquire more technology"? He admitted that cost and learning ability were two key problems.

According to Lundvall (1992), technology and institution are interdependent in a country. Technology (in a broad sense) which is not only a very practical thing, but also non-material elements, such as technical know-how, management, organization of work etc.) does not exist all by itself, but is embedded in an institutional set-up. When an industrial company enters a new country, the capabilities of the company reside not only in its production technology, but also, and primarily, in its organising capability to transform input into output; And this capability, in turn, depends on its relationships with local suppliers and on local government institutions.

In Chapter 4, it is argued that government institutions and intervention directly determine local content, further affecting the relationship between foreign auto assemblers and their local suppliers. Since 1994, the Thai government has struggled to enter GATT. For this purpose, the Thai government is adopting vigorous policies and measures to promote "100% local content process" in the auto industry. It may become a positive stimulus to the development of buyer-supplier relationships.

5.3.2 Cultural differences

Cultural differences are often perceived as a major obstacle in transferring any type of strategy, tool or technique across national boundaries. The concept of "culture", here, concerns a whole range of social characteristics, including art, science, language and institutions etc. It is culture that makes market economics like Sweden, Japan and Thailand, different from each other. Cultural systems are governed by institutions, including those for breaking and changing institutions, and these direct economic

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development and industrial production. Culture also determines or affects conceptual thinking, as presented in the Thai case study.

In domestic auto production chains, communication (the development of a common language etc.) and "distance" are two important facts affecting industrial relations. In international auto production chains, cultural distance and differences are very important, requiring skilled communicators aided with considerably subtle understanding, i.e. flexible polices are essential to achieve communication and cooperation between parties.

According to Lundvall (1992), cultural space is a loose and multidimensional concept, but it relates to important characteristics in the real world. Especially when buyer-supplier cooperative processes and communication processes involve complex and ever-changing messages, this dimension becomes extremely important. Both cultural distance and cultural space are called cultural differences. When they are present, certain types of messages become difficult to transmit and decode. In the Thai case, when local Thai suppliers integrate into Toyota's or Volvo's production chains, complex and ever-changing messages, combining explicit information with tacit assumptions regarding mutual obligations, are often required. As cultural differences between assemblers and local suppliers may block their cooperation, Lundvall deemed (1992) that multinational corporations with their own internal channels and codes of information may also develop a specific, transitional, corporate culture, as seen in the different Volvo and Toyota approaches in Thailand.

Thailand, for historical reasons and its rapid development, is affected by multi-cultural influences indeed. The Thai case, as a typical example, relates to four national cultures at least: Swedish, Japanese, Thai and Chinese culture. In a comparison between Thai and Japanese, Thai people, as they describe themselves, are more open welcoming foreigners and foreign cultures. For example, in a joint venture cooperation, a Thai is more interested in getting profit than control right. As one local Thai manager said: "if we can earn money, we do not care who controls the company."

In Thailand, one hears different comments about Thai and foreign cultures. A local Swede refers to some foreigners' impressions mentioning that the Thai is a "modest and honest person but a little lazy". He adds: They lie down under coconut trees and wait for ripe coconuts to fall down. Referring to Thai traits, a local American managing director comments: "Making a comparison between local pure Thai and Thai-Chinese people, the former is easily satisfied in work and life, whereas the latter keeps forging ahead, eager to make progress in business". During my second study trip, I discussed national characteristics with my Thai friends. They frankly admit:

The traditional Thai people are lazy, because of Thailand's unique natural conditions, the warm climate during whole year, abundant crops and fruit. There is rice on the land, and fish in the rivers. It is easy to get enough food during the four seasons. Therefore Thai people do not need to work as hard as people living in other countries. But the development of new industrialisation in recent years is destroying traditional concepts and life style. Many young Thai people are eager to get houses, cars and more money. So they are trying to obtain more enjoyment through hard work.

I have not studied these cultural phenomena in detail. My superficial observations do however not contact these statements above. When discussing suppliers rationalisation and restructuring process with local suppliers, asked whether they want to become system supplier. Their answers were often negative. Two Thai-owned suppliers seemed satisfied with their present situation. The government looks satisfied with local content at present. During my first visit, I was told that Volvo's local content was 54 points (about 45% local content). It was at the same level one year later. The phenomena is the same for local foreign assemblers. Volvo and Toyota claim that they were not asked for
a higher local content after reaching 54 points. Compared to Volkswagen in China, Volkswagen has been assembling passenger cars in China since 1985. It was much later than Toyota and Volvo came to Thailand. At present, Volkswagen has reached about 85% local content in its car production. The government's requirements are to increase 5% local content per year until reaching 100% component localization.

Reflecting on these differences between Thailand and China, I remember the local Swedish manager's words: "Thailand is only a production centre but not a technological centre". If this is true, I ask myself: "Why is Thailand only a production centre"? My Thai case study has no definite answer to this question. Maybe another study, starting in cultural theory, can provide further answers.

5.3.3 On education, language and communication

The national education system is a cornerstone of national technological development. Maybe the most important and obvious way that public policy can strengthen technological capability is through investing in education and inside-firm training, and through continuously renewing the form and content of these activities. In production chains, if integrated buyer-supply cooperation is to the auto maker's competitive advantage, adequate public investments in education and training are preconditions for sustaining competitiveness of competitive advantage. Apart from public education, inside-firm training has become more important in recent years.

Of course, creating specific competence and a fundamental formal education system demands substantial public investments. Compared to Thailand, Sweden and Japan have well developed systems for national education and training skilled workers, which supports and stimulates technological development and the supply chain integration process. In Thailand, many interviewed local Thai supply managers and foreign auto makers agree that the undeveloped national education system and the serious shortage of qualified engineers have become the bottleneck of Thai technological development. So they declare that it is time to increase investment in and improve the Thai national educational system without delay.

Language knowledge, as a tool of communication, is very important in international cooperative activities. As mentioned by the Manager of Volvo Asia Auto Component Centre, it is a base for people to do everything, especially in a joint venture company. It is impossible to fulfill an international cooperative project without smooth language communication.

5.4 Company characteristics

5.4.1 Core company culture

In auto production chains, the auto maker, as the core company, plays the dominating role for a successful buyer-supplier relationship. In fact, each company creates its own cultural system of rules (often tacit) of cooperation, social intercourse, communication etc. In addition, company cultures do affect each other during buyer-supplier cooperation.

The analysis above argues that the cultural and institutional differences influence buyer-supplier relations between different countries. This is why Toyota and Volvo in Thailand display different supplier relations from their parent companies. The only constraint is that the Thai supply base is less advanced or non-existent. At a company level, culture is also the most important criterion in assessing the viability of a successful supplier partnership. It describes the underlying business methodology and
operating values that are the key to ensuring success or failure within the relationship. In order to distinguish it from national culture, we call it company culture or company characteristic. In my case studies, it is the cultural differences between Volvo and Toyota that account for their distinctive features in supplier partnership:

- There are important differences in buyer-supplier relationships between Toyota and Volvo. Toyota is characterised by strictly fulfilling its Toyota Production System to its suppliers, for example, long-term contracts, open books, and JIT etc.

- Volvo's supplier relationship is characterized by more trust and a lower degree of vertical integration.

- Toyota's supply strategies are relentlessly focused upon cost and price competition, while the Volvo strategy involves a much stronger element of quality and flexibility.

What are auto makers' basic principles when seeking supplier cooperation? In Thailand, Toyota's purchasing manager announces frankly: "Cost reduction is Toyota's philosophy". Clearly indicating the potential culture of a Toyota-focused organization, spreading the Toyota Production System to its suppliers to strictly control their production costs, going through long-term relationships to achieve its continuous price reduction rate. Volvo's philosophy is also clear - "quality is everything", indicating a quality-focused strategy, establishing confidence with suppliers to transfer tangible and tacit knowledge to those actively contributing to Volvo business success.

Because of these company culture differences, Toyota and Volvo differ in purchasing management and supplier organization. As a consequence of its cost-focused principle, the Toyota style is a rigid stratified supplier system. In Thailand, most of its first tier suppliers are integrated into Toyota group through part or whole ownership or in other ways. The buyer-supplier relation is thus characterized by high vertical integration. In general, Toyota controls its suppliers' costs directly and in detail. For instance, TRW Fuji Serina is a small specialist valve producer in Thailand. It supplies car valves to Toyota without ownership integration. For the valve cost control, Toyota not only timed every product process and labour cost, but also asked TRW to buy raw materials from Toyota's subsidiaries, even when the price was 40% more expensive than others. The other special way that Toyota exerts its influence on suppliers is through the transfer of high grade personnel to supply companies. Because Japanese industry is famed for its rigidly hierarchical system, if the age of manager is over 55 in Toyota, normally he is in a hopeless situation to be promoted to a higher position. By accepting a work position in a Toyota supply company, new promotion is possible. In this way, relations between Toyota and its suppliers become very close indeed.

Supplier cooperation and management in Volvo is more flexible. In Sweden, Volvo has developed very close cooperation with its system suppliers. This partnership is not vertical integration with ownership, but it functions as quasi-integration. Both Volvo and its suppliers cooperate in advanced engineering processes. The supply chain is thus deeply integrated in Volvo's product development. In Thailand, although Volvo is a small size and low volume auto maker compared to others, it is regarded as the Thai market's most attractive and professional customer. As one interviewed local Thai supplier manager comments:

Among our customers, Volvo is the best and more open than others. Although Volvo is a low volume customer, its purchasing price for parts is almost the highest. Volvo's high technology produces its high quality. In Thailand, Volvo car is at a higher quality level than many others.

Due to Volvo's trust and quality principle in supplier cooperation, it is not strange why Nippondenso declared that its relation with Volvo is more close than the relation with
Toyota, although both Nippondenso and Toyota belong to the Toyota group. However, after analysing different buyer-supplier partnerships between Volvo and Toyota, I do not want to grade either of them. First, the case studies are rather limited (at least, there is no comparison with Toyota in Japan). Second, under different national cultures, it is difficult to say which one is better. Companies can reach the same goal by different routes. The key is to find which is the most suitable for each one.

5.4.2 Suppliers engineering skill and the degree of involvement

How does a supplier integrate itself into the auto production chains? What is the supplier's potential role in the auto maker's product development process? The case studies posit that answers are different from country to country, equally from supplier to supplier. It is common that the degree of supplier integration into a production chain is related to the supplier's engineering skill and its rationalization process.

In Sweden, with the process of supplier restructuring and closer buyer-supplier links, the tendency of supplier chain integration has become more evident. The first tier of suppliers (normally being system suppliers) are integrated into auto makers' product development not only in production steps, but also in the highly advanced R&D process of prototype design. As one marketing manager of Autoliv says, "Now, we are not only in the 'black box'. We stand on the same level as our customer. Seeing very clearly the future objectives for both of us, we know what our goal is and how to reach it". Indeed more and more suppliers have gained enough engineering skill and ability to integrate themselves into the auto makers product development.

However, suppliers' engineering skill is relatively weak in Thailand, and Thai suppliers rely greatly on foreign technological help. Many joint venture companies receive technological support from their home companies; some local Thai-owned factories buy and use special knowledge under licence; the third way is to seek for technological help through horizontal cooperation. One example of that is TRW, Fuji, Serina Co. Ltd., a specialist valves supplier, which has joint venture relation with the Fuji Company and is also a member of the multinational TRW group. The plant's managing director says: "Almost all of our part designs come from TRW and Fuji home company. Even if we want to develop wholly technological design ability ourselves, it may take about 10 years at least".

In this case, it seems that the low technological and less advanced supplier base has hindered close buyer-supplier cooperation. In order to integrate into auto maker's product development early and deeply, suppliers, especially in the first tier, must enhance their engineering skill and self-development ability.

5.4.3 Inside-firm training and learning process

Toyota and Volvo perform well in their inside-firm training. In fact, in production chains, when suppliers are more or less integrated into auto makers' "product development", the training transfer from auto assemblers to their suppliers becomes a meaningful learning process between the auto buyer and supplier.

According to Arrow (1962), learning which occurs inside the production stages or between the production and construction stages is in economic theory connected with the concept of "learning by doing". In auto production, learning is given its own identity within the chains. This is seen as important in enhancing suppliers' engineering skill. The feedback from user to producers of a product is denoted by Rosenberg as "learning by using" (1976), which deals with skill improvements that grow out of the productive process. Learning by using is an experience that begins where learning by doing ends. It may be a much more pervasive phenomenon in high technology industries.
In the auto industry, as suppliers are integrated into the assemblers' “product development” process, both “learning by doing” and “learning by using” are inevitably involved. It is often the situation that the first tier suppliers send their engineers and managerial staff to train and learn in the final auto assembly companies. In Sweden, I heard "resident engineers" in Volvo Torslanda Factory. In the Thai case, almost all interviewed Thai-Japanese joint venture suppliers send technicians and operators to be trained in parent Japanese companies. In Volvo Asia Auto Component Centre, three department managers studied at Volvo in Sweden.

Obviously, in order to enhance engineering skills, suppliers need to keep in close contact and collaboration with their customers through sending guest engineers to work in the assembly factory, analysing feedback (assessment) from assemblers, and meeting the needs of function requirements from assemblers, which are increasing continuously etc. During collaboration, suppliers learn from what they do and observe, to create, improve and eventually increase engineering skill themselves. This is why the learning process stimulates buyer-supplier relationships in production chains.

5.5 Cases Summary

(1) Different degrees of supplier chain integration
In Volvo's case in Sweden, the auto maker and its suppliers are developing towards deep quasi-firm integrated partnership.

In the Thai case, Volvo and Toyota, based on their cultural differences, have different characteristics of partnership. Generally, local buyer-supplier relations in Thailand are mainly pure business relations with less technological cooperation in product development than their parent companies in Sweden and Japan.

(2) Close partnerships need long-term cooperative relations. They start with business relations first. Trust is the essential prerequisite of close cooperation. The degree of supplier integration in the auto makers product development relates to suppliers' engineering skill and self-development ability.

(3) The level of technological development is the base of buyer-supplier vertical cooperation, linked to the state's industrial development and national education level including many other factors of the state's background. Therefore, government policy, national cross-culture as well as company culture, even language communication etc. are important factors affecting international buyer-supplier relationships.

5.6 Methodological discussion

5.6.1 The preparation of data collection: getting access

It was said that access is an important but difficult problem in the study of management. During the case studies, two problems puzzled me very often: How do I gain access to companies process and how satisfactory is this access?

Indeed, it was often difficult to gain sufficient access to the process of change to be examined or investigated, often being insufficiently aware of the problems of restricted access.
Barnes (1977, p.8) states that a "... social scientist may well find that gaining access to the people that he wants to study may be as difficult and lengthy a process as gaining financial support for his work". It might be a slight exaggeration but it is a fact in the case studies. In order to come into contact with Japanese auto assemblers in Thailand, it took for more than half year. I tried to make use of introductions from influential official people in the Japanese government, asked help from Volvo in Sweden and in Thailand, sought for references through the Japanese company as well as researchers in Sweden, even phoned to Nipponenso's European office in Netherlands to find a way of contacting Toyota. Finally, I succeeded in visiting three Japanese auto assemblers, Toyota, Daihatsu, and Hino in Thailand with the help of my local Thai friends. It is interesting that all these visiting and interviewing activities were arranged just through personal contacts.

In the case studies, it is necessary to interview people, usually referred to as interviewees, respondents or informants. But one also needs informants to help in gaining access to people, interviews and observation. Without at least one efficient and benevolent informant, we are lost in an unfamiliar setting, particularly, when the data collection relates to case studies in foreign countries.

5.6.2 Data collection: interviews across cultures

The case studies examine the selected auto assemblers' relationships with their local components suppliers. All major facts and processes over time were to be duly investigated, discussed and finally analysed. The data are collected via exploratory interviews, face-to-face interviews, telephone interviews, correspondence, and printed company materials.

Normally, it is not so easy to organise the content of interviews. As the interviewees are informed in advance by telephone and through correspondence, of the purpose, they are free to express their thoughts. Although directed interviews, by asking the necessary questions is considered to be the most efficient way, it doesn't mean that all the executives interviewed were very candid or eager to talk and answer questions, especially when being interviewed in Thailand.

Conducting interviews, like other aspects of human interaction, is culture-specific. The strategy an interviewer has to adopt for collecting data in Thailand can be very different from that in Sweden. Trust, past contacts, acquaintances, and language play crucial roles in Thailand. Language communication seemed to be a major barrier when we interviewed Japanese owned or Japanese joint venture suppliers, involving four languages: Chinese, English, Japanese and Thai, two interpreters were sometimes necessary for our conversation.

Telephone interviews - limited to Sweden - served the following purposes:
- to arrange face-to-face meetings and to explain the object of the research
- to collect complementary information following the face-to-face interviews

During the course of the studies, several Volvo final assembly factories and representatives of their local suppliers were studied, partly through interviews with various employees and purchasing/selling managers, and partly through an analysis of relevant areas of the company's history by examination of the relevant documents.
6 A Chain Reaction Model: Cooperating Buyer-Supplier Relationships Driven Production

6.1 Summary and reflections

6.1.1 Question summary on the case studies

After the empirical case studies, the major questions, presented in the end of Chapter 2, are answered and summarized here:

1 There are three sorts of buyer-supplier relationship in auto production chains:
   - Traditional pure market relations without coordination, like some specialist
     suppliers and their customers;
   - A black box relationship with different collaboration, as function or second tier
     suppliers and their customers;
   - Vertical quasi-firm relations with a high degree of cooperation, similar to
     relations between some system suppliers or first tier suppliers and auto makers.

In order to create competitive advantage and world class suppliers, the buyer-supplier
relationship is changing towards closer collaboration as well as cooperation.

2 Vertical quasi-integration is the highest level of buyer-supplier cooperation at
   present, actively and positively promoting auto makers’ “product development” and
   suppliers’ self-development, being profitable to both buyer and supplier within the auto
   production chains.

3 The JIT system invented by Japanese producers is not a dogma. Only the principle
   of Just in Time delivery is important to promote flexible production and buyer-supplier
   cooperation, but not concrete methods. Therefore, it is meaningless to classify different
   JIT styles.

4 Not only price, quality, delivery reliability, production flexibility and engineering
   skill etc. affect the buyer-supplier relationship, but also companies and countries
   cultural background make great differences in buyer-supplier cooperation and
   collaboration.

6.2.2 Reflections on the case studies

There are many possible reflections here. At the micro level these reflections of mine
concern auto makers and their suppliers. These reflections are briefly reviewed below.

Reflections upon auto makers

1 If Volvo and Toyota are achieving significant competitive advantage through
   devoting investment to their domestic supplier collaboration and development, can
   they afford a similar approach in their international production chains?

2 If Volvo and Toyota have such different approaches to collaboration with their
   suppliers, can any auto company wishing to achieve world class status afford to
   follow a different route?
3 The major transition from traditional relationships to partnership demands a new way of working with suppliers. The move from partnership to a quasi-firm relation requires a further step - giving up control over parts of the process which, it might be assumed, are the natural preserve of the auto maker. It means that not only the supplier, but also the auto maker must surrender some authority in order to integrate supplier’s competitive advantage into its product development. This could cause and expose great resistance within the auto maker and supplier. How do companies overcome this resistance, if such moves are necessary in order to rationalise the production chain and reduce costs, etc.?

4 During the transformation from traditional pure market relations to the new buyer-supplier relationships, the purchasing department of an auto manufacturing company plays a very important role. The close collaboration of all activities between buyer and supplier dramatically changes the role of purchasing, as it develops towards the whole company’s new purchasing strategy, which includes production, quality, design and production engineering. The new role of purchasing management is summarised in Figure 6-1. How does the purchasing department realize this great change initially?

![Diagram]

Figure 6-1 The new role for purchasing within network sourcing.

**Reflections upon suppliers**

The key to a successful buyer-supplier relationship is the development of the suppliers. Perhaps the biggest problem is to enhance the supplier’s confidence and ability in self-development. For this purpose, apart from auto makers’ investment and assistance, how do suppliers develop and rationalize themselves through the cooperation process?

1 Are they willing and able to enter into the type of relationship that their customers are seeking?
In order to become competent suppliers - even to become world class suppliers - as their customer expects, they need sustained and intensive efforts in engineering skill. This is an expensive investment for the future. Do they really want to pay such a high price for integrating into their customer's product development?

Are they as demanding towards their suppliers as their customers are of them? Are they willing and capable of replicating the same relationships with their own suppliers?

Finally, Lamming (1993) says that there are three key management tasks in the future: the management of change or transformation, the management of process, and the management of relationships. This paper attempts to describe the importance of the third task from the case study perspective. There is every reason to believe: without collaborating relationships, industry, particularly the discrete parts industry, such as the auto industry, cannot move forward. As long as the auto industry is endless, the development of the cooperative buyer-supplier relationship will also be limitless.

### 6.2 Why collaborate or cooperate

"Why does one need to cooperate in auto production chains"? This question, asked at the beginning of this paper, is answered in the empirical case studies presented. Effective competition demands competent component suppliers; to compete effectively at world class level, requires world class suppliers resources, and their full collaboration.

The term "collaboration", in an adaptation of the format used by Mowery (1988), is employed as 'an instance of inter-firm collaboration for significantly mutual medium or long term benefit, involving product development, manufacture or marketing that is not based upon arms-length market transactions, and includes substantial contributions by partners of capital, technology, know-how, or other assets'.

The fact that a supply chain is an important source of competitive advantage has been realized by auto makers since Japanese success in its auto industry. However, such advantage does not come of itself, it requires the auto maker's intensive and sustained efforts devoted to supplier coordination and development. From Womack (1990) to Hines (1994), many researchers believe that the major differences between Japanese and American management are mainly concerned with the way coordination is managed both inside the company and between customers and suppliers. This collaboration involves, as Norman (1991) puts it:

(The) mutual involvement of the firms in the various tiers aims at improving design, quality and efficiency. There is a remarkable source of dynamic cost advantage that flows from this mutual involvement. It is based upon constant two-way flows of strategic information between suppliers and buyers of the components and products. The aim is to seek ongoing technological improvements (Kaizen) by the active use of the systems of JIT and TQC at every layer in the subcontracting pyramid.

Since the auto industry is essentially conservative and technical change is characterized by incremental innovation, the assembler and component supplier must seek to establish a good coordination basis in product technology development: shared technological change. Here, supplier coordination refers to the activities made by an auto assembler to mould their suppliers into a common way of working so that competitive advantage can be gained particularly by removing inter-firm wastage. This type of coordination involves areas such as: working to common quality standards, using the same
paperwork system, shared transport and employing common inter-firm communication methods such as EDI.

Contractor and Lorange (1988) once summarised benefits of company collaboration, derived from their research:
- Risk reduction.
- Economies of scale and/or rationalization.
- Technology exchange
- Coopting or blocking competition.
- Overcoming government-mandated trade or investment barriers.
- Facilitating initial international expansion of inexperienced firms.
- Vertical quasi-integration advantages of linking the complementary contributions of the partners in a value chain.

In the case studies, experiences of Toyota and Volvo show that this type of buyer-supplier cooperation and the ability to use it increases competitive advantage for cooperative parties. This cooperation in unlocking the potential skills and abilities of the supply chain is embodied by Volvo and Toyota practise:

- A tiered and systematized supply structure with every part from single or dual sourcing;
- Managerial methodology of buyer-supplier relationships, e.g. JIT delivery, open book and cost reduction etc.;
- Close, long-term relationship involving a high level of trust, openness and profit sharing;
- A high degree of quasi-vertical integrated design employing skills and knowledge between auto maker and its first tier or system suppliers;
- A high degree of supplier innovation and design in both new products and processes;

The case studies in Sweden and Thailand reveal that the competitive advantage produced through cooperation is significant in terms of cost, quality, and delivery, especially in new product development and supply chain flexibility.

6.3 Three sorts of buyer-supplier relationships and supplier development

In these case studies, we see three different buyer-supplier relationships in figure 3-8, pure business relations with marketing coordination; "black box" partnership with limited technical collaboration; and highly advanced engineering processes involving quasi-firm cooperation. Although relationships between buyers and suppliers are different from country to country, and from company to company, one thing - towards a close cooperation within international production chains - is currently under way. The renewed efforts of best practise auto makers, from Toyota to Volvo, to organize their supply chains in new regions: vertical quasi-integration is still essential to achieve significant competitive advantage in production chains.

"Black box" partnership, as one typical form of collaboration, is still a powerful strategy. Through making use of suppliers' possible benefits and advantages, it encourages a joint approach to problems leading to reductions in costs, quality improvement etc. During this cooperative process, however, suppliers are fitted into a "black box" and passively accept auto makers' demands. Lamming (1993) points out:

That partnership retains a traditional view of the supply chain - that it is the customer, the company which in mass production has accumulated most of the control of the value chain, that "owns" the whole process, whilst the suppliers are
"Fitted in "by a procurement process still based upon buyer power. Partnership is seen by many suppliers, as just another way of appeasing the customer. The essence of partnership is sound - it is cooperation - but the prevailing climate of ownership works against this ever developing into true collaboration.

In Volvo's case, the experience of Autoliv has certified Lamming's perspective. As Autoliv's marketing manager says: "When we stayed inside the 'black box', we could not see what happens outside nor what the future is. In order to enhance the ability of self-development, it is necessary to cooperate more closely with our customers"1. Therefore, for a genuine rationalization of the supply chain, there has to be true collaboration between the buyer and supplier jointly involved in providing the end product. The vertical quasi-integration which we saw in Chapter 4 is such a relationship.

When both collaborators are involved in a highly advanced engineering process, the buyer-supplier relationship is viewed as a "quasi-firm", with its own organizational structure and goals, communication mechanisms and culture. This is illustrated in Figure 2-2. In order to develop this "quasi-firm" relationship, each company has to commit resources outside its organizational boundaries. The "third partner" thus has its own resource bases - people, equipment. And both assembler and supplier remain legally independent but operate closely towards mutual advantage and shared destiny. Its broad goals are to rationalize the part of the supply chain to which it relates and to provide added value at lowest cost.

For this quasi-firm relationship, the supplier comes out of the "black box". As an equal and independent collaborator, it actively contributes to the customer's final product development. As the Autoliv manager mentions: "Standing at the same level with Volvo, we see clearly Volvo's future, and our future also. We know thus how develop ourselves".

In general, a quasi-firm has a finite life, i.e. during a specific buyer-supplier joint venture period. The life cycle is the same as the cooperative project life.

The Volvo-Autoliv case shows that emergence of the quasi-firm, as a vertical integration relationship, has blurred companies' boundaries and the demarcation between customers' and suppliers' roles, emphasizing the importance of joint development of new technologies, using complementary assets in the process. In the quasi-firm group, both buyer and supplier work together to a common purpose and shared profits. Therefore, this vertical quasi-integration is called cooperation. At this level, buyer-supplier relationship is higher than the "black box" level. The latter is a representative of collaboration.

In Chapter 2, one distinct effect of the new purchasing strategy is to develop suppliers' integration. The case study result argues that vertical integration is increased through quasi-firm collaboration. In this new integrated relationship, both buyer and supplier have no ownership but share destiny, according to Blois (1972), Gadde and Grant (1984), it is called quasi vertical-integration.

As discussed in Chapter 2, the quasi vertical-integration is quite different from traditional integration. The most essential difference is that traditional integration only benefits firms in the final stages of production chains, whereas quasi-integration benefits both partners of one cooperative project in the production chain. One distinct character of quasi vertical-integration is that the cooperative partners share their destiny but without ownership relations. Having distinct advantages, it is possible that vertical integration will become a reality in the future.

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1 Quotation from one of Autoliv's marketing managers, 1995.
quasi-integration may develop continually in the near future. Figure 6-2 explains the relation between integration and cooperation.

![Figure 6-2 Relation between integration and cooperation](image)

Even though vertical quasi-integration is recognized as significant for supplier rationalization, it is possible that some relationships never need to reach quasi-integration level. Indeed, a relationship strategy and step must be intrinsically linked to the technology strategy of the supply firm, since technology is expected to flow into the organization via suppliers and other collaborators.

Perhaps the greatest hurdle to be overcome for the auto assembler is gaining the confidence of suppliers. Therefore, the role of supplier development is crucial to the success of supply relationship.

Hines (1994) gave out the narrower definition of supplier development as: "the activities made by a customer to help improve the strategies, tools and techniques employed by suppliers to improve their competitive advantage, particularly by removing intra-company wastage. This type of development would include the dissemination of customer strategies so suppliers could plan their processes more effectively, as well as the customer offering specific assistance to the suppliers in areas such as factory layout, set-up time reduction and the operation of internal Kanban systems". In the Japanese auto industry, supplier development was described by Ishikawa (1985) below:

Nursing subcontractors is an essential task of the purchaser. In Japan, many subcontractors are not strong enough on their own. If they do not know effective management or quality control (techniques), the purchaser must provide opportunities to strengthen them in these areas. For example, the purchaser may sponsor seminars on quality control for its subcontractor's managers, engineers, and QC circles. The purchaser can visit suppliers, engage in QC audits and provide guidance. Generally it takes at least three years to make a subcontractor a good one. The management of the purchase must establish a long-range policy and consider nursing its subcontractors for the long-range benefit of both parties.
The task of supplier development is technology transfer from assembler to its suppliers. This investment involves the transfer of both hard technologies as well as softer management technologies. The best assemblers not only teach their suppliers hard techniques, but also help them to adopt the softer human resource management and culture features exhibited by the assemblers. It is obvious that this higher degree of sharing technology between the buyer and supplier could only take place within an environment of extremely high goodwill trust, not only between buyer and supplier but between all firms in the final assembler's network of supply.

As a result of this technology transfer, it provides not only a more efficient mechanism for teaching suppliers about new tools and techniques, but also helps suppliers to share strategies and direction and hence remove inter-company wastage. The combination of this intra- and inter-company wastage removal results in significant competitive advantage.

6.4 A new chain reaction model based on buyer-supplier cooperation

Economic growth is sustained by development mechanisms that are somewhat similar to chain-reaction. In the standard production paradigm, this chain reaction occurs through successive reorganizations and increasing use of "hard" automation, leading to scale economies and thus to greater efficiency. In turn, this leads to lower costs, lower price and growing demand, which triggers a new reorganization, and so forth.

The advent of Japanese lean supply has resulted in a great shift in the relationship between the car assemblers and the suppliers and among suppliers. We believe this shift will produce fundamental implications for the auto industry.

The auto makers' experiences in the case studies demonstrate that close cooperation with suppliers can create sustainable competitive advantage and drive product in the production chains. It not only reduces cost, but also results in a dramatic improvement in response time, as well as product improvement.

Reflecting on Ayres's and Zuscovitch's chain-reaction models, a new chain-reaction model in the auto production chain is made up here. It is the returns-to-supply chain integration cycle. The new model embodies the principles of the basic chain reaction models: a cost-price-driven product as well as innovation-driven product. It explains that a collaborative buyer-supplier relationship can generate continuing product competitive advantage, for as long as the technology-driven economic development exists. Its schematic version of the cycle is shown in figure 6-3.

The model conceived comprises nodes in a linked technical and non-technical change, where the potential interaction between buyer and suppliers can be described as close collaborating games. It is such a transformation process, starting from one node (see the figure 6-3), continuing in several steps to others, and after some time reinforcing the positive effects of the initial competitive advantage in several nodes throughout the whole production chain. Namely, a supply chain can be an important source of competitive advantage to any company which devotes intensive efforts to supplier coordination and development. The "chain-reaction" based on the case studies unlocks the mutual competitive advantage and by so doing gains significant competitive advantage.

This chain-reaction model describes the importance of collaborative buyer-supplier relationships in product development process. Perhaps we can say that without such a cooperative relationship, industry, at least the auto industry, cannot move forward.
6.5 An idea for further research

Up to now, great changes in market relations occur not only between auto makers and their suppliers, but also in other discrete parts industries. If supply relationships are different from country to country, and from company to company, what are the differences between different industries? It is reported that the telecommunication corporation Ericsson is organizing a new strategy to develop supply cooperation within production chains. Ericsson might become a new case studying objective in the near future.

Both production chains are of essential interest for national industrial development. The auto chain is generally more market oriented while the telecommunication industry contains more public planning.

The history of Ericsson in South East Asia is longer than that of Volvo. And it has begun to locate some of its R&D activities in some developing countries, e.g. China, India and Malaysia. The further project is going to investigate how to combine actor-oriented and structural perspective in technology absorption and translocation of R&D along international production chains.

The case studies presented in this report show technology translocation having positive effects on the host country's innovative capacity, where several conditions have to be fulfilled, the most important being the local capacity for technological absorption. In the coming project, better insight should be given into how guest multinational companies cooperating with local component suppliers, can promote the transfer and development of technological, organizational and managerial "know how".

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2 Refer to “Ericssons nya strategi: Mera program utveckling och fler underleverantörer” from Newspaper Elektronik, 14/1995.
The end?

This is not the end.
It is not even the beginning of the end.
But it is, perhaps, the end of the beginning.

Sir W. L. S. Churchill
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Part II
Management of Buyer-Supplier Relationships in Telecom Supply Chains
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1 Introduction

1.1 Background

Five or six years ago, when I was working at Ericsson with supply process development, I saw a video program, an interview of an Ericsson vice president. The journalist asked, “what is the most important improvement for Ericsson in the near future?” “I think it is supply chain management,” he replied without hesitation. This occurred while Ericsson was in its most prosperous period.

Mature industries are often characterised by continually decreasing margins and over-capacity in production. "Ericsson is now facing the same problems as all mature industries face. We are thus entering the era of ‘supply chain competition,” Åke Fahlen, former vice president of Ericsson (China) said when I met him for the first time in the spring of 2002. That was both the starting point for the co-operation project with Ericsson (China) on “Managing Buyer-Supplier relationship in the Telecom Supply Chain” and ultimately, the second part of my PhD thesis.

Research into why the supply chain competition era has come about, coupled with the study of how supply chain competition replaces traditional competition in production, technology, and marketing has led to an interest in Dell Computers. In less than 20 years, Dell Computers have become a leading company in the global PC business. Dell’s made-to-order model has blossomed into a new manufacturing paradigm. However, a Dell manager revealed that Dell’s margin has decreased from 70% to 15% during the last ten years. How does Dell avoid stumbling – "It is the supply chain,” says a Dell Computer high-level manager. “We carry about five days' worth of inventory. Our rivals carry 30, 45, or even 90 days’ worth. This is critical”. To reach this level the business requires a most efficient supply chain management system and a low cost operation model.

Supply Chain Management (SCM) incorporates key ideas from lean manufacturing and supplier management and extends the scope to distribution. The objective of supply chain management is to improve the efficiency of the product delivery process from materials to suppliers to the end customer, the right product, at the right time with minimum cost (i.e. cost for handling and buffering) and maximum customer satisfaction.

How may this objective be reached? The most difficult operational issue concerns offering better value to the customer whilst continually and simultaneously reducing the cost.

A company may fall into a trap after it has been pushed by customers to lower prices and shorten delivery times. The situation may be described with the Chinese saying:

“Your horse is required to run faster but eat less food”. Escaping from the dilemma with only competitive products and technology is not enough. An efficient production system that includes supply chain management is now a necessity to compete in the market. This is why Nokia has made the supply chain network one of its strategic cornerstones together with its products and brand image.\(^2\)

My earlier study of Buyer-Supplier Relationships in Auto Production Chains (Part 1 of this thesis) shows, that as an industrial organization model, buyer-supplier technological collaboration possesses the characteristic of creating and upgrading competitive advantage in the production chain. The case study also shows that buyer-supplier networks are not only alternative ways of deploying existing resources, but that they actually create new economic resources as well.

Chesnais (1996) argues that networks might possess an organization, which owns the capacity to create resources, and, given access to all their strengths they may gain and increase this capability through co-operation. Through a wide variety of formal (contractual) and informal linkages, firms can combine and pool innovative and productive capabilities, which if properly coordinated can be greater than the sum of the technological capabilities of the individual firms.

Networks are information intensive, however, Zuscovitch and Justman (1993) point out that the following properties are of particular importance in the context of the “information-intensive production system”:

> When intensive information is embodied in products both through the exploitation of user needs and through the larger scale incorporation of science and technology, the firm tends to rely increasingly on intangible assets to assert their competitive advantage; the real side or the 'book value' decreases in importance. This intangible capital of the firm is much less transferable than physical assets, due partly to the tacit dimension of technological practice, and, partly to the collective nature of these assets. The cumulative nature of learning makes these assets even more 'local' and specific. If information cannot be efficiently transferred through markets even with the right 'incentive', then the only way to transmit such experience is by sharing its production. In this light, networks represent a mechanism for innovation diffusion through collaboration. An interactive relationship becomes not only a co-ordination device to create resources, but an essential enabling factor of technological progress.

In the case of the telecommunication industry, the need for co-operation stems from the particular requirements of complex sophisticated systems characterised by technical inter-relatedness, customer-oriented demands, short production life cycles, and a high investment in R&D (Ottosson & Wang, 1996), especially in applied R&D which is probably quasi-irreversible. These characteristics make buyer-

supplier collaboration within the demand-supply chain more important and extensive in the telecommunication industry.

1.2 Research problems and research questions

The aim of the study is to analyse the means by which a company fulfils customer demand in the best way through different supplier relationships. It also addresses the issue of how alternative relationship types are used in reality, and why.

The study focuses on the relationship between the focal company and its suppliers. Using case study methodology, the study starts by observing and collecting large amounts of data from selected cases. Based on the collected data and case analysis, a description and an interpretation of an appropriate customer-supplier relationship model at the strategic level is then built from this study.

The research problem is as follows:

**How is the most appropriate buyer - supplier relationship selected under different business conditions?**

This research problem is explicitly studied from a buyer company’s standpoint. It can be divided into the following key research questions:

1. What types of buyer-supplier relationships can be classified in the supply chain? (theoretical classification)
2. How are alternative relationship types used in reality, and why? (case description)
3. Which selection factors actually specify the most appropriate supply relationship for a focal (buyer) company? (prescription)
4. How, and under which conditions, should the relationship segmentation model be used? (application)

The well-known contingency theory of organization by Lawrence and Lorsch (1967) tells us that there is no best method of organisation because so much depends on the environment. Following the principle of this contingency theory, this study will search for a suitable buyer-supplier relationship model for the case company in different business situations.
1.3 The scope of the research

The scope of this case study is restricted to a supply chain in the telecommunications industry where the success of supply processes is dependent upon how well a focal company manages its supply chain with horizontal or vertical integration to fulfil its customers' demands. In this thesis, the term "focal company" is defined as a company who plays a dominating role in the supply chain and is therefore a focal choice in this study. If nothing else is specified, Ericsson is the focal company under discussion. The focused product type is a typical high-tech and innovative radio system network product with a relatively short life cycle (Ottosson & Wang, 1995). Furthermore, the business environment is focused on a fast-growing turbulent market in China.

This thesis is a work of inductive research conducted as a multiple-case study in a mobile systems network business during 2002-2003. It covers strategic sourcing and relationship management of supply chains for high-volume radio base stations in a network. The selected focal company is Ericsson (China) AB, a daughter company of Ericsson AB. Ericsson is a leading system supplier in worldwide mobile telecommunications, and, China is one of the most important and fastest growing markets. The research into "Managing Buyer-Supplier Relationships in the Telecom Supply Chain" is a close co-operative project together with Ericsson (China). The project aims to increase Ericsson's competitive advantage and customer satisfaction through strategic supply chain relationship improvement in China. The main objective is to investigate and analyse the current supply relationship strategy and performance situation, to use benchmarking with other comparable industrial companies, and finally, to seek a new strategic supply relationship solution (model) for further improvement in the near future.

1.4 Thesis composition

This thesis consists of six chapters.

The opening chapter (Chapter 1) is an introduction. It gives an outline presenting the background and purpose of the study, the research problem and questions arising. The scope of the research is also described in this chapter.

The literature review (Chapter 2) outlines supply chain management issues, the progression of customer-supplier relationships, as well as strategic inter-organizational relationships. It is a review of theoretical concepts and also a theoretical base for this study.

The third chapter (Chapter 3) discusses research methodology and method. The chapter presents the motivation for the case study. It provides a comprehensive explanation of considered research techniques, namely, hermeneutics, qualitative research, inductive methodology, technical norm, as well as action research. The research process is also constructed in this chapter.
The case study is then presented in Chapter 4, which gives the background to the case study. Five different cases illustrating Ericsson and its suppliers’ relationships are presented together with a comparable case from a Chinese home products producer, Haier.

"Fact finding and case analysis " follows on. This occurs in Chapter 5. Based on the Data analysis, the four main problems emerging from Ericsson-Supplier strategic relationships are presented. Four research questions are then proposed based on these problems. Further discussion concerning research questions is followed in this chapter accordingly.

The final conclusion and theory building are presented in the last chapter (Chapter 6). A new dynamic customer-supplier relationship model based on the case study is presented together with a summary of the study. Opportunities for further study are suggested following upon my reflections on this doctoral experience.
2 Literature Review of Supply Chain Management and Buyer-Suppliers Relationships

2.1 Introduction

The primary objective and interest was to focus on customer-supplier relationship management in a supply chain without having exactly decided upon the research subject. The review started with the following works: "Logistics and Supply Chain Management" (Christopher, 2000), "Managing the demand-supply chain, value innovations for customer satisfaction" (Hoover, et al. 2001) A Relationship Model (Spekman 1998). Several PhD theses in the relevant area were also referred to. (Heikkilä, 2000, and Collin, 2003.) Not all of these were covered in great depth.

Further into the literature review and my research project process, it became clear that I was interested in strategic customer-supplier relationships in a supply chain management context and that this would be an appropriate research subject for my study. Based on the primary literature review and problem finding from my case study, the following research question was raised: "How should the most appropriate buyer-supplier relationship be selected in different business conditions"?

Having identified the research question, a further literature review was required to seek out literature relating to customer-supplier relationships within supply chains, so that the literature would support the development of categories and themes.

The sequence of this literature review thus looks for supply chain strategy, for inter-organizational relationships and for early model references. It focuses on a number of contextual matters such as supply chain integration, core competence, competitive advantage, vertical and horizontal relationships and strategic partnerships. The entire literature review is made at the strategic customer-supplier relationship level.

2.2 Competitive advantage and supply chain management

The need for rapid and sustainable development within supply chains is one of the key imperatives of today’s business environment. It is undoubtedly a key source of competitive advantage as the locus of competition moves from the company to the supply chain.

Many authors argue that supply chain management provides a major source of competitive advantage (Ohmae, 1983; Christopher, 2000). Dell is one of the most successful companies to have used its supply chain for competition. As a result, it has made dramatic progress during the last 20 years. Ohmae (1983) shows one simple model of competitive advantage in relation to the three C’s’. The ‘Three C’s’ are: the customer, the competitor and the company. From Figure 2-1, we can see
whether a company can enhance its competitive advantage by successfully utilizing its assets. However, as we are entering the era of ‘supply chain competition’, asset utilization applies to not only the company’s assets, but assets through the whole supply chain as well.

---

**Figure 2-1  Competitive Advantage and the ‘Three C’s’**


An increase in supply chain disintegration caused by the consolidation of manufacturing capacity by contract equipment manufacturers, 3rd party logistics and business to business exchanges, means that processes that were once wholly owned by the traditional multinational are now managed outside the organisation’s boundaries. The resultant increase in business partners has led to greater complexity of supply chain management. Subsequently effective management has become more of a challenge. Within this environment, the need for collaborative partnerships becomes a fundamental prerequisite for business success. The opportunity for success lies in collaborating across the extended supply chain, operating it as a single entity with all partners using advanced technology to integrate seamlessly. This new interdependent buyer-supplier relationship is aptly described by the Chinese saying: “Two grasshoppers tied on one string.” – If one wins, both win, and vice versa.
2.2.1 Supply chain management

Figure 2-2 is a typical manufacturer’s supply chain:

Figure 2-2 shows that supply chain management is a process of management of design, development, and of the optimization of the internal and external activities within the supply chain. These activities include procurement from suppliers, materials supply, distributing finished products and service to the customer.

In order to become a winner in the supply chain competition, all suppliers and customers within the supply chain must be synchronised to deliver products for an efficient chain performance (Spekman et al. 1998). The essence of supply chain management is a matter of strategic planning to develop a sustainable competitive advantage by reducing investment without sacrificing customer satisfaction (Lee and Billington, 1992). The success of supply chain management is now measured by cost, innovation, product lead-time (speed), and customer satisfaction (Spekman et al., 1998).

A supply chain creates products and services that are transferred from suppliers to customers (e.g. organizations, businesses, and private citizens). It includes tried suppliers (or a network of suppliers), manufacturers (or assemblers), distributors (as 3rd party logistics) and customers. It also implies a set of supporting links in transport, communications and other facilitators to connect them to each other. The challenge is to integrate each part into a coherent larger system. Houlihan (1996) has summarised some essential characteristics of a supply chain:

- The supply chain is a complete process for the provision of goods and services to final users;
- Membership includes all parties, including logistics operations from initial material supplier to final user;
• The scope of supply chain operations includes procurement, production and distribution;
• Management extends across organisational boundaries to include planning and control over operations of other organisational units;
• A common information system accessible to all members makes coordination possible between organisations;
• Member organisations achieve their own individual objectives through the performance of the supply chain as a whole.

Supply chain management (SCM) involves a total set of business and management activities used to convert resource inputs into products and services.

Christopher (1998) defines supply chain management as follows:

It is the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supplier as a whole.

The goal of supply chain management is to link the marketplace, the distribution network, the manufacturing process and procurement activity in such a way that customers are serviced at higher levels and yet at a lower total cost.

According to Christopher’s definition, the focus of supply chain management concerns the management of relationships across complex networks of companies, which may be legally independent but are in reality interdependent. Successful supply chains will be the ones governed by a constant search for win-win relationships based upon mutuality and trust. The objective of SCM is twofold: efficiency (making best use of resources at lower total cost) and effectiveness (addressing customers and their demands and servicing them at a higher level).

Schary and Skjött-Larsen (2001) stress that coordination is imperative to the concept of supply chain management, as it not only involves reducing costs and improving responses to change, it also provides an opportunity for the development of appropriate strategies. They describe the two basic tasks of supply chain management as follows:

• Coordination – to make market demands and customer orders visible throughout the whole supply chain and to make an effort to supply them.

• Managing assets across the supply chain - to reduce supply cost without sacrificing customer satisfaction.

Furthermore, Schary and Skjött-Larsen have stated that successful chain management will provide a framework for resource decisions and create competitive advantage through the effectiveness of the entire chain and chain of partners’ relationships. This can lead to a longer lasting competitive advantage within the supply chain.
2.2.2 Supply chain integration

Lean production and lean supply, which began in the 1970s, has greatly changed buyer-supplier relationships. An account of this is given in Part 1. One distinct effect is on the development of supplier integration (see Part 1, Chapter 2 pp. 30). The key is to create a structure co-ordinating all key actors in the supply chain (i.e. buyers, suppliers, customers) and to capture organizational capacity so as to be able to respond to end-user customers efficiently and effectively, while simultaneously maintaining flexibility and autonomy for the associated actors.

Companies have to find a way to integrate the efforts of all functions across supply channels, minimizing conflict wherever possible. The process of integration controls the extent to which the business can achieve corporate, business and functional control vertically and horizontally throughout the supply chain. Hensher and Brewer (2001) argue that the higher the degree of integration, the greater the need to emphasize co-ordination and find a responsive organizational form to maximize it. There are two types of integration process: vertical and horizontal:

- Vertical integration, moving upstream towards suppliers and downstream towards customers, and based on market channel transactions (as demand-supply chain integration);
- Horizontal integration, moving towards competitors, for example joint venturing between a private enterprise and a government agency.

Ensuring a rapid response to customer demands is critical for the vertical integration of all partners in the supply chain into a coherent system.

Supply chain integration is not merely an issue of functional control, it also involves a degree of strategic and performance control in relation to the customer in the supply chain. When businesses are not vertically integrated, they have to rely on negotiating trade agreements with others in the supply chain for all of the following areas: purchasing, production, storage, distribution, transport, meeting delivery deadlines, and service to customers. Porter (1985) outlines the advantages and disadvantages of vertical integration as Figure 2-3.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td>Secure economies of scale and/or scope</td>
<td>Cost of overcoming mobility barriers</td>
</tr>
<tr>
<td>Tap into technology</td>
<td>Increased operating leverage</td>
</tr>
<tr>
<td>Ensure supply and/or demand</td>
<td>Reduced flexibility to change partners</td>
</tr>
<tr>
<td>Enhanced ability to add value to business</td>
<td>Higher overall exit barriers</td>
</tr>
<tr>
<td>processes</td>
<td>Capital investment requirements</td>
</tr>
<tr>
<td>Heighten market channel entry and exit barriers</td>
<td>Differing managerial requirements</td>
</tr>
<tr>
<td>Enter a high-return business</td>
<td>Greater need for co-ordinating</td>
</tr>
<tr>
<td>Defend against foreclosure</td>
<td>techniques</td>
</tr>
</tbody>
</table>
Hensher and Brewer (2001) maintain that additional complexities such as differentiation and conflict are introduced into supply chain management with vertical integration. The more unstable and dynamic the competitive context becomes, the more differentiation the business needs to establish. Once a business engages in differentiation, particularly across the supply chain, it has gone beyond its core business and core competences.

This situation often leads to functional outsourcing, for example, 3rd party logistics for inventory management. Figure 2-4 shows the evolutionary process of supply chain integration from stage 1 to stage 4.
2.3 Market, hierarchy and resource creation

The outsourcing that started within the automobile industry has gone on to become a fashion in manufacturing industries generally. This has led in the last decade to strategic and structural changes. These comprehensive changes have in their turn led to a new situation with regard to the role of purchasing and how it functions, not only strategically and organizationally, but also in relation to suppliers.
2.3.1 Market, hierarchy and core competence

Before an "outsourcing" discussion can take place, it is necessary to deal with the dynamics of inter-firm collaboration. This involves addressing a number of issues, such as, the motivation of partners and how each sees the benefits of how resource creation through inter-firm collaboration can create competitive advantages through the learning of tacit knowledge. Understanding the dynamics of inter-firm relationships may shed light upon the situations and conditions which the firm needs to choose between, namely, internal or external relationships or contracts.

Economic analysis of the dynamics of inter-firm collaboration was first carried out in the 1980s (Chesnais 1988). However, most studies are either explicitly or implicitly couched in the framework of the Coase-Williamson theory of market and hierarchies.

Early in 1937, Coase presented an account of the firm as a governance structure rather than a neo-classical structure with a “black box” production function. Coase’s key insight was that firms and markets were alternative means for organizing similar kinds of transactions. Williamson (1979 & 1985) develops Coase’s thinking in terms of transaction costs and Chesnais gives a concise summary of his transaction cost theory. (OECD, 1992, pp. 86):

The core of Williamson’s argument is that exchanges, which are straightforward, non-repetitive and require no transaction-specific investments will occur in markets, but that transactions between firms that involve uncertainty about their outcomes, that occur frequently, or those that require substantial “transaction-specific investments,” are more likely to take place within hierarchically organized firms. In particular, transactions are moved out of markets into hierarchies as knowledge specific to the transaction (asset specificity) builds up. When this occurs, the bureaucratic costs of large-scale corporate organization will be preferred to market transactions.

Here the term "asset specificity" as used by Williamson refers to the extent to which resources are specific to a particular product or context. According to the theory, transactions should have occurred in either markets, or large, hierarchically structured organizations. In principle, Williamson concludes that a situation with a high degree of uncertainty and asset specificity is best dealt with within the company’s own hierarchical structure. Furthermore, Williamson argues that particular forms of organization are best suited to achieve particular business goals because they result in efficient transaction costs.

Cox (1996) makes the following two points about the important contribution of Williamson's work:
• It has broken down the neo-classical view of the firm, which described the firm as a static system of production rather than a system of exchange.

• Williamson’s approach has also forced us to question what the suitable boundaries of the firm might be and why they shift and change.

Williamson's theory of the relationship between transaction costs and asset specificity requires further scrutiny in order to ascertain under which circumstances and conditions internal or external contractual relationships might be more or less useful in achieving the lowest transaction costs? Cox’s approach to asset specificity is embedded in an entrepreneurial rather than a production oriented view of the firm. He redefines "asset specificity" in terms of "fitness of purpose' of specific skills, expertise and transactions in achieving a sustainable position for profit within specific supply and value chains. The more a particular knowledge base contributes to profitability, the more it should be regarded as an example of high asset specificity.

In an industrial society, the term "high asset specificity" is often interpreted as "core competence" due to its vital importance for the firm’s profitability and survival within supply chain competition. Collins (1991) makes reference to definitions of a firm's core competence and discovers that it concerns those resources that are fundamental to a firm's strategic position. "Core competence" is also a term often connected with "outsourcing".

Reve (1990) describes core skills and complementary skills. He states that only the core skill should be kept in-house. Complementary skills can be shared through a strategic alliance and through collaboration when it is strategically important. If the skills are of less strategic value, these may be purchased on the open market. He goes on to say that a company's skill profile tends to change over time. Thus strategic core competence must be continuously redefined.

Schary & Skjött-Larsen (2001) argue that core competence connects to the company’s competitive advantage, which creates an opportunity for prices and profit margins that exceed the market.

Hamel (1991) argues, "Core competence or core skills can be both strengthened and lost during strategic alliance and collaboration. Core skills can be learnt from partners or transferred to others, but in the process a partner might lose its own core competitive advantage during outsourcing or in a strategic partnership relationship. Strategic alliance and partnership involve both collaboration and competition, it is like a double-edged sword.

2.3.2 Resource creation: the one key attribute of the firm and the potential of collaboration

Why are firms willing to collaborate? The reasons for increased inter-firm collaboration can be explained as follows. It is a reaction to the growing pressure of global competition, escalating R&D investment, production costs and the risk of
rapid and radical technological change. Financial and economic uncertainty brings influence to bear on the situation as well (Coombs, 1996). Kogut (1988) summarises the benefits of collaboration as follows:

- Risk reduction
- Economies of scale and/or rationalization
- Technology exchange
- Co-opting or blocking competition
- Overcoming government-mandated trade or investment barriers
- Facilitating initial international expansion of inexperienced firms
- Vertical quasi-integration advantages of linking the complementary contributions of the partners in a value chain.

The question “why are firms willing to collaborate?” has a strong bearing on the nature of the firm. In terms of the Coase-Williamson theory, the firm is indeed a “second best” instrument of resource allocation, the best one being the market. As Williamson says: “Markets and firms are alternative instruments for a related set of transactions” or again, “Only as market-mediated contracts break down, is the transaction in question moved from markets and organized internally” (1985, pp.87). According to this point of view, transaction cost-related market failures are the principle reasons for firms to identify and save expensive transaction costs. Obviously, the theory encompasses questions relating only to resource allocation (Cantwell, 1989; Lazonick, 1991). It excludes any active role for managerial strategy and leaves the firm as a passive reactor to transactional circumstances (Casson, 1986). Chesnais (1996, pp.26) criticises this theory, saying, that this view of the firm omits several key dimensions of corporate activity which in reality represent the essence of what firms are about; notably their resource – value – and surplus – (e.g. profit) creating attributes and their capacity for strategic conduct.

According to Chesnais, once the nature of the firm is established as the institution where resource and value creation takes place in a capitalist society, resource, value and profit creation then become the key attributes of the firm; the capacity of the firm to minimise the burden of certain transaction costs to market for intermediate products can at best only represent one of the sources of corporate viability. (Chesnais, 1996, pp.27) According to this interpretation, the firm’s ultimate goal is the use of minimum inputs (resources) to achieve maximum output (products), which must undergo a successful test of the market.

The struggle to enhance the capacity of resource and profit creation and of reaching the firm’s goal relies heavily on mastering technology. Many economists (e.g. Prahalad and Hamel, 1990; Coombs, 1994 & 1996) state that collaboration can permit the creation of new competencies via the assembly of previously separated technological capabilities contributed by different network members. Since the 1970s, Japanese corporate and industrial networks have shown a new form of production or techno-economic system “transcending markets and hierarchies” (Imai and Baba, 1991).
One of the features of these resources newly created by collaboration and networking is that the collaboration contributes not only formal codified knowledge but also tacit knowledge and skills (Senker and Faulkner, 1996). Case studies of the auto and telecom industries in this thesis further describe networking (e.g. buyer-supply relationships) as an important means by which companies acquire and exchange tacit knowledge through personal interaction. This applies to both colleagues inside the company, and, to external supply networks. When networking occurs, it has an overlap-function in the form of a mutual learning process.

Chesnais (1996) argues that networks are not simply alternative ways of deploying existing resources, but that they actually create new economic resources which would otherwise not exist, or whose existence would be delayed. Chesnais’ further analysis argues that networks might possess organizations that own the capacity to create resources and can take steps to ally their strengths and increase this capability through co-operation. Through a wide variety of formal (contractual) and informal linkages between firms as well as innovation-related public institutions, firms can combine and pool innovative capabilities, which, if properly coordinated, could be greater than the sum of the technological capabilities of the individual firms.

2.4 Outsourcing strategy

During the past decade outsourcing has become an important supply chain strategy for many companies where buying more from outside suppliers is concerned. According to Bear Stearns (2001), about two-thirds of the North American auto industry’s value now resides with suppliers. In the year 2001, the average electronics OEM was hoping to outsource 73% of its manufacturing. 40% of all OEMs were hoping to outsource the manufacture of 90% or more of their final product. According to La Grangeville’s report (1999) the outsourcing of operations and facilities across industries in general rose by 18% in the period from 1999 to 2000. Reports by Standard and Poor (2000) point out that the market-to-book ratio of the S&P 500 was six times greater than it had been in 1981 – This means that companies were ordering more ready-made goods from the market instead of manufacturing in-house themselves. It is a reflection of the declining importance of tangible assets.

Many researchers are interested in questions such as: why outsourcing? What are the driving forces behind it? Brandes et al., (1997) cite three reasons for the underlying decisions concerning outsourcing.

- A need to focus on core competence. This is a strategic decision, which means that the company should keep its core competence in-house while complementary resources can be purchased from the outside.

- Cost efficiency. The question arising here is: “who can produce the product most cost-efficiently and how? Cost efficiency may be improved in two
ways, either through high productivity or through high-competence products.

- Financial problems. If the company is facing financial problems, such as one of cash flow, then it may have to cut down on some of its business and release certain resources or investments to external partners in order to reduce financial pressure.

Welch and Nayak (1992) assert that outsourcing is the antithesis of vertical integration. The advantages of outsourcing include:

- The conversion of fixed costs to variable costs
- The opportunity to reduce capital investment requirements
- The potential to reduce all total costs (through partners’ economies of scale/scope and lower wage structure)
- A redefined and balanced workforce in terms of worker type, gender, and experience
- The acceleration of new product/service developments
- Gains in access to invention and innovation from partners
- A focus on high value-added activities

Many researchers point out that the practice of outsourcing has not been as successful as its theoretical expectation (Brandes, et al., 1997; Bengtsson & Berggren, 2002 etc). McIvor (2000) argue that there is evidence to suggest that companies are not achieving the desired benefits from outsourcing. McIvor (ibid.) refers to a survey carried out by the PA Consulting Group (1996) who found that only 5% of the companies studied had achieved high levels of benefits from outsourcing. Lonsdale et al., (1997) conclude that outsourcing decisions are rarely taken within a thoroughly strategic perspective, as many firms simply consider short-term perspectives. Outsourcing seems to be primarily motivated by the search for short-term cost reductions. It is not certain whether outsourcing is capable of maintaining competitiveness for all companies in the long-term view A report from The McKinsey Quarterly (Doig et al., 2001) shows:

One fifth of the executives in a recent survey say that they are dissatisfied with the results of their outsourcing agreements, while another fifth of respondents say that they are neither satisfied nor dissatisfied – which suggests that they are not seeing clear benefits3. Dun & Bradstreet report that 20 to 25 percent of all outsourcing relationships (manufacturing, finance, information technology, and so forth) fail within two years and that 50 percent fail within five. Nearly 70 percent of the companies responding to a Dun & Bradstreet survey asserted that suppliers “didn’t understand what

---

they were supposed to do” and that “the cost was too high and they provided poor service4.

In such a case, it has often been forgotten that outsourcing isn’t an end in itself but rather a strategic tool for enhancing overall performance. The ability of outsourcing to play this role depends partly on the form chosen. … If outsourcing isn’t used strategically, it probably shouldn’t be used at all.

The following interesting question may be raised. Are the outsourcing decisions a long-term strategy or merely a short-term tactic? Brandes et al., (1997) argue that outsourcing is more successful if it is based on strategic decisions, which include core competence and cost efficiency considerations, rather than if it is taken as an emergency action in the event of financial problems.

Whilst considering outsourcing as a strategic decision, Doig et al. (2003) make the point that the following is vitally important for top management to consider when making an assessment whether to outsource or not:

- Strategic assessment – “Why outsource? ” Does access have any strategic importance? How can the firm’s manufacturing strategy meet the needs of its overall business strategy? The conclusion reached is that outsourcing probably shouldn’t be used at all if isn’t used strategically.

- Operational assessment – “What are the targets (such as lead time and unit cost) of outsourcing in performance levels? What are the optimal supply chain arrangements for reaching these targets?"

- Organizational assessment – “How does the business achieve results? ” How does manufacturing strategy link with business strategy to manage the supply process through inter organization relationships?

According to Doig (2003), company top management must use these three dimensions to assess both internal and external operations as well as a combination of both in order to create the most value through supply chain management.

Furthermore, as outsourcing greatly alters the purchasing role in companies, it has become a strategic issue instead of a traditional operative function. As Deming (1986, pp. 33) points out, purchasing should:

…..end the practice of awarding business on the basis of price tag alone. Purchasing must be combined with product design, manufacturing and sales in order to work with the chosen suppliers.

Gadde & Håkansson (1994) point to three areas of decision in the strategic purchasing context:

The make or buy decision, as we have discussed above, needs a clear focus on core competence (asset specificity) and cost efficiency consideration (transaction theory).

The supply–base structure will deal with how to organize different suppliers within the supply chain. It will illustrate tier structure, for instance (1st, 2nd and 3rd tier suppliers), and show how the outsourcing process operates smoothly with regard to transaction and supplier sourcing policy (single, dual, or multi-sourcing.)

To sum up, the buyer-supplier relationship has become a strategic issue for two reasons, according to Schary & Skjött-Larsen (2001). The first reason concerns cost rationalization and the second relates to the benefits derived from utilizing the resources and competencies of suppliers for the development of new skills and innovation. It is thus important to build different kinds of relationships with different suppliers during different periods of time.

2.5 Evolution of buyer-supplier relationships

During the last decade, the study of relationships has become a well-developed stream of thought in the literature from both the buyer and supplier’s point of view. In order to be flexible, adaptable and efficient, many western and eastern companies focus their resources on managing the supply chain process. This approach has led to many supply strategies such as “outsourcing” (Wilcox, et al., 1997), and the creation of supply-tiering structures (Lamming, 1993; Hines, 1994; Hines et al., 2000). These create great changes within buyer-supplier relationships moving from a widespread range of suppliers towards fewer suppliers. Where single sourcing is concerned, the move has been from traditional “adversarial purchasing relationships” (Lamming, 1993) to a new concept of “partnership sourcing.” Researchers and practitioners have realised that new competition is no longer a question of single company versus single company, but more a question of supply chains versus each other.

Spekman et al. (1998) summarises an historical trend wherein buyer-supplier relationships move from open-market negotiation to co-operation, and on to co-ordination and collaboration. He shows a key transition process as in Figure 2-5.

A low information transfer and commitment mark the first two relationship levels between two partners. In adversarial relationships between firms only price information is exchanged. There is no further co-operation and both buyer and supplier strive to maximize individual short-term profits. Co-operation, according to Spekman, is the exchange of basic information based on long-term buyer-supplier relationships. It is a starting point for supply chain management and co-ordination.
whereby buyer and supplier have closer information exchange and linkage systems like EDI and web page linkage. The relationship has a higher level of intensity. Spekman states that the move from co-operation to co-ordination is a necessary evolution, yet it is still not a good enough condition for total supply chain management. Collaboration, which requires high levels of trust, commitment and information sharing between buyer and supplier, has become an important development in the evolution of supply chain management. It results in a real partnership relationship in comparison to the first two relationships. At the collaboration level, buyer and supplier will share information freely and work together trying to solve common problems as partners during the process of new product design and development. They will also share a common vision of the future. Thus buyer and supplier have become interdependent partners.

Figure 2-5 The key transition from open-market negotiations to collaboration
Source: Spekman et al. 1998, p. 57

Helper (1991) illustrates two patterns of buyer-supplier relationships, namely, arm’s length contractual, and obligatory contractual relationships. These represent the extremes of a multi-dimensional resource of possible trading relationships.

Arm’s length contractual relationships involve a single specific, discrete transaction. An explicit contract defines the tasks and duties of both parties. All business exchanges are performed at arm’s length to avoid undue familiarity and personal ties. It is therefore easy to change trading partners when the contract is terminated.

Obligatory contractual relationships, by contrast, are more embedded in social relations between trading partners and are also characterised by a form of mutual trust. Transactions often take place without a prior formal contract. Even when the tasks and duties of each partner are specified in a contract, both parties recognise the incentives to do more than expected by the partner. For long-term trusted relationships, especially for a single sourcing supplier with a partner who has a problem, the former is often willing to collaborate, seeking remedies, rather than shifting to a new partner.
Cox (1996) proposed five different types of buyer-supplier relationships as listed below (see Figure 2-6)

- Adversarial
- Preferred supplier
- Single sourcing
- Network sourcing
- Strategic alliances

<table>
<thead>
<tr>
<th>External Contracts</th>
<th>Internal Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Asset Specificity</td>
<td>Medium Asset Specificity</td>
</tr>
</tbody>
</table>

- **Adversarial Leverage**
- **Preferred Supplier**
- **Single Sourcing**
- **Network Sourcing**
- **Strategic Alliance**

![Figure 2-6](image)

**Figure 2-6** A stepladder of external and internal contractual relationships

*Source: Andrew Cox, Relational competence and strategic procurement management, European Journal of Purchasing & Supply Chain Management, 1996*

**Adversarial relationship**

An adversarial relationship implies that it is price-based upon open market terms of negotiation. It is a traditional market relationship focusing on price comparison and motivated by purchasing practices. As it occurs under open-market conditions,
customer-supplier relationships are often easily changed whenever price based open negotiation fails. This explains why it is referred to as an arm’s length relationship. This type of “arm’s length” relationship offers a great amount of flexibility for buyers in competitive markets. The buyer focuses on short-term cost reduction only, with no obligation to co-operate. The arm’s length relationship is often used in traditional markets, such as commodity markets and low - tech industrial markets with multiple suppliers, low assets speciality and a low degree of competence. In high-tech industries, like the telecommunications industry, it is often used for standardized products, or components.

Preferred supplier relationships

Preferred supplier relationships mean that the buyer keeps long-term contracts with fewer suppliers. The preferred suppliers provide goods and services, which are of a medium asset speciality and can be considered complementary to the core competences of the customer. However, the purchased products have relatively low strategic importance for the customer. Buyers will often use a bidding process to evaluate and choose a few suppliers as preferred sources of goods and services. The contract length is normally longer than a year. After that, co-operative activities such as product specifications, quality improvement, and cost reduction will continue in both their common interests.

Single sourcing

Single sourcing means that a single supplier supplies the buyer with special goods and services during a given time period. This type of buyer-supplier relationship refers to the supply of a medium to high level of asset speciality with products and services often connected directly to the core competencies of the buyer. As the auto industry’s lean production has shown; the single sourcing strategy forms a good combination when used in conjunction with the Just In Time delivery system. This practice has become widespread in many industries during past two decades.

Bailey & Farmer (1986) have listed the advantages of single sourcing as follows:

- The supplier can offer advantages because of economies of scale
- Personal relationships can be more easily established making communications more effective
- The buyer’s administrative work is reduced
- Closer relationships and a reasonable tenure can result in a mutual effort to reduce costs
- Tool and fixture costs are reduced; long-term tools may be used
- Quality control is made easier since there is only one location
- Scheduling is made easier

However, the drawbacks of single sourcing are equally clear for both buyers and suppliers if they become too dependent upon each other. Whenever the supplier is a single source, the buyer runs a high risk if the single supplier fails to deliver due to fire, strikes, and other unexpected delivery problems. Such a case occurred some
years ago when Ericsson's single supplier, responsible for the delivery of a key semiconductor component for their mobiles, had a fire in its factory, Ericsson had to pay several times the price to buy the component elsewhere. Even so, the final product came to market much later than planned. From a supplier’s perspective, the success of a single sourcing policy depends very much on the extent of customer demand and upon the supply market situation. In order to avoid the risks inherent in single sourcing, one practical solution is for buyers to choose double sourcing for their core products and key components. For the same reason, suppliers would be well advised not to rely on a sole customer for orders.

Network sourcing

Many economists (e.g. Prahalad and Hamlet, 1990, Coombs, 1994, 1996) express the belief that collaboration can permit the creation of new competencies by bringing together the previously separated technological capabilities that different network members have. The success of the Japanese car industry and its unique supplier sub-contracting structure has demonstrated a new form of production and “network sourcing” co-ordination (Hines, 1994, 1995). Network sourcing is a combination of the many different aspects of co-operation between major car manufacturers and their suppliers. These include a tiered supply structure, a cross-exchange of staff between buyer and supplier and a relatively high asset speciality together with risk sharing. Early involvement of suppliers in design and innovation helps to foster trusting relationships, and strengthen the development of supplier co-ordination.

According to Womack et al., (1990) and Lamming (1993), the traditional pattern for a Japanese co-operation has been to build up stable long-term inter-firm contractual relationships and to use “network” types of co-operative organization. These collective or “social” forms of Japanese organisation bring substantial benefits to each partner and strengthen the competitive advantage through the whole lean supply chain.

The benefits of a supply network are obvious for a buyer when the network plays a dominant role. These benefits include flexible production in response to new market requirements, low transaction costs and strong information linkage through Electronic Data Interchange (EDI) and Kan-Ban systems. Furthermore, close proximity allows for the further advantage of frequent delivery. With stable relationships in the network, suppliers can be encouraged to invest heavily in new technology and to take part in new product and process development thereby increasing their own competence through a network sourcing strategy.

To manage the supply chain as a network, there are many issues and challenges facing organisations as they make the transition to a competitive environment. Christopher (1998) draws attention to the following points as being the most significant:

- Collective strategy development
For network competition to be truly effective a significantly higher level of joint strategy development is required. This means that network members must collectively agree to strategic goals for the network and to the means of attaining them.

- **Win-win thinking**
The biggest challenge is to shift from the concept of the adversarial buyer-supplier relationship to a win-win partnership. This means that all partners should benefit and be better off as a result of the co-operation.

- **Open communication**
For network marketing to work to its fullest potential, visibility and transparency of relevant information throughout the supply chain is essential. EDI or other information linkage channels allow end-to-end pipeline visibility to become a reality. Open-book accounting is another manifestation of this move towards transparent information flow so that each partner’s costs, data and profit are visible to others on the same supply chain.

As the case study of Ericsson and its supplier relationships (see Chapter 4) indicates, it is difficult for buyer and supplier to agree on strategic goals in general. Yet it may happen under certain circumstances and when the timing is right, for instance, for a specific project, product or during a given time period. Open communication and open-books are even more difficult to achieve in reality when buyer and supplier have different strategic goals. These will be discussed in Chapters 4 and 5.

**Strategic alliances**

Strategic alliance between companies is a fact of life in business today. Many companies consider a good partner to be a key asset in a corporation. Kanter (1994) describes alliance as a company’s “collaborative advantage.” However, whether a company gets the advantage or not depends upon its ability in “the art of alliances.”

Strategic alliances are voluntary arrangements between firms involving information exchange and technology sharing. Close collaboration in connection with product development and concerned services may be included in the package (Gulati, 1998). Strategic alliances are deeper than normal business relationships. They include certain main advantages such as:

- Matching of skills
- Knowledge of technologies
- Resources and activities to complement the partners’ own capabilities

A strategic alliance is a value adding partnership. Each partner performs only parts of the process, focusing on one specific activity with its own core competence. In the vertical context of supply chains, a strategic alliance is beneficial for both material and component procurement. The same can be said for services such as
third-party logistics, information and transportation. The strategic partnership becomes a long-term agreement without the necessity for vertical integration by ownership. Strategic partnerships are especially useful in international procurement because they provide flexibility and commitment beyond normal contract relationships. It is no easy task to draw up and maintain contracts across national boundaries. Furthermore, cultural patterns often result in personal relationships in preference to formal contracts.

Kanter and her research group observed more than 37 companies and their partners worldwide. Several of the relationships were studied for more than 20 years. The study concluded that the best inter-company relationships, like the best marriages, are true partnerships dependent upon on the following eight “I’s" (1994, pp. 100)

- Individual excellence—Both are strong and have something of value to contribute to the relationship
- Importance—The relationship fits major strategic objectives
- Interdependence—The partners need each other
- Investment—The partners invest in each other
- Information—Communication is reasonably open
- Integration—The partners develop linkages and shared ways of operating to work together smoothly
- Institutionalisation—The relationship is given a formal status with clear responsibilities and decision processes
- Integrity—The partners behave toward each other in ways that justify and enhance mutual trust

In short, different customer-supplier partnerships may be based on long-term or transitory relationships depending upon the sharing of resources, costs, and/or access to one another’s markets. These factors imply a degree of trust existing between the partners.

Summarizing the five relationships mentioned above, Cox adds that levels of customer-supplier relationships are very much dependent upon asset specificity and the degree of competence of purchased goods or services (see Figure 2-7). The higher the degree of asset specificity and competence, the closer the buyer-supplier relationship becomes. The closest contractual relationship between buyer and supplier is a strategic alliance, where purchased goods or services are of relatively high strategic importance for the focal firm. Single sourcing is therefore used more often within this strategic relationship. Starting with the auto industry, single sourcing, and strategic alliance have become widespread practices in customer-supplier relationships in many industries. Ericsson has built strategic alliance partnerships with its five EMS suppliers in recent years. This raises an interesting question as to whether it is the best problem-free solution. Chapters 4 and 5 try to answer this question.

In a short summary of the buyer-supplier relationship transformation process, Spekman et al. (1998) mention two important findings from their empirical study as follows:
- The transformation process from adversarial supplier to becoming a supply chain partner is a long one and is not always necessary for every customer-supplier relationship.
- A focal firm must make the decision to select its partner and apply a supply chain strategy with care. Coordination and collaboration require different levels of trust and commitment, leading to different outcomes.

![Figure 2-7](image_url) Progression of customer-supplier relationships


2.6 Inter-organizational relationship management and existing conceptual relationship models

2.6.1 Relationship is a complex dynamic concept

There is an abundance of literature on relationship management. Many researchers make the point that relationships between firms can be viewed in the same vein as human inter-personal relationships\(^5\), which are complex and variable as to the degree of trust, mutual understanding and co-operation that exists between partners.

Axelrod (1964) has produced a game known as the "Prisoners' Dilemma" to explain the importance of mutual trust and commitment: Two thieves were caught by the police and put into different cells. As the thieves couldn't communicate with each other, the court interrogated them individually, the possible penalty had four options. Depending on how much the thieves trusted and co-operated with each other, the jail sentence for both thieves could vary from zero years and being free to both staying in jail for 2 years (see Figure 2-8). The game expresses an important principle: persons or teams will collaborate if they know that the result will be advantageous, otherwise, they will compete with each other believing they can gain an advantage by doing so.

\[
\begin{array}{c|cc}
& \text{Confess} & \text{Don’t confess} \\
\hline
\text{Confess} & 2,2 & 1,5 \\
& (2 years for both) & (1 year for A, 5 years for B) \\
\hline
\text{Don’t confess} & 5,1 & 0,0 \\
& (5 years for A, 1 year for B) & (Both are free)
\end{array}
\]

Figure 2-8   The Prisoners’ Dilemma: penalty options (years in jail)

Source: Adopted from Axelrod, (1964)

Ottosson (2003)\(^6\) uses the following example to describe the differences between mathematical logic and relationships:

A well-known example of mathematical logics is as follows:

If: \[
\begin{align*}
A &= B \\
B &= C
\end{align*}
\]

\[
A = C
\]

Independent of time & situation

\(^6\) The example is taken from Ottosson's presentation: "Be dynamic to master different situations!" (2003) Royal Institute of Technology.
But the logic of relationships looks more like this:

\[
\begin{align*}
&\text{If:} \quad \begin{cases} 
A \text{ likes } B \\
B \text{ likes } C
\end{cases} \\
&\text{then:} \quad \begin{cases} 
A \text{ likes } C \\
A \text{ dislikes } C
\end{cases}
\end{align*}
\]

The relationships are dependent upon time & situation.

As the example shows, relationship management cannot be calculated by pure mathematics. It cannot be taken as a static model either. Relationships vary with time and circumstances, as do levels of trust, mutual understanding and co-operation. It is important therefore, to view supply relationships as a dynamic concept and not as a static model.

**2.6.2 Key factors of inter-firm relationships**

How can we manage the complexity of inter-firm relationships? To answer this question, it is necessary to understand the key factors that influence them in order to be able to develop a strategic model for their management.

Hughes et al., (1998) presents practice-derived results collected over the past two decades from buyers and suppliers in over thirty countries. Ibbott’s action research of inter-company relationships between Vodafone and Ericsson (2001) is based on Hughes’s results. It provides a table of relationship factors that include the relevant circumstances of his case study, namely, that of full and active buyer-supplier relationships. Figure 2-9 describes the key factors affecting buyer-supplier relationships to which I have added my own comments with regard to the subject matter under research.

<table>
<thead>
<tr>
<th>Relationship Factors</th>
<th>Profiling Key Factors in Supplier and Business Relationships: Full and active collaboration</th>
<th>Ibbot’s Conditioning Comments</th>
<th>Author’s comments regarding the case study of this thesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust</td>
<td>Organizational interdependency calls for fundamental and total trust</td>
<td>Key factors in customer organization. Here there are a number of participating companies in which the parent organization has varying equity and participation. Globalising requires them to accede negotiating “control” of these items acquired on global terms.</td>
<td>Trust is the most important factor for partnership. However, total trust and total open-box within inter-firms are difficult to achieve in reality.</td>
</tr>
<tr>
<td>Existence of Common Goals</td>
<td>High correlation and overlap in terms of service, quality, technical innovation, time to market,</td>
<td>The common goals are to globalise the supplier-customer relationship. The customer seeks economic benefit arising</td>
<td>It is not surprising to find that buyers and suppliers often have conflicting motivations. But it is also</td>
</tr>
</tbody>
</table>

30
<table>
<thead>
<tr>
<th>Relationship Factors</th>
<th>Profiling Key Factors in Supplier and Business Relationships: Full and active collaboration</th>
<th>Author's comments regarding the case study of this thesis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>cost drivers, environmental impact, etc.</td>
<td>possible to find common strategic goals for partners for certain projects, or products during certain periods.</td>
</tr>
<tr>
<td>Personal Relationships</td>
<td>Relationship management may well be central to the overall effectiveness. Detailed consideration will have to be given to managing and building those relationships</td>
<td>Agree. The development of the inter-organisational and inter company relationships has been a key anchor in the chosen approach to globalisation. Inter-firm relationships can be viewed as human, inter-personal relationships.</td>
</tr>
<tr>
<td>Continuity of Key Staff</td>
<td>May well be the prime driver of the relationship. Change of senior people may lead to short-term turbulence.</td>
<td>Agree, and there have been no adverse changes in this regard. It depends upon the key staff member’s personality. Thus continuity of key persons may be both positive and negative.</td>
</tr>
<tr>
<td>Required Competence</td>
<td>The possession of strategic competencies and capabilities may be at the heart of the relationship</td>
<td>I have taken much time investing in the promulgation of the globalisation strategy around the world both with supplier and customer, senior country and corporate management. I agree. In this case the relationship is often based on a competitive action within a collaborative framework. Where outsourcing is concerned a smaller supplier with lower competence will be acceptable if the supplier is willing to learn from the bigger and more resourceful buyer.</td>
</tr>
<tr>
<td>Expectation of the Parties</td>
<td>High levels of synergies and support to mutually extending expectations. Particularly noticeable in technology transfer, innovation flows, and strategic cost management</td>
<td>The synergies have been reinforced by taking an end-to-end approach from manufacture to the point of being in service in the customer organisation. It is more important for the strategic partnership and outsourcing process.</td>
</tr>
<tr>
<td>Internal Relationships</td>
<td>Alliance selection will have to be done at very senior levels. Alliance managers to liaise/coordinate across</td>
<td>I am, as director in one of the customer operating companies, that global “alliance manager” with the responsibility of delivering the</td>
</tr>
</tbody>
</table>
### Relationship Factors

<table>
<thead>
<tr>
<th>Benefit to Each Party</th>
<th>Profiling Key Factors in Supplier and Business Relationships: Full and active collaboration</th>
<th>Ibbot’s Conditioning Comments</th>
<th>Author’s comments regarding the case study of this thesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutual high expectations as to profit, cost improvement, technical information, etc.</td>
<td>The expectations are mutual in the sense of achieving the globalisation objective. Whilst they are asymmetric with respect to price and cost, these two elements are nevertheless interdependent.</td>
<td>Without win-win thinking, no relationship can last long.</td>
<td></td>
</tr>
<tr>
<td>Freedom to Switch Business</td>
<td>Switching business would be as a result of a fundamental breakdown in relationship</td>
<td>The customer has a prohibitively high switching cost thereby making it essentially unthinkable.</td>
<td>Even strategic alliances have the freedom to switch business. However, it is high risk for the buyer when the buyer has a single sourcing policy.</td>
</tr>
<tr>
<td>Future Levels of Business</td>
<td>Jointly growing business may be a prime motivator</td>
<td>The supplier expects a greater global reach within the customer’s operating interests. The customer seeks a high level of operating quality at the best cost price globally. In the mobile telecommunications sector, this means growth in the current climate.</td>
<td>It is easier to have a closer relationship when both partners have a similar business vision.</td>
</tr>
<tr>
<td>Length of Relationship</td>
<td>Long-term investment and joint collaboration. Unlikely to be less than three years.</td>
<td>Given the lack of freedom for the customer to switch suppliers, the relationship has to work out of necessity and must therefore be long term.</td>
<td>Positive and negative influences affect long-term relationships depending on the focal company’s business strategy, partners’ competence, etc. Excessive length of long-term relationship might hinder company’s development.</td>
</tr>
</tbody>
</table>

Figure 2-9 Profiling Key Factors in a Full and Active Supplier Business Relationship

Source: adopted from Ibbott, 2001, pp. 70-71 and author’s comment regarding the case study

In Figure 2-9, Hughes et al., mention that a strong theme in the key to the success of a full and active collaboration is the management of the various aspects of the relationship and the mutual management of expectations. However, Ibbott argues that the complexity of his case is not anticipated in these proposals, notwithstanding
the merits of relationship factors as Hughes et al., proposed (1998). In my case study of Ericsson’s strategic supplier relationships, I found that price and cost are not only independent of each other, but that it is also difficult to find common goals between Ericsson and its strategic alliance partners. Chapters 4 and 5 will provide more detailed information and a discussion on this point. I believe this is the reason why collaborative customer-supplier relationships are so difficult to manage.

2.6.3 Relationship management and concerned conceptual models

Early in the 1980s, Kraljic offered a “purchasing management” model based on two factors: (1) the strategic importance of purchasing; (2) the complexity of the supply market (see Figure 2-10). During the past 20 years, the model has given pragmatic advice on how top management can recognize the extent of its own supply weakness and formulate a strategy for supply in different business situations.

Cousin’s research (2002) notes that the central concept of a relationship approach is that it is concerned with two things only: collaboration and the sharing of resources. Resources include both physical items (such as machinery) and intangible resources (such as tacit knowledge, technological processes etc.). The primary goal of a relationship approach is to gain competitive advantage through improvement of product development and process design, and to make both partners more efficient in supplying the end product.

Cousins’ key points on inter-firm relationships are:
- Partnership relationships do not exist. There are ranges of varying collaborative relationships, all of which are competitive.
- Organizations do not trust each other. They manage risk based on business case decisions.
- A ‘relationship’ is not an entity; it is a process. It thus needs to focus on a definable outcome, which can range from cost saving through joint product development and problem solving. Only once the focus is decided, can the appreciable relationship be developed.

Using Lamming’s "quasi-firm" argument (1993), Cousins makes the point that relationships should be viewed as variable inter or intra-organisational processes. Comparing different points between Lamming and Cousins, I think that the "quasi-firm" view is a static analysis, similar to an arms-length strategic alliance, which points to a special relationship in a static time period. The "relationship process" is a dynamic concept. It points to different relationships at different times. These case study results of relationships between Ericsson and its suppliers have supported this dynamic analysis. The following case analysis shows that a dynamic approach is more rational and suitable for today’s supply chain competitive environment.

---

7 This is often referred to as asset specificity, or core competence.
8 This point is even supported by Cox (1996) in his study of relational competences.
### Importance of Purchasing Criteria:
- Cost of materials / total costs
- Value-added profile
- Profitability profile

### Complexity of Supply Market

<table>
<thead>
<tr>
<th>I</th>
<th>Purchasing Management</th>
<th>II</th>
<th>Material Management</th>
<th>III</th>
<th>Sourcing Management</th>
<th>IV</th>
<th>Supply Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement focus</td>
<td>Time horizon</td>
<td>Key performance criteria: high</td>
<td>Procurement focus</td>
<td>Time horizon</td>
<td>Strategic items</td>
<td>Time horizon</td>
<td></td>
</tr>
<tr>
<td>No critical items depending</td>
<td>Unlimited, normally</td>
<td>Cost/price, materials flow management</td>
<td>(e.g. scarce materials, high-value components)</td>
<td>up to ten years</td>
<td>&amp; specified materials</td>
<td>up to ten years</td>
<td></td>
</tr>
<tr>
<td>Key performance criteria: high</td>
<td>Commodity, mix of commodities</td>
<td>Functional efficiency</td>
<td>Key performance criteria</td>
<td>Item purchased</td>
<td>Long-term availability</td>
<td>Value materials</td>
<td></td>
</tr>
<tr>
<td>Typical sources</td>
<td>Supply materials</td>
<td>Typical sources</td>
<td>Supply materials</td>
<td>Supply material</td>
<td>Natural scarcity</td>
<td>Natural scarcity</td>
<td></td>
</tr>
<tr>
<td>Establishment local suppliers</td>
<td>Abundant</td>
<td>Established global suppliers</td>
<td>Abundant</td>
<td>Natural scarcity</td>
<td>Natural scarcity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decision authority</td>
<td>Mainly decentralized</td>
<td>Decision authority</td>
<td>Centralized</td>
<td>Natural scarcity</td>
<td>Natural scarcity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 2-10 Purchasing management model**

34
In order to manage complex customer-supplier relationships, it is necessary to create an appropriate relationship model for the supply chain to show how a buyer copes with the demands of multiple suppliers, when a different relationship is required in each different situation.

Burnes and New (1996) propose three models of supply chain relationships with possible improvements as shown in Figure 2-11.

<table>
<thead>
<tr>
<th>Model</th>
<th>Mechanism for supply chain improvement</th>
<th>Focus</th>
<th>Key requirement</th>
<th>Key metaphor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model one</td>
<td>Partnership and cooperation to eliminate waste at interface</td>
<td>Relationship</td>
<td>Trust</td>
<td>Marriage</td>
</tr>
<tr>
<td>Model two</td>
<td>Supplier development for technology transfer from customer to supplier</td>
<td>Knowledge/skill</td>
<td>Communication</td>
<td>Paternalism</td>
</tr>
<tr>
<td>Model three</td>
<td>Best practice firms work with best practice firms: survival of the fittest</td>
<td>Performance</td>
<td>Strategic clarity</td>
<td>Evolution/chemical kinetics</td>
</tr>
</tbody>
</table>

Figure 2-11   A Framework for Supply Chain Improvement


Model one (Figure 2-11) is a “married” partnership relationship, in which some or all of the following characteristics exist as summarised by Burnes and Whittle (1995) below:

- There is a long-term commitment to developing and improving cooperation and collaboration
- Both customers and suppliers are proactive
- Both partners are integrating the key process and activities
- A clear and well-structured framework exists for determining cost, price, and profit for both sides
- A win-win philosophy operates – both partners must benefit from the partnership approach

The merits of model one are great. However, this case study of Ericsson and its strategic alliance partnerships shows that model one causes thorny problems such as buyers facing the issue of single sourcing and suppliers having to worry about threats of business being withdrawn.
Model two (Figure 2-11) describes an active partner who improves the other. As Burnes and New (1996) have stated, this relationship is often conflated with the same ideas of partnership as in Model one. This often happens with a big buyer who is advanced and resourceful, whilst the supplier is likely to be smaller and less advanced. If the buyer is willing to improve the smaller supplier, and the supplier is eager to learn from the buyer, this approach means that both buyer and supplier are using the word "partnering" as an active verb. Hines (1994) highlights how this may entail actively encouraging suppliers to collaborate and learn from each other. Such cases often occur when a large focal company manages its localisation process. It is a good way of transferring and absorbing technology and at the same time benefitting both partners. However, it requires the buying company to choose its supplier carefully and to keep up a continuing commitment to that partner. Otherwise, the relationship will end up with no-benefit for either partner.

Model three (Figure 2-11) offers an open perspective on supply chain improvement. This means that one buyer deals with multiple proactive customers. The one best fitting the firm will be the one to survive in open competition. The driving force behind the process is much the same as with Darwinian evolution. A comparable situation occurring in my case study concerns the purchase of standardized components or items from the market.

Cousins has developed a conceptual model for relationship management as a dynamic state, (Figure 2-12) which is different from Lamming’s quasi-firm model and Burnes’ supply chain improvement model. Arguing against Lamming’s “quasi-firm” position of sitting between two firms, Cousins takes a view of relationships as being an inter- and intra-organizational process. Like other processes within a firm, the relationship process must be focused on a specific delivery value, such as product, service, or commodity item. This means that a company may engage in different relationships with one supplier and that each relationship must be based on competitive action within a collaborative framework.
In Cousins’ conceptual matrix, two axes are important: dependency and certainty. He classifies dependency as having four distinct categories: Historic, Economic, Technological, and Political. These are based on Williamson’s concept of “asset specificity” and on the literature on relationship management (Figure 2-13). The second axis of the model is certainty. Cousins describes certainty as being linked to trust and the possibility of success. Uncertainty connects to failure or risk. Thus certainty versus uncertainty could be interpreted as trust versus risk. Figure 2-14 gives an explanation of “trust versus risk.”

In box A, the firm is in the situation of one-side dependency and uncertainty. This is a risk and a weaker position for the firm. There are three ways for the firm to move out of the bottleneck position it finds itself in. If the firm could find ways of increasing certainty and mutual dependency, it might be possible for it to move itself from A to either C or D. Another alternative would be to become independent and move itself to box B.

With regard to the dependency model, Cousins focuses on a special product or service and not on the organisation in general. Case study and analysis in later chapters of this thesis lends further support to Cousins’ point of view.

<table>
<thead>
<tr>
<th>Dependency type</th>
<th>Description of dependency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historic</td>
<td>The parties have always dealt with each other. They know and feel that they can interpret each other’s moves and feel comfortable with the partner even if it may not be the best one. They have an established relationship they feel they can build upon.</td>
</tr>
<tr>
<td>Economic</td>
<td>Economic size; one or other party is a significant market player. They may be the market leader or a significant follower. One or other party has invested significantly in terms of switching costs, i.e. tooling, joint training, information technology such as CAD/CAM, etc.</td>
</tr>
<tr>
<td>Technological</td>
<td>One or other party has a distinctive processing capability or a product capability that the other requires. Therefore the partner is seen as significantly adding to the other’s business. In addition, there could be the possibility of joint product development by linking technologies and approaches to produce a new product or process – synergistic technological competitive advantage.</td>
</tr>
<tr>
<td>Dependency type</td>
<td>Description of dependency</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Political</td>
<td>One or other party has to deal with the other due to external, environmental or internal, organisational pressures. For example aerospace and defence firms are often obliged to deal with home manufacturers. (In one of the case study examples 80% of the supply comes from the home market.) The USA has institutions such as “buy American”, laws and small and disadvantaged business legislation, etc.</td>
</tr>
</tbody>
</table>

Figure 2-13 A typology of inter-organisational dependencies


<table>
<thead>
<tr>
<th>Trust</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowing they will do what they said they would</td>
<td>Fear of the unknown</td>
</tr>
<tr>
<td>Having faith</td>
<td>Unpredictability</td>
</tr>
<tr>
<td>A willingness to participate</td>
<td>Risk of failure</td>
</tr>
<tr>
<td>An understanding</td>
<td>Being taken advantage of</td>
</tr>
<tr>
<td>Predictability</td>
<td>Unprotected</td>
</tr>
</tbody>
</table>

Figure 2-14 Trust versus risk


In Cousins’ model, box B views a traditional open-market relationship, i.e. the firm is independent, running at high risk in multi price based competition. Trust in others is low.

Box D and C show two different models of collaboration. The strategic collaboration shown in box D is restricted to strategic partnerships with long-term relationships, joint technology and business interests. Both partners are mutually dependent with a high degree of trust. Box C represents tactical collaboration, which is on a lower level compared to strategic collaboration, probably focusing on process improvements, such as VMI co-operation.

To sum up, Cousins’ model shows a new way of thinking about the management of relationships in an active dynamic situation. This model, tested in my case examples has prompted me to dig deeper into the conceptual relationship model of a dynamic environment.

2.7 Learning, trust and relationships

2.7.1 Learning, transferring tacit knowledge and networking
A number of researchers have included learning in the analysis of inter-firm relationships. Inter-firm links can assist the firm’s learning process (Lyles, 1988) and provide opportunities for “high-level” learning (Dodgson, 1991). Learning can both assist in developing competence and empowerment, thus providing a competitive advantage (Dodgson, 1996). Radosovic (1991) puts forward the following concept of “social intelligence:

Network relations and linkages represent a natural response to situations where the sharing of tacit knowledge is a prerequisite for the successful production of new technological knowledge. As technological capacity is a mixture of firm-specific knowledge and knowledge acquired through co-operation … we could talk of knowledge creation as a social process based on sharing (pp. 31).

Polanyi (1966) describes "tacit knowledge" as “we know more than we can tell”. For example, in technology transfer, “know-how” is the kind of knowledge, which can be neither wholly formalised, nor transmitted solely through written documents. Know-how transfer requires personal interaction through secondment, training, and so forth.

According to Senker and Faulkner (1996), tacit knowledge is by its very nature primarily transferred by example and practical experience. The channels through which tacit knowledge is obtained are thus primarily person-embodied rather than literature-based. Personal networks not only include internal links with other members of staff, but also with people in other companies (customers, suppliers and competitors) as well. Senker and Faulkner argue therefore, that inter-firm collaboration gives the firm an external channel to acquire tacit knowledge.

In the "supply chain competition era" companies compete as constellations of collaborating partners, each contributing value, and together combining skills, capabilities and experience to accomplish goals that they could not easily achieve by themselves. Spekman et al., (2002) point out that a key strategic issue is the ability to lever a partner's capabilities beyond tangible assets and explicit knowledge. Hall (1999) argues that there are many core skills/assets that remain tacit knowledge and are not easily transferred within a supply chain. Some of these assets include employee know-how, reputation and company culture, all of which are important within the fabric of the company.

In a number of industries it is not uncommon to find that different partnerships are forged to enable a transfer and absorption of knowledge and/or technology among the different firms (Wang, 1997). The type of knowledge exchange between partners is partly a function of the extent to which knowledge is explicit or tacit. Effective learning, i.e. management of knowledge transfer, can be viewed as core competence that potentially bestows a competitive advantage upon the members of a supply chain (Spekman et al., 2002). It is hoped that this study will gain insight into Ericsson’s supply chain in China, and that this information can be used to enhance
its ability to absorb and transfer knowledge, which will be advantageous to its future development.

### 2.7.2 Trust and inter-firm relationships

Many authors have chosen to describe inter-firm relationships as the quality of relationships between firms. This has obvious implications for the outcome of any collaboration that might take place. An aspect of relationship that has received considerable attention is the issue of trust. All networks require trust and reciprocity in order to function.

Trust between firms, according to Sako (1992), is “… a state of mind, an expectation held by one trading partner about another, that the other will behave in a predictable and mutually acceptable manner” (pp. 377). She develops the idea of trust by classifying it into three different types according to the kinds of predictability shown in behaviour. These are, Contractual Trust, Goodwill Trust, and Competence Trust, defined below as follows:

- **Contractual Trust** – Trust that each partner adheres to the points of the contract as agreed, and keeps promises.

- **Competence Trust** – Trust that the partner can perform his or her role competently, and that she/he has the ability to fulfil what the contract requires.

- **Goodwill Trust** – Trust that the supplier or partner is willing to do more than necessary in excess of the agreed terms and conditions, when required. “… Someone who is worthy of goodwill trust is dependable, and can be credited with a high degree of discretion. She or he can be expected to take initiatives whilst refraining from taking unfair advantage …. Trading partners are committed to take initiatives, (or exercise discretion) in order to exploit new opportunities over and above what was explicitly promised” (Sako, 1992, pp. 379).

All three types of trust could be involved in inter-firm relationships. “Goodwill” trust is very much based on mutual commitment to long-term relationships.

The significant role of trust within inter-firm relationships is emphasized both theoretically (Buckley and Casson, 1998) and empirically. Japanese customer-supplier interaction is generally considered to be successful owing to their high levels of trust (Dodgson, 1996). Whereas the results of my case study in Thailand (see Part 1, Chapter 5) argue that Swedish firms are more successful when it comes to showing “goodwill trust” to promote effective inter-firm links; Japanese companies are in fact better when it comes to showing “contractual trust” and “competence trust” in their inter-organizational links.

Why does a high level of trust facilitate effective inter-firm relationships and collaboration? Dodgson (1996) offers three reasons. The first relates to the sort of knowledge being transferred, which is often either tacit, firm specific and
commercially sensitive, or proprietorial. The transference of tacit, firm specific and commercially sensitive knowledge requires dense, reliable and continuing communication paths. Proprietorial knowledge is the kind that can provide important elements of a firm’s defining competence and competitiveness. Partners are therefore expected to share trust in each other’s ability to provide valid and helpful responses to uncertainty. The second reason relates to the time scale of successful inter-firm links. Trust facilitates continuing relationships between firms (Arrow, 1975). Håkansson’s empirical research (1989) indicates that many user-supplier links have surprising longevity. The third reason for a high level of collaborative trust relates to high management costs. These are characterised by communal interests and organizational cultures irrespective of external inputs, which may be widespread and continually supplemented by employees’ knowledge of the status and purpose of the links. Combining these features requires an enormous effort to build up strong relationships, risking them through lack of trust is not a sensible option.

2.8 Conclusions

Primary findings and new challenges from the literature review are summarized as follows:

(1) Supply chain management concerns the management of complex relationships across company boundaries, which may be legally independent but are in reality interdependent within the supply chain.

(2) Successful supply relationship management can create resources and enhance competitive advantage for both partners within the supply chain;

(3) Before entering into a buyer-supplier relationship it is most important to first define the firm’s asset specificity or core competence in order to make decisions whether to outsource or manufacture in-house.

(4) Although many factors influence the buyer-supplier relationship, trust and commitment are of the utmost importance.

(5) The key to supply chain management is to develop the most appropriate relationship model with different external partners under different conditions. The existing models provided by (Kraljic, 1983; Lamming, 1993, Cox, 1996; Burnes and New, 1996; Cousins, 2002) have greatly inspired this study and given cause for reflection. However, there appears to be endless room for improvement and further research especially when we apply these models to individual industrial societies.

The literature review has provided substantial references for the guidance and support of these case studies through the various stages from data collection to case analysis and finally towards the conclusion and theory building.
3 Research Methodology

The investigative method selected for this case based research is inductive, theory building and hermeneutic, leading therefore to a qualitative approach. This chapter will present the motivation for the case study in question and provide a comprehensive explanation of considered research techniques, namely, hermeneutics, qualitative research, induction, triangulation, and technical norm. The research design applied throughout the study process will also be fully described.

3.1 Why case study?

Choosing an appropriate research method is not only an essential condition for any successful scientific undertaking, it is also dependent upon the purpose of the study. As this study demonstrates, there are certain methodological problems involved in the investigation of variables relating to a firm's behaviour and its customer relationships.

The research proposition to examine how and why customer-supplier relationships are pursued was instrumental in the choice of a case study method in order to pursue these aims.

Since the purpose of this study is to obtain depth as opposed to breadth of understanding of customer-supplier relationships in supply chain practices, the research requires a tracing of the development of these relationships. Subsequently the case study method was considered to be the most appropriate method of fulfilling the purposes of the study. According to Yin (1994) case studies are the preferred strategy when "how" or "why" questions are being posed. It naturally lends itself to a “holistic” view of social reality, to the description of historical development and the intensive study of a “dynamic” process. In social science research, case study methods often present a more complete picture of the object. They make it possible to include relevant facts and provide detailed descriptions, thus enabling a complete analysis of the strategic choices made.

According to Gummensson (1988), qualitative (informal) interviews and observations provide the best opportunities for learning among the methods available to the traditional researcher.

A case study is a single unit of analysis, which is defined as an "in-depth, multifaceted investigation, using qualitative research methods of a single social phenomenon. The study is conducted in great detail and often relies on the use of several data sources.” (Feagin, et al., 1991) The case study is usually seen as an instance of a broader phenomenon, as part of a larger set of parallel instances. Since
just a single instance of a phenomenon is under investigation in this research, there
is the further supposition that certain kinds of data collection procedures will be
employed, procedures that will permit the investigation to examine the phenomenon
in greater depth and detail. These are usually termed qualitative methods in contrast
to quantitative methods.

Feagin, et al, (1991) argue that there are several fundamental advantages to be
obtained by undertaking a case study:

- It permits the grounding of observations and concepts about social action
  and social structures in natural settings studied at close hand.
- It provides information from a number of sources and over a period of time,
  thus permitting a more holistic study of complex social networks and of
  complexes of social action and social meaning.
- It can furnish the dimensions of time and history to the study of social life,
  thereby enabling the investigator to examine continuity and change in
  living world patterns.
- It encourages and facilitates theoretical innovation and generalisation in
  practice.

This research interweaves the activities of customer-supplier relationships with
many other types of relationship throughout the supply chain. Consequently, the
research should report real change processes and consider different viewpoints of the
phenomenon within its web of complex relationships. Case study method facilitates
such a purpose by allowing the researcher to undertake a broad study without
focusing in advance on a limited number of variables or relationships (Norman,
1976). This method of analyzing integrated technological co-operation continues to
provide critical insights and information for a better reading of trends in industry.

Because the demand for a close customer-supplier relationship comes not only from
the customer but also from suppliers, the study of their relationships requires close
observation. It is quite possible that an event, after “the intensive observation
approach”, offers an opportunity of perceiving different aspects in their relationship
to each other, thus enhancing the researchers knowledge. The case study method,
therefore, confers a better chance of a total understanding of the study object
(Valdelin, 1974) and of studying phenomena in their context (Yin, 1984).

In addition to using various sources of evidence such as documents, organizational
records and interviews, direct observation at case study sites is also necessary to
avoid a unilateral perspective. Interviewing managing directors, marketing and
purchasing managers, project managers on sites can obtain multiple measures of the
same phenomenon. The interviews with both customer and supplier crosscheck their
responses and degree of co-operation. It is interesting to get different viewpoints
from both sides for the same event or question, as they occupy different positions
within the demand-supply chain.
Two Chinese idioms are instructive on the topic of research methodology. “If you want to know the taste of a pear, eat it” and “if you want to recognise the profile of a mountain, observe it from the outside rather than the inside”. These case studies make use of “inside” observation initially and then employ a distant view by thinking and reflecting upon the case study results.

Detailed observations reveal many different aspects of a situation in relation to each other, thus providing a view of “the process” within its total environment. Later analysis of the data and reflection upon the results may lead to a knowledge formation process.

Theory building through inductive case research is the given choice of an appropriate approach for this study. The objective is increased understanding of the phenomenon. The research is directed towards the development of testable hypotheses that are generalizable in various application environments.

Theory building from case study research is a suitable method for the description and exploration of new phenomena (Handfield and Melnyk 1998; Eisenhardt 1989). This type of theory building relies on direct observations of the objects or participants in the case study. The research approach is inductive, utilizing mainly qualitative data. The case study method allows the investigation to retain the holistic and meaningful characteristic of complex real life events (Yin 1989).

### 3.2 Inductive case study methodology

Case study is one of several research tools increasingly used in social science research. For different research purposes case study methodology is divided into three types:

**Deductive methodology:** is a process of reasoning in which a conclusion follows necessarily from the stated hypotheses, inference by reasoning from the general to the specific case.

**Inductive methodology:** is a process of deriving general principles from particular case observation and coding facts or instances.

**Abductive methodology:** resembles induction in the respect that the conclusion reaches beyond the content of the premises. Abductive reasoning is active in the creative acts, for instance, in the formulation of a hypothesis. Figure 3-1 provides an explanation of different case study methodologies.
The principle of logic for different case study methodologies can be explained by the following examples:

**Deduction**

Rule: All beans from this bag are white
Case: These beans are from this bag
Fact: These beans are (certainly) white

**Induction**

Case: These beans are from this bag
Fact: These beans are white
Rule: All the beans from this bag are (probably) white

**Abduction**

Fact: These beans are white
Rule: All beans from this bag are white
Case: (Maybe) These beans are from this bag

This research is based on an inductive case study methodology. The study assumes a selected case (a focal company and its relationships with its suppliers.) A considerable amount of data is amassed. Facts concerning the case are gathered through field observation, interviews, and examination of documents of all kinds. Based on the collected data, a description, or an interpretation of, or a theory about
the case is then built up inductively. Unlike the deductive model, there is no hypothesis that directs the data collection; Inductive case study methodology is particularly stressed in Grounded Theory. The main difference between this methodology and other approaches to qualitative research is its emphasis upon theory development through the interplay of data collected in the actual research. (Strauss & Corbin, 1998) The theory comes about as the result of the research.

The logical principle of induction shows that an inductive conclusion is a rule reaching beyond the content of its premises. Therefore the conclusion is as follows – it may be false even if the premises are true. Inductive reasoning offers limited probability of drawing conclusions. A weakness inherent in inductive case study methodology is that we draw conclusions based on what we actually know, and upon something we don’t yet know. Thus, it is important to re-test the conclusion after research has been completed and to exercise careful control over the quality of selected case study designs.

3.3 Technical norm

Wright (1965) argues that the concept of technical norm is a scientific foundation of statements and decisions for the constitution of new knowledge in design sciences. In fact, a technical norm is a description of the relationship between means and ends. Its philosophical foundation is based on Aristotle’s practical inference. The essence of practical inference is that a human being assumes the end of an action first, and then thinks how and by what means the end may be reached. A technical norm provides normative rules that require an obligation to behave in a certain way for the pursuit of this interest as an end (Wright, 1965). In fact, technical norm can be simply described as follows:

“If you want B, and you believe that you are in situation A, then you ought to do X”

Using the principle of technical norms in management research, it is possible to provide simple normative rules for complex management situations. According to the reasoning of technical norms, two basic approaches are often used in management research. The first approach may be expressed thus: if end B is the desired aim from within situation A, the search must be to find means X, which will lead from A to B; The approach is obviously based upon the logic of inductive reasoning. In the alternative situation, means X is already given, thus the search is to find out whether or not end B can be achieved within situation A. Figure 3-2 shows these two different approaches.
Situation A Means X End B Logic

| Approach 1 | A | ? | B | Induction |
| Approach 2 | A | X | ? | Deduction |

Figure 3-2 Application of Technical norms in research management

Using this fundamental concept of technical norm to explain the work embodied in this thesis, which may be simplified as follows:

“Which model of customer-supplier relationship (X) should be selected in order to achieve the most successful supply chain performance (B) in the given business situation (A)?

3.4 Quality of case study design

Yin points out that the case study method may have certain drawbacks. Two common concerns regarding case study methods relevant to the context of this research are: (a) that case study research lacks rigor, and (b) that it provides little basis for scientific generalisation (Yin, 1984).

The lack of rigor associated with the method relates to the question of whether case study findings are inherently more biased than findings based on, for example, a survey. In essence, it is the internal validity of the case that is at issue. Yin (1984) explains as follows. “What is often forgotten is that bias can also enter into the conduct of the experiment, and, in using other research strategies, such as designing questionnaires for survey.” In order to avoid the introduction of bias, Yin cautions for great care to be exercised in case study design.

A good research design requires external validity, reliability, construct validity, and internal validity. These are important pre-requisites for the quality of a case study design (Yin 1989; and Ellram 1996).

- **Construct validity**
  Addresses the establishment of appropriate operational measures for the concepts being studied. Thus, a challenge occurs in this phase of data collection. Three tactics are suggested to support the establishment of construct validity: using multiple sources of evidence, establishing a chain of events, and having key informants to review the draft case study report.

- **Internal validity**
  Is only a concern in causal or explanatory case studies. Internal validity addresses the establishment of a correct causal relationship, as distinguished from a spurious relationship, whereby certain conditions are
shown to lead to other conditions. The test of inter-validity often occurs in data analysis. It relates to making proper inferences from the data, considering alternative explanations, and use of the convergent data and related tactics.

- External validity
  During the design of the research, it is important to establish a research domain within which the study’s findings can be generalized. External validity reflects how accurately the results represent the phenomenon studied and whether the study’s findings are generalizable beyond the selected case.

- Reliability
  Addresses the case study result, which must be true and trustworthy. This means that other researchers repeating the same case study over again should arrive at the same findings and conclusions. It concerns the repeatability of the experiment and whether replication is possible. The goal of reliability is to reduce errors and biases in a case study. Yin (1984) maintains that there are two keys to reliability, namely, the use of a case study protocol and the development of a case study database. A case study protocol includes the use of an interview guide together with procedures to be followed in using the test instrument.

This research makes use of certain criteria for judging the quality of the method as a tactical means of controlling its validity at various phases of the research. For the present study, measures are taken at (a) the preparation phase of data collection – using a well-developed case study protocol including different interview guides for different interviewees; (b) the actual data collection and fieldwork – using multiple sources of evidence, keeping close contact with and getting feedback from key informants to review the case study working report each time; (c) the fact-finding and data collection – using analytic pattern-matching and open discussion with key informants on findings and analysis reflection.

A triangulation procedure is used to reduce the likelihood of misinterpretation during the data gathering and analysing processes. According to Yin (1984) and Stake (1998), triangulation has been generally considered to be a process of using multiple perceptions to clarify meaning and verify the repeatability of an observation or interpretation. Four different types of triangulation are used in this study:

1. Data triangulation: makes use of a variety of data sources instead of a single source during the data collection. The case study used a structured or semi-structured interview for a larger number of persons in the early data collection phase and an open-ended interview or focused interview for a smaller number of key persons during the middle and later data collection period. With the exception of multiple interviewees, the study collected evidence from internal documents including archives. Figure 3-3 shows how data triangulation is used in the study.
(2) Investigator triangulation: avoids making use of a single interviewer as much as possible for all the interviews. Two researchers often participate in the same meeting.

(3) Theory triangulation: within its given theoretical framework this study has provided a review of several different customer-supplier relationship models from Lamming (1993), Spekman (1998), Andrew (1995) etc as a guide to a single set of data analyses and to enable new theory building.

(4) Methodological triangulation: multiple research methods are used to contribute to this case based research and corroborate the same fact or phenomenon. The methods used include induction, hermeneutics, qualitative as well as partial quantitative analysis and benchmarking.

![Figure 3-3 Convergence of multiple sources of evidence (Yin 1984)](image)

For qualitative casework however, it is difficult to say whether all observations or interpretations can be perfectly repeatable. As a control procedure of case study quality, triangulation helps to reduce misunderstanding and increase data validity through multiple data gathering.

3.5 Case selection and research process

In view of my former supply and logistics work experience within Ericsson and my Chinese background, I have chosen Ericsson and selected suppliers (focusing on the Chinese market) to represent the main case companies. This research will
observe and analyse how and why different relationships between Ericsson and its suppliers impact on demand-supply chain performance in the fast growing telecom network industry.

Research design in particular describes the knowledge creation process and the methods applied in detail (Yin, 1994). It is also a tactical plan for the entire research process.

The process consists of four phases which are (1) pre-understanding and planning, (2) case investigation and fieldwork, (3) fact-finding and analysis, and finally, (4) theory building. These phases are illustrated in Figure 3-4.

Figure 3-4 Research Process (adapted from Coghlan and Brannick, 2001)

Pre-understanding

This is a phase of preparation and planning for the entire research process. There is a Chinese saying: “A good start is half-way to success”. The study starts by clarifying these four key words “why”, “what”, “how” and “when”. “Why” establishes the purpose of the study. “What” structures the research problem and underlying research questions. “How” embodies two actions: the first is to understand the
research phenomena through a review of the literature based on the research problem; the second is to select a case and a co-operating partner from industry. The final key word “when,” concerns the construction of a primary research project plan of the above-mentioned elements and suggests a time schedule for the research.

Case investigation and fieldwork

This phase starts with preparing an interview guide for the different interviewees. In the first instance customer and supplier will be asked different interview questions. Interviewees working in different positions will also be asked different questions. The interview guides may be classified as structured, semi-structured and open-ended. These interview guides are most important, especially during the early interview period. In order to test the interview guides’ design validity, it is necessary to send them to the key informants from selected industrial partner companies before they can be used for interviews. Thereafter, a primary interviewee list and fieldwork plan is decided upon in conjunction with industrial partners.

The next step involves on site visits and interviews. These are supplemented by extensive telephone interviews, mails and an exchange of documents. Direct observation and internal project participation takes place to clarify issues and corroborate data where necessary. The research data is collected simultaneously.

Fact-finding and analysis

Data analysis starts with in-case analysis of each case and involves a detailed study write-up for each case. The written case description is important for research reliability. It also enables the draft to be reviewed by informants so that its construct validity can be improved if necessary.

In-case analysis will look for a good pattern of customer-supplier relationship to match an effective demand-supply chain performance.

Cross-case analysis is an exploration of differences between different cases. It will not draw conclusions, but will develop ideas for further study (Ellram 1996). It will also link current propositions and theories to my previous case study findings.

Theory building

Case studies are an excellent source upon which to build theories. They provide detailed explanations of “best practices” and offer more understanding of data gathered (Ellram, 1996). Like other qualitative research methods, the inductive case study method lends itself to theoretical speculation and generalization. Theory construction could either suggest new interpretations and concepts or re-examine earlier concepts and interpretations in major and innovative ways (Yin 1984).

The theory-building phase draws research conclusions mostly by comparing the concepts and theories emerging out of the fact-finding and data analysis from the selected cases and the literature survey. The research result will suggest an
appropriate customer-supplier relationship model by proposing logical and effective relationships between the observed variables from the studied cases.

The theory building process involves investigating whether the case study findings from the data collection and data analysis are similar or contradictory, and if so, why. The subsequent theory is expected to guide practical demand-supply chain improvement in industry and to be further refined and developed in future research.
4 Background of the Case Studies

4.1 Development of Ericsson’s sourcing and supplier relationships

In today’s technology-driven economy, market demands and globalization are forcing changes that require companies to be faster and more responsive than ever before. Increased competitive pressures are shortening product life cycles making it imperative that original equipment manufacturers (OEMs) continuously release new products to maintain their market share and margins. More and more leading OEMs are relying on electronic manufacturing service (EMS) providers to assemble their products. Market forces are pushing OEMs to outsource and this effectively means that there is continuous pressure to shorten time to market. Outsourcing enhances asset utilisation and masters the complexity of process technologies, thus enabling OEMs to focus on their core competencies, which include research and development, sales, and marketing. It has been particularly emphasised that large OEMs tend more and more:

- To outsource non-critical activities
- To establish close "partnership" relationships with suppliers
- To reduce and trim their supplier bases  (Gadde & Snehota, 2000)

New supply chain relationships are no longer talking about suppliers and customers as if they were independent entities managed in isolation (Schary & Skjött-Larsen, 1995). Furthermore, competitive advantage no longer resides within a company's own innate capabilities but rather with the relationships and linkage that the firm can forge with external organisations (Lewis, 1995.)

Forging this external linkage to gain competitive advantages is not an automatic process. As Kanter points out, (1994) it is an "art of alliance." This means in effect that establishing and managing effective supplier relationship at every link in the supply chain is becoming a prerequisite for success (Spekman et. al., 1999.)

Ericsson was a deeply vertically integrated company with a significant and diversified manufacturing system before the 90s. It kept the whole production process in house from product design, to key component production, to system product assembly. Since the mid of 90s the telecom marketing situation has changed enormously. Facing the great challenges of over-capacity, decreasing margins, and less capacity need for the future, Ericsson has been compelled to seek new sources of sustainable advantages to survive. One economic rationale has been to sell factories to EMSs in order to open up the way for new loadings and to avoid labour redundancies.

Ericsson started its outsourcing process in the middle of the 90s in order to change its organization from vertical to horizontal integration, especially within its
Hardware areas. As a standardized mature product in a fixed network area, AXE became the first real outsourced case example of an important Ericsson product. At that time Ericsson had decided to keep only test platforms in-house and to sell the entire AXE switch production in Östersund to Solectron, a worldwide Electronics Manufacturing Services (EMS) provider. The decision was made as a result of open market competition and a decreased production margin.

In recent years, there has been a large-scale outsourcing trend within Ericsson’s Radio division. In 2000, Ericsson sold its Visby RBS manufacturing factory (Sweden) to Flextronics, another leading EMS provider focused on delivering supply chain services to technology companies worldwide. As a consequence of the Visby outsourcing, Flextronics acquired sole responsibility for the complete TRU-production for RBS 200 products for the rest of their product life. During the following years, Ericsson continued to outsource its entire mobile phone production to Flextronics.

According to Bengtsson and Berggren (2002), one reason for Ericsson’s outsourcing was that the American contract manufacturing company would be able to improve capacity utilization and reduce production costs by attracting other OEM customers to the factory. However, as a result of the tendency for manufacturing industries to move their production to lower-wage areas in the world in recent years, both Solectron and Flextronics have closed most of their outsourced factories in Sweden and moved their production to low-wage locations. China is becoming one of the most attractive countries for EMS providers. Among Ericsson’s current EMSs partners, three out of four have manufacturing activities in China.

Continued outsourcing within ERA has moved many other productive activities out to external suppliers, namely Emerson, Flextronics and Sanmina-SCI. The activities in question include computer signal card production, subassemblies of cabinets and cables and power supply units.

According to Ericsson’s new production strategy (2002, see Figure 4-1), Ericsson now keeps its core activities in house. These include core product designs, final assembly, testing, as well as New Product Introduction (NPI)/Industrialization. All non–core products, such as power, mechanics, PCB and cables etc, are outsourced globally. The outsourcing process with its new production strategy is bringing great changes and challenges to Ericsson’s supply relationship management.
Production Strategy – Core products in-house

Figure 4-1 Ericsson’s Production Strategy – Core products in-house

Source: Based on Interview in Ericsson (2002), Sweden

Figure 4-2 shows a general Ericsson supply chain after the outsourcing process:

- FC – Flow Control Centre as a logistics control and an order receiving/discharge centre;
- NPC – Node Production Centre is defined as a 1st tier supplier (within Ericsson) for final assembly and testing;
- Production as a 2nd tier supplier – mainly EMSs for subassembly and production;
- Components as a 3rd tier supplier – either Ericsson’s own suppliers or EMSs own suppliers;
- RMS as a 1st tier supplier means Regional Master Suppliers. They are mainly site materials and packing materials suppliers;
- Distribution centre is a place where products are distributed and transferred.
Figure 4-2 Ericsson general supply chain

*Source:* from Ericsson (2002)

Figure 4-2 shows that the 1st tier supplier NPC is internal to the Ericsson organization. The 2nd tier supplier comprises Flextronics, Solectron, and Emerson and is responsible for module or product semi-production. Each EMS is a “single sourcing” for one of Ericsson’s product families. The 3rd tier suppliers in the supply chain are component suppliers. Only some of them in this group are Ericsson suppliers, i.e. Ericsson has purchasing relations with them directly; many component suppliers have direct business relations with their upstream customers, i.e. EMSs, instead of Ericsson.

From the Ericsson general supply chain above, one Ericsson supply model is illustrated in Figure 4-3:
This study of Ericsson – Supplier relationships is focused on Ericsson and its 2nd tier suppliers - mainly EMS providers, and a few special suppliers.

4.2 Strategic alliances between Ericsson and the EMSs

Ericsson has buyer-supplier relations with four contract manufacturers (EMSs): Flextronics, Solectron, Sanmina-SCI, and Elcoteq. Considering their strategic importance for its business development and supply chain management, Ericsson has built up strategic alliances with these four EMS suppliers. Flextronics and Solectron have provided almost 80% of Ericsson’s supply volume distribution during recent years. Ericsson considers these four EMSs as strategic suppliers.

Ericsson defines\(^9\) a strategic supplier as one of assessed performance that is contracted to deliver products, technology and/or services to Ericsson and thereby improve the competitive advantage of both their own company and Ericsson. A strategic supplier relationship involves joint strategic objectives and common business planning from both short and long-term points of view. Ericsson has built strategic supplier relationships with more than 30 suppliers within different business and sourcing areas such as, dedicated IC, development tools, software & OEM, as well as site solution/regional sourcing.

From Ericsson’s definition\(^{10}\), a strategic alliance is an Ericsson-supplier relationship based upon a shared commitment to deliver total solutions and services and thereby improve the competitive advantages of both companies. A strategic alliance is often referred to as a “virtual company” because it involves joint strategic objectives and common business planning, both in the short and long-term. It is typically associated with a sharing of risks and profits as well as expected and unexpected opportunities to learn from one other. Mutual trust is important in a strategic alliance. Likewise it requires a dedicated alliance management in both companies as well as roadmaps for further development, clear lines of communication and a common understanding of what, how and when performance is to be measured.

### 4.2.1 Why strategic alliances?

Ericsson’s intention, by outsourcing manufacturing facilities, is to stay competitive through faster access to the rapidly changing market environment, more effective asset utilization, and the ability to lever state-of-the-art process technologies. The EMSs take the opportunity of accommodating the overflow capacity from the manufacturing operations of the multi-OEMs. This strategy enables Ericsson to focus on their core competencies such as R&D, sales and marketing. A great challenge for both Ericsson and the EMSs is to develop a flexible and streamlined supply chain, which allows more competitive advantages to be realised.

**Ericsson’s view:**

Ericsson seeks the mutual benefit of co-operation through strategic alliances with EMSs in design, manufacturing and in the supply of electronic products and services. The aim is to enhance Ericsson’s global competitiveness through state of the art production technology and design for manufacturing, as well as world-class product quality and supply chain efficiency.

One interviewed Ericsson Corporate Program Manager states the following reasons:

- “Lower manufacturing costs through economy of scale in the EMS companies, as the EMS provider has the opportunity to attract other OEMs, which can avoid labour redundancies and utilize production capacity economically.

- Design service to reduce cost in design. Many OEMs are professional designers for tools, modules, and molds. By co-operating with them, Ericsson can obtain access to state-of-the-art production technology.

- To get lower prices on standardized components and thus reduce total production costs. About 60-65% of Ericsson’s radio product component list is made up of standard parts. The EMSs can capitalise on buying higher sourcing volumes for the standard items.

\(^{10}\) Source from Ericsson inside web: Inside sourcing – Alliance management, 2001.
• To utilize the EMS companies’ World Class Logistics (WCL) to achieve high delivery performance, quality and flexibility.”

One EMS provider's view:

Solectron believes that sourcing and strategic alliance will bring benefits to both partners:

• Time-to-Market
  In the intensely competitive electronics industry, companies have only a small window of time and opportunity in which to deliver their products to market. The earliest entrant to the market has a chance to reap significant financial rewards as well as the dominant market share. Faced with shorter product life cycles, electronics OEMs are forced to reduce their time-to-market in order to remain competitive.

• Economics
  The OEMs who choose to outsource can realize significant financial benefits partnering with Solectron – their source for manufacturing equipment, inventory and manufacturing workforce. Solectron offers higher capital utilization thanks to a business model, which lever its resources among multiple customers. In addition, the risks of frequent changes, shorter product life cycles, component price fluctuation, component shortage, and increased product complexities are significantly reduced.

• Technology
  As electronic products become technologically more advanced, manufacturing processes become more sophisticated. Thus, OEMs face greater difficulty in maintaining the technological competence needed to retain competitiveness with each successive product generation. By partnering with Solectron, the OEMs can gain access to the latest equipment, process knowledge and manufacturing expertise without making substantial capital investments.

4.2.2 How to manage the strategic alliance?

In order to manage the strategic alliance with its selected EMSs, Ericsson builds an alliance structure for interfacing with the EMS suppliers as below:

A corporate program manager at Ericsson is responsible for sourcing synergies and monitoring strategic alliances or strategic supplier development programs. Each EMS has also appointed a Global Account Manager, to fulfill relevant alliance duty on the EMS provider’s side.

At top management level, the partners work together for common strategic objectives, high level follow up, and approval of joint planning going forward.
The main interface is a procurement organization between Ericsson and the EMS provider on the middle tactical level. This middle management level focuses on business plans for joint development, definition of KPIs, negotiation of prices and contracts, and allocation of resources, as well as monthly reporting.

At the operational level of the Ericsson-EMS supplier interface, both work for carrying out the practical details of the alliance.

4.2.3 "Like romances, alliances are built upon hopes and dreams - what might happen if certain opportunities are pursued"

Kanter (1994) describes a business alliance between two companies as a romantic relationship. In the beginning, the partners come together with their own hopes and dreams. Then the relationship either grows and develops, or it fails – which is much like relationships between people. This research is going to uncover some of the fundamental aspects of Ericsson – EMSs strategic alliances and the growth of their relationships.

- When the Ericsson -EMS alliance started, the two partners brought their dreams and hopes together. Both were willing to make compromises for the alliance. So the partners had a honeymoon period.

- After the honeymoon, the partners noticed that their dreams and hopes differed, sometimes leading to conflict. How to adjust the goals and structure of the alliance became an important step, which in turn influenced the development of the alliance. Too often, both Ericsson and the EMSs devoted more time focusing on cost reduction than on competitive advantage enhancement; they worried more about controlling the relationship than about nurturing it. Typical questions often heard from Ericsson and its EMS partners were: “Who has received the most benefits from the alliance?” “Who should have more control in the alliance?”

- A strategic alliance, as a living business relationship, is very sensitive to economic tendencies and the marketing situation; Most of Ericsson’s strategic alliances with its EMSs started in 2000. Since then, for about three years, the world telecommunication market has suffered a terrible winter. This has impacted greatly on strategic relationships. As one interviewed president of Flextronics said: “Our relationship with Ericsson is just following market change; when markets are up, the relationship is easier, otherwise, it is tougher.”

4.3 Background to Ericsson in China

4.3.1 History of Ericsson in China
During the last two decades, China’s economy has been growing at a high-speed. The Chinese export industry has experienced a shift from primary products to manufactured goods. It is not a coincidence that China is nicknamed the factory of the world. The main advantages of producing in China are low production costs and a huge domestic market. There are almost 250 million mobile phone-users in China. The country offers a great opportunity and challenge for international telecom OEMs (such as Ericsson) and their EMS suppliers in China.

Ericsson’s presence in China dates back more than one hundred years. Ericsson received its first order in China in 1892, and 2,000 Ericsson telephone sets were delivered to Shanghai in 1994. In 1985, Ericsson set up its first representative office in Beijing. In 1994, Ericsson established Ericsson (China) Company Limited in Beijing as the holding company for Ericsson’s activities in China. This era saw a rapid increase in business and investment in China for Ericsson. With nearly 4000 employees, 24 offices, 10 joint ventures and three entirely Ericsson-owned companies in China, Ericsson has now become the country’s leading telecommunications supplier, providing a full range of communication solutions and services in mobile systems, digital mobile phones and data-com.

Ericsson has a structured localization strategy to coordinate, implement and manage its localization, local purchase and export initiatives in China. During 2000, Ericsson has purchased to the sum of US$ 1.8 billion locally in China and exported products and services valued at US$ 1.46 billion. Ericsson actively encourages its global suppliers to invest in China. Up to 2003, at least 50 important supplier factories have close co-operation with Ericsson’s Flow Control Centre in China. Ericsson and its first and second tier suppliers have invested 15 billion CNY (US$ 1.8 billion), which has created 30,000 employment opportunities in China.¹¹

4.3.2 Ericsson supply relationship and localization process in China

In order to promote its global strategies, Ericsson has built three regional supply hubs in North America, Europe, and Asia since 2002 (see Figure 4-4). The Asian supply hub is located in Nanjing, China. This Flow Control Centre works as supply centre for both “radio access” and “core network” products. The Centre (NJ NPC) is playing a role not only in China, but also in Asia – Pacific, and can function even as a global sourcing hub.

¹¹ Source from Ericsson (China) AB inside web, 2003.
Strategic sourcing and low cost localization in China

Since 1996, the Chinese government has required localization for international business in China. It requires a localization rate of 50%, which is formulated as:

\[
\text{Localization rate (\%) } = \frac{\text{Local purchasing value}}{\text{Total purchasing value}} \geq 50\%
\]

One Ericsson Localization Office Manager says: “The driving force of Ericsson's localization is cost reduction”. When ENC started its production (assembly) in China, Ericsson invited several of its international suppliers to come to China too. As an encouragement, Ericsson made some promises to these suppliers. For instance, Ericsson would pay the 2nd tier suppliers' import tax and transportation costs. This increased Ericsson’s local product prices. Since 1997, Ericsson has established a special organization to promote and guide its product and production localization process in China. Up to 2003, Ericsson localization rate was 96% for RBS, 80% for Switches, and 92% for Mobile Sets.

The Ericsson product catalogue of local sourcing in China includes: RBS systems, site materials, CDMA systems, switch systems, access systems, DBO products, packing materials and machining and manufacturing.
However, “there is still a huge potential to benefit even more from the investments made in facilities personnel and relations”\textsuperscript{12}. One main challenge for Ericsson in China is “strategic sourcing and low cost localization” This strategy for this includes the following requirements:

- Localized product: local R&D, local sourcing;
- Extended export to Asia, Europe and the rest of the world;
- Technology transfer to increase competitive advantage for both Ericsson and local suppliers;
- Corporate R&D: early local supplier-involved product development;
- Competent local employees.

At the moment, the localization process is focused mainly on local production. As the telecom industry is not only a labour-intensive industry but also a technology-intensive one, Ericsson (China) supply has estimated that if Ericsson could localize some of the product design and development activities, the total production cost would decrease by about 30%. However, local manufacturing on its own, with no local R&D, would reduce the total cost for Ericsson products in China by only 10%.

The advantage of local supply is:

- Competitive advantage of lower total production cost
  According to an Ericsson (China) report, the cost of GSM products from China, and the landed cost in Asia and Europe is 10\% lower than from elsewhere. In fact, wage levels are often more than 10 times lower than in Sweden. However, in the high-tech segments, local R&D, local sourcing and local competent employment are more important than local production.

- Shorter and more flexible delivery times
  Product lead-time is important for customer satisfaction and cost reduction. As the manager of sourcing and localization in Nanjing, Ericsson Panda Communication Ltd. Said: “Lead-time is customer driven. Our problem is with the overseas suppliers. At present, the RBS production includes 2\% value from abroad, whereas Switch has more than 70\%. ENC has no control of the suppliers abroad. For our product delivery, it is often these imported 2\% or 70\% valued components that delay our lead times. We then have to use buffer to satisfy delivery times due to unreliable forecasts.”

- Better customer service and support
  There is no doubt that local supply can offer quicker and more flexible service and support.

\textsuperscript{12} Paper document received from Åke Fahlen, vice president of JV and supply, Ericsson (China), June 2002.
The current Ericsson supply base in China is a layer structure as shown in Figure 4-5. As can be seen, several EMSs, like Flextroncis and Emerson deliver products directly to Ericsson. Elektroskandia is one of Ericsson’s third party logistic providers. It takes care of logistics operations for all site materials and accessories.

**Supplier Base – Layer's structure**

![Supplier Base Layer's Structure Diagram](image)

Figure 4-5 Ericsson’s Supply Base – Layer structure in China

*Source: Based on information from Ericsson (China, 2003)*
5 The Case Studies

This chapter describes a series of case studies. It consists of four Ericsson –Supplier relationships on different levels and in different situations. The fifth case is an external case, concerning Haier, a Chinese home products producer, and its supplier relationships. All the cases are collected from China and Sweden through intensive interviews with Ericsson and its suppliers, as well as related persons.

5.1 Case 1: Ericsson’s strategic partnership with Flextronics, Solectron and Emerson

5.1.1 Background of Flextronics, Solectron, and Emerson

(1) Flextronics – a fast growing EMS provider

Headquartered in Singapore, Flextronics is a leading global provider of Electronic Manufacturing Services (EMS). It is both flexible and fast. It focuses on delivering supply chain services in different electronic areas. Flextronics provides design, engineering, manufacturing, and logistics operations in 29 countries on five continents. This global presence allows for supply chain excellence through a network of facilities situated in key markets and geographies that provide customers with the resources, technology, and capacity to optimise their operations.

As an “end to end” product solution company, it offers a full range of development, manufacturing and support services. As one Flextronics program manager in China explains: “End to end solutions mean that full service capability enables Flextronics to bring technology from concept to reality and delivery to the end customers”. In 2002, Flextronics was Nr 1 worldwide in the EMS industry ranking by revenue. The company had revenues of $13.4 billion in the fiscal year ending March 31, 2003.

Having created a global “end to end” solutions operation, Flextronics claims to provide a complete array of design, engineering, manufacturing, and logistics and post-manufacturing services. By strategic positioning in every major market, Flextronics offers synchronized worldwide manufacturing that provides technology companies with a model that minimizes manufacturing and material costs while optimizing their logistics model.

One important business model of Flextronics is its “Integrated industrial parks”, where all the suppliers’ factories are built close to the Flextronics production centre. Both components and final products are made on the same site and shipped directly from the Industrial Park to the OEM's end users. The aim of the business model of the Industrial Park is to reduce the freight costs of incoming components and outgoing products. Products not produced on site can be obtained from Flextronics' network of regional manufacturing facilities located near the Industrial Parks.
Flextronics operates six Industrial Parks in low-cost regions around the world in Latin America, Asia, and Europe; Two of them are located in China. These parks enable an infrastructure that combines leading-edge engineering, manufacturing, procurement, and logistics services. Each park incorporates the manufacturing of printed circuit boards (PCBs), components, cables, plastics and metal parts needed for final system assembly, thus functioning as complete manufacturing centres. These parks integrate strategic suppliers onsite to reduce material procurement costs and accelerate new product introductions.

In recent years, Flextronics has augmented its role as “vendor” with that of a “virtual manufacturer” by offering design, engineering, manufacturing and logistics solutions. “By utilizing these services, OEMs can concentrate more on their core competencies - such as research and development, sales, marketing and branding - and less on design, manufacturing and distribution”, says Flextronics. So far, Flextronics has built partnerships with companies spanning the entire technology landscape, including Alcatel, Dell, EMC, Ericsson, Epson, Sony Ericsson, Hewlett Packard, Microsoft, Motorola, Nokia Networks, Siemens, and Xerox.

Ericsson – Flextronics alliance:

The Ericsson and Flextronics co-operation started in 1998, when Ericsson sold its Karstard factory to Flextronics, and then outsourced the Visby factory (for RBS assembly) to Flextronics.

Why does Flextronics co-operate with Ericsson? And what benefits can Flextronics offer to its customers? A director of Flextronics business management, major global accounts, answers: “We want to get more business from Ericsson through alliance collaboration. Of course, it’ll also enable our customers to get benefits due to the following:

- Focus on core competence and mitigate risk;
- Contract with a single entity to deliver complete solutions;
- Optimal speed to market through streamlined processes;
- Realisation of economies of scale for product and service costs;
- Deployment of high-quality systems that lever in-depth system and technology expertise;
- Achievement of product and service consistency throughout a network.”

About the strategic alliance relationship with Ericsson, one Flextronics Plant Manager cited Michael Marks, Chief Executive Officer of Flextronics: “We have no time to stay in the middle. Flextronics must deliver the whole product solution”.

(2) Solectron – a worldwide supply chain facilitator

Founded in 1977, Solectron is a worldwide provider of electronics manufacturing services (EMSs) to electronic original equipment manufacturers (OEMs). These services include: product design and engineering, prototype development, printed
circuit board (PCB) and sub-system assembly, system assembly and testing, global distribution and post-manufacturing. As a global supplier of pre-manufacturing and post-manufacturing services to electronics OEMs, the company offers customers competitive outsourcing advantages, such as access to advanced manufacturing technologies, shortened product time-to-market, reduced total cost of ownership and more effective asset utilization.

One of Solectron’s significant decisions made in 1999 was to initiate an organisation change from being a design and manufacturing company to becoming a world premier supply chain facilitator – an enterprise that (according to its strategies) promotes speed, efficiency and cost containment throughout the entire supply chain. Redefining its business, Solectron was reorganised into three strategic business units – technology manufacturing, global operations, and global services. These units – and the entire business – are supported by a materials supply-based management organization. All units bring complementary capabilities into highly efficient, responsive segments that together form a continuum of services across the entire supply chain.

In order to develop efficient and optimized supply chain solutions, Solectron has implemented an integrated supply chain process and system to provide real-time information internally between business units and the global market. Spanning five continents and more than 23 countries, Solectron locates in each major operating region in the world – Asia, Europe and the Americas. This EMS provider also continues to build its low-cost manufacturing capacity, particularly in Asia, to take advantage of the region's lower costs, streamlined supply chain and potential of end market.

Solectron has been present in China since 1996. Solectron (Suzhou) Technology Co., Ltd. was Solectron’s first manufacturing site in China. Today Solectron has 10 sites in China offering integrated solutions, including new product introduction services, full product manufacturing and systems integration, sheet metal manufacturing, enclosure design and manufacturing, backplane assembly and repair and recycling services.

The Ericsson – Solectron alliance

Ericsson signed the “Global Alliance Agreement” (GAA) with Solectron in 1997. Solectron’s chairman, president and chief executive officer Koichi Nishimura commented (1997): “We look forward to providing an integrated, global service to Ericsson as they penetrate new markets around the world, thereby enhancing Ericsson’s ability to bring new products to market”. And Anders Igel, head of Ericsson’s business area Info-com Systems said (1997): “Teaming up with Solectron will assist us in meeting new, competitive demands in the telecommunications market. Solectron’s reputation for quality and their focus on customer service, particularly in time-to-market needs, will help us achieve world-class manufacturing”.

Ericsson’s Norrköping factory in Sweden, which produced PCBs, was first outsourced to Solectron in 1997. And the second Ericsson AXE-switches assembly factory in Östersund (Sweden) was sold off to Solectron in 2000. According to the outsourcing agreements, Solectron provides a complete range of integrated supply-chain solutions for Ericsson. These include supply-base management, early prototyping, New Product Introduction (NPI) management, printed circuit board assembly, configure-to-order and build-to-order complex systems assembly, and global services.

Solectron supplies products and services to Ericsson in the following product range: HWM; EAR, GSM/TDMA/CDMA, AXD310, Minilink and WDM. The cooperation involves Time-to-market (TTM) and Time-to-customer (TTC) processes.

The focused areas of the Ericsson – Solectron alliance are cost rationalization, supply chain performance and flexibility, and the building of relationships through professional business awareness.

(3) Emerson - a global technology solutions’ powerhouse

Emerson was founded in 1890, as a manufacturer of electric motors and fans. Over the past 100-plus years, Emerson has grown from a regional manufacturer into global technology solutions powerhouse listed on the New York Stock Exchange.

The Emerson Group is organized around eight customer-focused businesses. Emerson Network Power is a complete spectrum of reliable power and precise environmental and connectivity solutions for today’s telecommunications and data network infrastructure.

Emerson Energy Systems is part of Emerson Network Power. It is a global market leader in energy related solutions for the information technology (IT) and telecommunications markets. Its business areas include: telecom energy solutions, standard or customized power supplies, DC power systems, climate control systems, shelters and enclosures, energy management systems, network energy implementation, and operation services.

Headquartered in Stockholm, Sweden, Emerson Energy is represented by local offices in 40 countries and serves customers all over the world. Emerson has design centres in seven countries, manufacturing plants in five countries, and customers in some 100 countries. For our Telecom OEMs’ customers group, Ericsson is one of Emerson's important customers. In April 2000, Ericsson outsourced its worldwide power system to Emerson. In October 2001, the Chinese telecom system supplier Huawei also sold its power system to Emerson.

5.1.2 Interviews with Flextronics, Solectron and Emerson

Interview 1: With a General Manager of Flextronics International (Beijing) LTD Beijing (China).
Background:

Flextronics Beijing was set-up as a joint venture with Ericsson Communication Systems Ltd and Beijing C&W Group Corp in June 2000. The joint venture factory provides end-to-end Electronics Manufacturing Service (EMS) solutions to Original Equipment Manufactures (OEMs). Ericsson is a major customer of Flextronics (Beijing).

On Flextronics’s customers and relationships in China:

In China, Flextronics has 3 international customers: Ericsson, Motorola and Nokia. It has also 2 local customers: Huawei and Datang. The general manager says: “Our relationships with customers are different. With local customers, you must be friends first. With western companies, it is just business. Western culture separates business and friendship, but this is not true of Chinese culture.”

On Flextronics relationship with Ericsson:

Flextronics entered a relationship with Ericsson in 1997. “It is apparent that whenever product prices go down, our relationship becomes more difficult to manage. The Flextronics - Ericsson relationship started at a low market tendency in 1997. When markets went up, the relationship became better. Present market tendency is in low a position again, so our relationship with Ericsson is low, too. At the moment, Ericsson forces Flextronics to reduce prices by 40%, otherwise the business relationship will be terminated. However, the friendship relationship is still important to us, and we have a very good one with Ericsson in China on the “operational level” However, the relationship on the “strategic level” is getting worse. Project work with Ericsson is very good, and whenever there is a problem, we can always get help from them.”

The localization process and Ericsson’s “outsourcing”:

“Because of price reducing pressure from customers, we turn our eyes to local suppliers. Two advantages of local suppliers are: price (about 20% lower), and flexibility (lead time). Ericsson’s headquarters in Sweden supports our localization process. However, it takes a very long time to receive technical approval. Flextronics has already today 50% local suppliers.

In principle, some components are specially designed for Ericsson, like ASIC components (3%). The suppliers of these components may be better at keeping direct customer relationships with Ericsson, as they are Ericsson’s unique component suppliers. This group is about 10-15% of Flextronics’s total number of component suppliers. Ericsson has released only 50% of its purchasing control rights. It is not wise to continue controlling the remaining 35%. The general feeling is that Ericsson controls Flextronics’s prices and profits too much.”
In China, Flextronics is Ericsson’s “single source” and Flextronics performs a “dual sourcing” policy for our own suppliers.

Reviewing the relationship with Ericsson, the Flextronics president in Beijing says: “Flextronics is in the beginning of a collaboration with Ericsson. We want to have more freedom. As our CEO says: Flextronics has no time to stand in between. We must deliver the whole product system.”

About company culture:

“The Flextronics’ organization is flatter than Ericsson’s, and it communicates better within its organisation. Ericsson is more hierarchical and complex, and the middle management of its organisation is difficult to penetrate (see Figure 5-1). The big difference between Flextronics and Ericsson is that Flextronics has discussions before making decisions, whereas Ericsson discusses after the decisions are made.

As Flextronics is an American company, we can see cultural differences between it and Ericsson. The Flextronics’ culture has a more American style with quick decision making, whereas Ericsson has a typical European business culture, with well thought-out plans and slow responses, and often a compromised decision making process.”

Interview 2: With the Director of Global Operations Flextronics in Lund, Sweden

1. Flextronics and Ericsson have different flexibility requirements for Normal Production Volume:
   
   In normal production design, capacity is defined as:
   Design Capacity (DC) = Max. Volume / working day
   However, Flextronics and Ericsson have different flexibility requirements for Normal Production Volume (NPV)
   Flextronics wants: 50% DC < NPV < 100% DC
   Ericsson demands: -100% DC < NPV < 130% DC

   “Ericsson requires that Flextronics accept that ordered product volume changes from (+) 30% to (-) 100%. This means that Flextronics should always have 30% of its production capacity in reserve, even in the case of max design capacity. It should also be prepared for order volume to be cancelled. This is difficult for Flextronics to implement.”

2. About supplier involvement in product design:

   “Yes, Flextronics wishes to be more involved in Ericsson’s product design and final testing. As it is, we are now mainly working on module production and semi-assembly for Ericsson products only.”

3. Conflicts as a result of Flextronics’ and Ericsson’s different business models:
“The Flextronics’s business model is: Industrial park + VMI\(^{14}\) + Kanban. We develop an industrial park and invite our suppliers into it. On the other hand, Ericsson applies its global supply chain concept. Thus, Ericsson often chooses about 2/3 of Flextronics’ suppliers. These Ericsson appointed suppliers are located in different places in the world. This often causes lead-time problems for Flextronics. With regards to purchasing price, Flextronics has only 2% price flexibility when it purchases components from these Ericsson selected suppliers. Obviously, there is a big conflict between Flextronics’ industrial park and Ericsson’s global supply chain. As a comprise solution, Ericsson once invited Flextronics to build an industrial park in Poland, but it would have been Ericsson who decided which suppliers would move into this park. In this case, it would still be Ericsson’s industrial park, and not Flextronics’. The only solution to this conflict is that Ericsson release control of the Flextronics’s suppliers.”

Ericsson culture:

“There are too many internal relationships in Ericsson, and the decision-making process is too slow. Internal communication is more difficult than external. The activities of Flextronics (Lund) were originally part of Ericsson. After outsourcing to Flextronics, I feel that the current communication with Ericsson is easier.

In comparison with our other customers, Ericsson’s forecasts are the worst. The reason for this is that Ericsson keeps too much storage with suppliers on different levels.”

Single or dual sourcing policy:

“Dual sourcing would waste Ericsson’s resource and investment. In fact, double sourcing would not give Ericsson double safety. Thus, it is better for Ericsson to have a single source policy, especially for its WCDMA system, as this will have twice the amount of software and hardware components than the current GSM system. Dual sourcing would result in too high supply costs for Ericsson, in this case.”

Conclusion:

As a conclusion, the interviewed Director of Global Operation says: “Flextronics wants to have ‘real outsourcing’. I believe, if Ericsson controlled Flextronics less, we could make more contribution to Ericsson through the whole supply chain.”

Interview 3: With Ericsson’s Corporate Program Manager with Flextronics in Kista, Sweden

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\(^{14}\) Vendor Managed Inventory
Q: “How would you give a general picture of the Ericsson – Flextronics alliance, in comparison with the Spekman model?”

A: “With reference to the Spekman model, we are in all relationship types, but price negotiation exist in the whole cooperative process. For certain close relationships, we have reached the “collaboration” level.”

Figure 5-1 is Ericsson’s strategic alliance structure with Flextronics and other EMSs.

Structure for interfacing with the EMS suppliers to ensure low cost, performance and quality

<table>
<thead>
<tr>
<th>Top management from both parties</th>
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<tbody>
<tr>
<td>- Strategic objectives</td>
</tr>
<tr>
<td>- High level follow up</td>
</tr>
<tr>
<td>- Approval of planning going forward</td>
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</tbody>
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<table>
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<tr>
<th>Procurement organization main interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Business plan for the joint development</td>
</tr>
<tr>
<td>- Definition of KPIs</td>
</tr>
<tr>
<td>- Negotiation of prices and contracts</td>
</tr>
<tr>
<td>- Allocation of resources</td>
</tr>
<tr>
<td>- Monthly reporting</td>
</tr>
<tr>
<td>- Follow up on a more detailed level</td>
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<table>
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<tr>
<th>Different parts of the organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Forecast &amp; order</td>
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<tr>
<td>- Payments</td>
</tr>
<tr>
<td>- Follow up</td>
</tr>
<tr>
<td>- Problem handling</td>
</tr>
<tr>
<td>- Design changes</td>
</tr>
<tr>
<td>- Development teams</td>
</tr>
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</table>

Figure 5-1 A strategic alliance structure between Ericsson and EMS providers

Q: “Telecom system suppliers are using two different supply models now. One is the “horizontal integrated model”. Another is called the “vertically divided model”(see Figure 5-2). What is Ericsson’s sourcing strategy with Flextronics, and why?”

Vertical dividing

<table>
<thead>
<tr>
<th>Horizontal integration</th>
</tr>
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<tbody>
<tr>
<td>Development</td>
</tr>
</tbody>
</table>
“It is very difficult to say if our strategy is based on “horizontal” or “vertical integration” I think that we use horizontal integration from “development” to “system assembly” and then we have vertical integration, shared with Flextronics.”

A: “Yes, the model is suitable for our situation. Ericsson’s relationship with Flextronics is really on different levels: simple buying – selling for standard items, strategic partnership for technical design, and volume production on leverage level and so on. In general, I think our relationship starts from “strategic partnership”(joint planning and technical collaboration), and develops in a leverage direction (for production). From “leverage” we finally move to the “standard
items” area (after our products become mature and are thus standard commercial ones).”

Q: “Figure 5-4 shows that Ericsson is seeking a new co-operation sourcing in design to reduce total costs. What do you think about the new co-operation in early product development? What is the current Ericsson- Flextronics cooperative level? How much is Flextronics involved in Ericsson’s product development? Please give examples.”

Step change in TK requires new ways of working: Powerful co-operation Sourcing + Design + PM +

100% = Total landed cost of the sourced component or module

20% of the cost is decided by sourcing skills and decisions

80% of the cost is decided by technology and design decisions

So far, sourcing has been limited mainly to work on the 20%

By powerful internal co-operation Ericsson can reduce also the 80%

Figure 5-4 Ericsson product cost composition

A: “Ericsson has co-operation with Flextronics in both production and technical design. For instance, RBS 1130 for CDMA is a good example of Ericsson and Flextronics co-developing and designing in Nanjing, China, to where Flextronics has recently moved its design operations from America.”

Q: “During the co-operation process, do you feel business culture conflicts between Ericsson and Flextronics?”

A: “Yes, there is big difference between the company cultures. I feel it is easier to co-operate with Flextronics than Solectron, because Flextronics is more American in its cultural style. And the Ericsson – Flextronics relationship in China is better than that in Sweden, because personal relationships in China are better.”
Q: “What are the difficulties in co-operating with Flextronics?”

A: “The most difficult thing is to find the driving force of collaboration. One example here concerns reducing product-testing time in Flextronics. As a result of collaboration, one product testing time was successfully reduced from 3 to 2 hours. To explain this case; if Ericsson’s payment to Flextronics is calculated at 110 Skr/hour, and the one-hour cost in Flextronics is 100 Skr, then Flextronics’ profit is 10% for this business. The following Figure 5-5 shows the result before and after the time reduction collaboration:

<table>
<thead>
<tr>
<th>Per product unit</th>
<th>Before</th>
<th>After</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ericsson Payment</td>
<td>3x110 = 330</td>
<td>2x110 = 220</td>
<td>-110</td>
</tr>
<tr>
<td>Flextronics Cost (Skr)</td>
<td>3x100 = 300</td>
<td>2x100 = 200</td>
<td>-100</td>
</tr>
<tr>
<td>Flextronics Benefit</td>
<td>10% x 300 = 30</td>
<td>10% x 200 = 20</td>
<td>-10</td>
</tr>
</tbody>
</table>

Figure 5-5 Difference before and after time reduction collaboration

As we can see, for each product testing, Flextronics lost 10 Skr due to the product testing time being reduced by one hour. The question is: what then is the driving-force to co-operate with Ericsson to reduce testing time?

The second difficulty is to find a common goal for both partners, as two partners often have different business models and structures. Take cost reduction for example, Ericsson’s target is 15%, while Flextronics is 10%. About business models, Ericsson creates global supply chains in order to build a worldwide supply network, while Flextronics implements its own industrial park in order to collect its suppliers into a planned industrial area. We are therefore not surprised that both partners have troubles and conflicts in their strategic alliance.

The third difficulty is how to balance the responsibility and alliance. One typical Ericsson-Flextronics supply chain is shown in Figure 5-6. Due to a “single sourcing” policy, Ericsson requires Flextronics to open its books for cost information. In order to gain control of the whole supply chain, Flextronics have to use Ericsson selected 2nd even 3rd tier suppliers, which have already signed purchasing contracts with Ericsson. Obviously, Flextronics is not willing to open its books fully to Ericsson, and is also un-happy to lose control of its own supply chain.
According to my work experience, open books, and visibility are important for co-operation. If the cost reduction rate is changed from 10% to 15% per year, through Ericsson-Flextronics joint effort, the question is who will get the benefit of the cost reduction.

It is important for cooperating partners to share benefits and create win-win relationships in the long-term.”

Interview 4: With the Director of Business Management, Major Global Accounts, Flextronics in Kista, Sweden

Q: “Telecom system suppliers are using two different supply models now. One is the “Horizontally integrated model” the other is called the “vertically divided model” (see Figure 5-2). What is Flextronics’ supply model, and why? Figure 4-1 shows the Ericsson production strategy model. What do you think about this model? Is this model good for both partners, and why?”

A: “Flextronics uses a horizontal integrated model today (see Figure 4-1). I can accept that Ericsson owns basic capacity volume production, and that we, as an EMS provider, work for capacity flexibility. However, two suggestions are:
(1) Ericsson should keep its own “core competence” and basic capacity line, and maintain a stable state in relation to the EOL.

(2) Flextronics ought to be more involved in “industrialization and ramp-up”.

Q: “One research report (Bengtsson and Berggren, 2002) shows that production efficiencies were not improved in the plant after Ericsson’s outsourcing (i.e. production costs were not reduced), do you agree?”

A: “In the beginning of the outsourcing, both Ericsson and Flextronics believed that production costs could be reduced dramatically. We were wrong!

<table>
<thead>
<tr>
<th>Production cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before outsourcing</td>
</tr>
<tr>
<td>After outsourcing</td>
</tr>
<tr>
<td>%</td>
</tr>
</tbody>
</table>

If Flextronics produces only for Ericsson, there is no great cost advantage for us. However, when more customers come to us, we can use our flexible production capacity, and get cost advantage through volume production.”

Q: “What are your motives for working as Ericsson’s outsourcing supplier?”

A: “The motivation for being an outsourcing supplier is to get more business from Ericsson. And also to learn from Ericsson about production operation, product knowledge, and design.”

Q: “Considering the Flextronics - Ericsson relationship, what are the problems of interface between the two companies? How will you make improvements?”

A: “Ericsson is being “over ambitious” somewhere. Ericsson products are technologically more complicated than Nokia’s. More interfaces are required with Ericsson. Normally, we need to contact 50 different Ericsson people when it comes to Ericsson products whereas, we only have to contact 8 people with Nokia. Ericsson’s organization structure is more complex than others.”

Q: “Figure 5-3 shows “Sourcing Strategies” in different situations. Considering the Flextronics - Ericsson relationship, which area is Flextronics in? What is the ideal position for you?”
A: “Our relationship with Ericsson is a type of “strategic partnership”. Ericsson is one of our strategic accounts. In the future, we may move more in a “leverage” direction.”

Q: “From Ericsson’s total product cost analysis, only 20% is sourcing cost, and 80% is decided by technology and design (See Figure 5-4). Ericsson is therefore seeking a new co-operation in design to reduce the total cost. Is this a chance or challenge for Flextronics? How much can Flextronics take part in the new co-operation process?”

A: “Flextronics is also working more in product design and development now. In the near future, Flextronics may contribute to cost reduction in technology and design by about 20-30%.”

Q: “What are your comments on Spekman’s relationship model?”

A: “I prefer the “Open market”-Partnership”- “Alliance “ model to Spekman’s model of “Open market”- “Co-operation”- “Coordination”- “Collaboration” – I believe that the customer-supplier relationship is always driven by cost focus.”

Interview 5: With Ericsson Corporate Program Manager at Solectron in Kista, Sweden.

Q: “Could you please give a general picture of the Ericsson - Solectron strategic alliance (short history, relationship levels and model…). How do you cooperate with Solectron (testing Spekman’s model as in Figure 2-5)?”

A: “Ericsson is using the Alliance Model as follows (Figure 5-7):

```
OEM  EMS

Cooperate level:
Alliance Steering Board
(3+3) persons, quarterly meeting

Tactic level:
Alliance Steering Team
(5+5) persons, monthly meeting
meeting once per month;

Operational Level:
Program improvement
activities
daily contact

Figure 5-7 Ericsson – Solectron alliance organisation
```
The difference between an “Alliance” and a “Strategic partnership” is: an Alliance is more flexible than a Strategic partnership; because the latter means that you must go ahead without “stopping” or “drawing back”.

It is very often the case that two partners have different business models in their alliance. Figure 5-8 shows how OEM and EMS providers differ in many business goals. We have struggled hard to find the common goals for our alliance.

<table>
<thead>
<tr>
<th></th>
<th>OEM</th>
<th>EMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margin (%)</td>
<td>10-15</td>
<td>3-6</td>
</tr>
<tr>
<td>Inventory turnover</td>
<td>5 (75 days)</td>
<td>8 (50 days)</td>
</tr>
<tr>
<td>Cost reduction (%)</td>
<td>15</td>
<td>10</td>
</tr>
</tbody>
</table>

Figure 5-8 Different goals between OEM and EMS providers.

The Ericsson – Solectron alliance started in 1997. We are trying to make the alliance better and more effective. In comparison with the Speksman relationship model, we are still in the stage of “Co-ordination”. However, it is very difficult to distinguish between “co-operation” and “co-ordination”.

Q: “Telecom system suppliers are using two different supply models now (see Figure 5-2). One is the “horizontally integrated model”(as Nokia’s model). Another model is called the “vertically divided model”(as Ericsson’s). What is Ericsson’s sourcing strategy with Solectron, and why?”

A: “It is very difficult to say if our strategy is one of “horizontal” or “vertical integration”. Solectron's supply integration is mixed.”

Q: “Figure 4-1 shows Ericsson’s product strategy model. What do you think about this model? Is this model good for both partners, and if so, why?”

A: “This is a good model for Ericsson and Solectron. In the same way as Flextronics, Solectron is also willing to be involved in Ericsson’s product development earlier.”

Q: “One research report (Bengtsson and Berggren, 2002) shows that production efficiencies were not improved in the plant after

\[15\] Inventory turnover means times per year
Ericsson’s outsourcing (i.e. production cost was not reduced after outsourcing). Do you agree? How are production efficiencies in the case of Ericsson’s outsourcing to Solectron?"

A: “There are two problems with this report, it contains incorrect data and misses one important fact. That is, Ericsson signed the “Global Alliance Agreement” (GAA) with Solectron in 1997. The first Ericsson factory in Sweden was outsourced to Solectron in 1997. The second Ericsson factory’s outsourcing started in 2000. According to the agreement, Ericsson has a committed purchasing volume loading written into its contracts with the EMSs, including a special price during the first 3 years. This means there is no real competition in the first 3 years. These EMS’ activities are still Ericsson’s “source” during this 3-year period. After 3 years, we then can define them as ‘real outsourcing’. Bengtsson’s report has neglected this important fact.”

Q: “Figure 5-3 shows a model of “Sourcing strategies in different situations” from Electrolux. Is this a suitable model for the Ericsson - Solectron relationship? If yes, what is Solectron’s situation? What is the ideal relationship between Ericsson - Solectron?”

A: “Yes, the model is suitable for our situation. The Ericsson relationship with Solectron is really on different levels: simple buying – selling for standard items, strategic partnership for technical design, and volume production on leverage level, and so on.

However, I am not so sure if we can make a comparison with Electrolux, because Ericsson is a high-tech industry with high R&D investment, whereas Electrolux has probably a much lower R&D investment. Its profit margin is also different from Ericson’s.”

Q: “Ericsson has different steering models between Ericsson and its EMSs. What are your comments of the Ericsson – Solectron alliance steering model?”

A: “In comparison with other EMSs, the Ericsson – Solectron relationship model is the most complex, as shown in Figure 5-9.”
EMS –OEM Co-operation level

EMS  
High  
OEM  
The highest level of relationship with a lot of joint planning, and tech. sharing.

ODM\textsuperscript{16}  
A lot of design service from EMS to OEM

Contract Manufacturing  
Low  
The lowest EMS-OEM relationship concerns only buying – selling things, like simple service, repairs, and print board assembly from EMS

Figure 5-9 Different EMS -OEM co-operation level

Q: "From Ericsson’s total product cost analysis, only about 20% is sourcing cost, and 80% is decided by technology and design (see Figure 5-4). Ericsson, therefore, is seeking a new co-operation sourcing in design to reduce the total cost. What do you think about the supplier being involved earlier in product development? And what is the current Ericsson- Solectron co-operation level?"

A: "Ericsson has a co-operation with Solectron in both production and technical design. However, it is often the case that the EMS provider has a lower R&D investment and capability than us. For instance, Ericsson R&D investment is about 15% of sales, but I guess Solectron or other EMSs may use less than 5%.”

Q: “During the co-operation process, do you feel a business culture conflict between Ericsson and Solectron? And what is the biggest difference?”

\textsuperscript{16} Original Design Manufacturing
A: “Yes, there is a big difference between the two company cultures. Solectron has more a Californian culture with a decentralized model, whereas Ericsson has a typical Swedish culture with a more centralised structure.”

Q: “What is your definition of “Supply chain cost”? What is co-operation cost? How do we measure the co-operation result?”

A: “It is difficult to define SCC. But to judge the co-operation result, we can look at what we expected in the beginning of the co-operation, and then what we have got during the co-operation, as shown in Figure 5-10.

<table>
<thead>
<tr>
<th>Why alliance</th>
<th>Result</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower manufacturing cost through economical scale</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Design service to reduce cost in design</td>
<td>Not yet</td>
<td>++</td>
</tr>
<tr>
<td>Lower price on standard components (60-65%)</td>
<td>No (due to unsuccessful alliance)</td>
<td>+</td>
</tr>
<tr>
<td>World Class Logistics (WCL)</td>
<td>No (there is no WCL yet)</td>
<td>+</td>
</tr>
</tbody>
</table>

Figure 5-10 Judgement of co-operation result

So, in order to measure the results of a co-operation, it is possible to start from the 4 issues: manufacturing cost through economic scale, design service to reduce cost in design, lower price on standard components, and world class logistics.”

Interview 6: With the General Manager of Emerson Network Power in Shanghai (China).

1 About Emerson:
“Founded in 1890, Emerson has a record of consistent long-term performance and strong global presence with over 123, 400 employees and 320 worldwide plants. It has over 60 industry leading divisions within the Emerson Group. Emerson Energy Systems is one of them. In fact, Emerson Energy Systems is part of Emerson Network Power. In April 2000, Ericsson outsourced its worldwide power system to Emerson, and in Oct. 2001, Huawei, a local Chinese telecom OEM, also sold its power system to us.”

2 Different company culture in comparison with Ericsson:
“Emerson and Ericsson have a totally different focus. Ericsson’s is on management and education, whereas Emerson focuses on daily costs - this is a typical American standard (style).”
3  About our relationship with Ericsson:
“In the telecom OEM customer group, Ericsson is our big customer. In China, Ericsson is our dominating customer. We deliver rectifiers to Gävle, Sweden, and power systems to ENC in China. We have two Ericsson's interfaces in China, ETC and ENC. Currently, we have our product R&D in Sweden together with Ericsson. If Ericsson wants to move its design to China, we can have our R&D in China too. Emerson is not just an EMS, we can deliver the whole solution to Ericsson. We can either design the product ourselves or co-design it with our customers.

Ericsson controls too much product R&D in Sweden, and doesn't completely trust Emerson. The reason for this might be a cultural difference between the two companies and the two countries.”

4  About “open book” and “black box”:
“Emerson has no “open book” concept, this is not our philosophy. We prefer the “black box” model.”

5  About single and dual sourcing:
“Emerson is now a single energy system supplier to Ericsson. However, we are happy to compare one apple with other apples. Comparing Emerson with other suppliers, we believe that Ericsson would find us the best power supplier. In fact, we have a dual sourcing policy for our own suppliers in China. One is local and one is an international source.”

7  About the key factors of the relationship:
“Three facts are important for a buyer-supplier relationship: trust, business model (dual sourcing), and a long-term relationship.”

8  Expected relationship improvement from Ericsson’s side:
“We feel that accessibility with Ericsson in Kista, Sweden is difficult, whereas communication with Ericsson (China) is good. We hope that the Ericsson top management in Sweden will trust us more. Remember, Emerson is not only a supplier; we can offer the whole solution design to Ericsson. This is why we prefer a “black box” type of relationship with Ericsson.”

Interview 7: With the VP of Sourcing Supplier Management, Ericsson AB Kista, Sweden

1  Comments on Spekman’s Key transition model (Figure 2-5) from open-market negotiation to collaboration:
“Technical discussions exist not only on a “collaboration” level, but also on all other levels of the relationship. On the other hand, it is difficult to distinguish “co-operation” from “co-ordination”.”
Ericsson has “open-market negotiation” relationships with many standard technology component suppliers, like relation with supplier “Leisa” in China. We purchase from its catalogue, with short contract. The relationships are mainly price-based.

Co-operation may mean a long-term contract and a lot of technical discussion, including R&D. For instance, ASIC often delivers products to our EMS’ suppliers.”

Ericsson has divided up its production relationship with Flextronics as shown Figure 5-11:

![Figure 5-11 Production relationship between Flextronics and Ericsson](image)

“Flextronics has built two “industrial parks” in China. Flextronics is working hard to persuade all its customers (like Ericsson and Nokia) to follow its business model, i.e. Flextronics will deliver a complete product to its customers. However, it is quite difficult when our product is not standardized. Ericsson also has a different business model than Flextronics. We take responsibility for our customer’s demands. For instance, delivery time to our customers varies from 20 to 150 days. Yet, delivery time from EMS suppliers to Ericsson is often fixed with a long-term contract with no flexibility.

One good example of a collaborative partner is Emerson, which was Ericsson’s daughter company, and is Ericsson’s single source for power supplier now. Ericsson has close co-operation with Emerson, including product development. Emerson is located in both Sweden and China (Shenzhen and Shanghai).
To increase efficiency in co-operation, there is a need to distinguish between information and communication. Information flow should be automatic and impact more efficiently communication. In this way, open information would improve co-operation and cost less.”

5.2 Case 2: Ericsson - CDC collaboration for cable products in China

Background of CDC

Chengdu PUTIAN Telecommunications Cable Co., Ltd. (in the following referred to as CDC) is a Sino-foreign joint venture listed on the Hong Kong Stock Exchange. It is the result of a total re-organization in October 1994 of the Chengdu Cable Plant under the Posts & Telecommunications Ministry of China. The plant was originally founded in 1958. CDC’s head office is located in the Chengdu High-Tech Development Zone. It has 2000 employees among whom over 700 are technical people, and the total net asset value was RMB 1.2 billion in 2001. It is a large and successful enterprise, and the China National Economy & Trade Committee recognizes its technology centre as one of the pilot technology centres of the top 40 State Enterprises and Groups.

Major products include: plastic local telephone cables, switchboard cables, CATV cable, different types of digital telecom cable, optical fibre, optical fibre cable, feeder cable used in wireless telecom station, distribution and drop coaxial cable for access network, leakage coaxial cables, etc. All the products made in the company are produced strictly in accordance with international or national standards such as IEC, MIL-C, ANSI/ICEA, ANSI/TIA/EIA, GB, YD or SJ. Its registered trademark is the brand CDC. The company received the certificate for GB/T 19002-ISO9002 Quality System and the quality certificate for networking, and the Golden Horse Award, the highest award for the excellent management of an enterprise in China. It was ranked as number one among Enterprises Best Satisfying Customers.

Relationship with Ericsson

Chengdu Cable is one of Ericsson's purely local suppliers in China. It is also a result of Ericsson's localization process. Before 1996, Ericsson’s cable supplier was from Sweden. The lead-time was long. With the local government’s requirement of local purchasing, Ericsson looked for local low-end product suppliers. This early localization process consisted of:

- General technological and commercial survey to find 3-5 suppliers
- Selection of 2-3 suppliers
- Product qualification testing
- Supply qualification survey
- Trial order
- Approval of selected supplier by Ericsson's headquarters in Sweden
In Ericsson's localization office, one project manager responsible for the relationship with CDC, says: “Although the advantages of using local suppliers are clear in cost, flexibility and lead time, there are some difficulties in implementing the localization process. These are: (1) to get approval for a new local supplier from the Ericsson headquarters takes more than one year, (2) in selecting a local supplier, it is often necessary to support and help it in order first to enhance its technology and R&D competence, (3) cultural differences may bring problems. CDC, as one of Ericsson’s local suppliers, is a good example and test of a localization process.

In 1996, CDC started to supply switchboard cables to Ericsson Beijing Company (BEC). With Ericsson's help, CDC has changed its cable insulation from plastic to nylon.

As a result of Ericsson’s re-organization, CDC's cable business relationship moved to Nanjing Ericsson ECA in 1997. As ECA was unhappy with the cable price offered by CDC, it asked for an “open cost” discussion. It was difficult in the beginning. ECA said, time after time: "Only if you tell the truth, can we help you to find the problem and make some improvements". After CDC finally opened its box for Ericsson, ECA found two reasons for why the CDC cable price was so high: The purchasing price of nylon was higher in China than in Sweden, and CDC’s nylon consumption rate in production was also higher than in Sweden: 1.3/m in CDC vs. 1.08/m in Sweden.

ECA then carried out two actions together with CDC:

1. ECA contacted Ericsson’s nylon supplier in Europe, reaching a compromise price after negotiation, which was better than the former CDC’s purchasing price;

2. Two Swedish cable engineers were sent to CDC. They worked on site to analyse and guide the production process of the nylon-insulated cables. CDC not only sent its engineers to work together with and learn from the Swedish engineers, but also opened its former casting design for Ericsson. As a result of this collaboration, the mixed engineer group has increased nylon press-forming speed from 100-200m/min to 500-600m/min, and the nylon-consumption rate has been reduced to under 1.1/m.

Through collaboration between ECA and CDC, the production cost of nylon insulation cable has been reduced, increasing competitive advantage for both partners. CDC sold nylon insulation cables to the value of over 10 million (CNY) to Ericsson in 2001. In order to develop this partner win-win relationship, Ericsson has moved its Cable Business Unit from Sweden to Ericsson in Nanjing. CDC is very satisfied with Ericsson's collaboration on the nylon insulation cable products.

The interview with Ericsson (Nanjing) shows that Ericsson is satisfied and proud of its local collaborative cable supplier.
Interview with the Vice President and Program Managers of Chengdu Cable Co., Ltd in Chengdu, China

Q: “Please describe briefly the history of your relationship with Ericsson in terms of business volume, type of products and number of projects”

A: “We started our co-operation with Nanjing Ericsson in 1996 in order to develop Nylon Insulation Cable. The main products are TEN 250 and TEN 280, 420, 480. The total sale of CDC was 1.9 billion CNY in 2001. Business volume with Ericsson was more than 10 million CNY in the same year.”

Q: “Please describe your supply process. What are normally included in Ericsson’s orders (product name, price, lead time and services etc)? Do you fulfil Ericsson’s order requirements well? If not, please describe the reasons.”

A: “We sign a “Frame agreement” with Ericsson every year. It includes; (1) General information; (2) Cable specification; (3) Purchasing agreement. Each order from Ericsson requires product volume and delivery time etc. Ericsson payment is very good. CDC delivers products to ENC’s warehouse. Normal lead-time is about 20 days.”

Q: “Are you Ericsson’s single source? If yes, is this good for your relationship with Ericsson? If you are also suppliers for any other companies, please describe your relationships with these customers. What are the main differences in comparison with your Ericsson relationship?”

A: “Yes, we are Ericsson’s single source. We have business relationships with BISC (Siemens), China Datang, and Alcatel etc. The relationship we started with Ericsson is the latest one. We are most satisfied with Ericsson’s co-operation. We feel that Ericsson considers CDC as a true partner. Our co-operator is Nanjing Ericsson Panda Communications Company (ECA).

We also have good relationships with other customers, but these are not as “open” as that with Ericsson.”

Q: “How about CDC’s forecast? Are you able to rely on Ericsson’s forecast plans, or not? And if not, why is this? Describe your buffer inventory and sub-order contract with Ericsson, if you have one.”

A: “Ericsson gives us an 8 week forecast. However, it is often too optimistic. When the Market Unit forecasts the product sales volume as 1, after amplification through many levels, it finally
becomes 4 or 5 to our suppliers (there is a bullwhip effect!). One unfortunate fact is that we still have cable products to the value of more than 3 million RMB in storage, after following Ericsson’s forecast. The manager of Ericsson Cable Business Unit has visited us several times and offered to help us.”

Q: “Do you have delivery problems caused by your supplier? Would you inform Ericsson if you foresaw the problem or hide the problem until it caused greater trouble?”

A: “The imported price of nylon is still higher than Ericsson’s purchasing price in Sweden. We have informed Ericsson. Ericsson is going to have negotiation with the nylon seller.”

Q: “Please describe your daily communication work with Ericsson (levels, persons, frequency, and contents)? How is your information linkage with Ericsson?”

A: “We contact Ericsson very often through meetings, phone and fax. If we have technical problems, Ericsson engineers often come to help us.”

Q: “Describe your co-operation, technology sharing/transferring, and supply chain integration activities with Ericsson, and the results you have got so far.”

A: “We have had a good collaboration with Ericsson concerning the Nylon Insulation Cable products. Through this collaboration, we have learnt technology from Ericsson and increased our competence. Thus, we think three facts are important for a successful relationship: trust, win-win and learning.

About learning, when Ericsson cable experts came and worked in our site, CDU sent our engineers to work with them in an integrated team. This teamwork gave a lot of opportunities for learning, especially as the Ericsson experts were open and kind to us.

We feel Ericsson has made a lot of efforts to help us. And the purchasing price from Ericsson is also “reasonable”. In fact, Ericsson didn't require our cable price to be as low as that of the Swedish cable supplier.”

Q: “What do you hope for in your relationship with Ericsson?”

A: “Reviewing our co-operation with Ericsson, our experiences are:
(1) It is important to have an open attitude to Ericsson;
(2) One should not make excuses to hide facts. It is good to tell the truth. As an Ericsson person said to us: “If you don’t understand,
just tell me”. In the beginning, when we had a problem with delivering JIT, we felt embarrassed to give the reason. Mr Ericsson said: “Only if you tell me the truth, can I know how to help you solve your problem”.

In our further co-operation with Ericsson, we hope:

(1) To keep a long-term partnership, in order to produce Ericsson cables, we have invested about 2 million RMB. We are looking for a long-term relationship with Ericsson.
(2) To enrich our co-operation area and increase its depth. Current co-operation is limited to only one or two cable products. We want to have a greater and deeper co-operation in order to gain more benefit for both partners.
(3) To join Ericsson’s Global Supply Chain, so we can follow Ericsson to international markets. We feel the current product approval formality in Ericsson headquarters is very complex and slow.”

Comments

Chengdu Cable is regarded as a good example of Ericsson collaboration with suppliers. Although Ericsson and CDU as two independent companies do not have close partnership relationships on the corporate level, they do on the product level. Ericsson and CDC have succeeded in creating a win-win, collaborative relationship in nylon insulation cable product development and production.

5.3 Case 3: Ericsson – Kaikai co-operation for CDMA site materials in China

Background

Ericsson divides its radio systems’ products into A Pack and B Pack. A Pack includes all accessory components, such as, site installation materials; B Pack consists of main body components, such as, radio base station products. However, some accessory components, like cables, wires and screws, can be used in both A and B Packs. In order to simplify the supply flow, Ericsson has used a third-party logistics provider as an external clients manager to control and deliver logistical operations of these assistant parts (see Figure 5-12). Elektroskandia is one of Ericsson’s 3rd party logistic providers in China. And Kaikai Telecommunication Equipment Co., LTD. (Kaikai) is one of Ericsson’s site material suppliers in China. As a site material supplier, Kaikai delivers products to Elektronskandia instead of Ericsson.

Kaikai was founded in 1991. Its main products are: feeder clamps, wave guide clamps, iron pieces for machine rooms (concave stell series, support rails and
accessories), ground kits, connectors for indoor and outdoor rooms, down-tilt kits, microwave antenna radomes, and standard parts and fasteners. It is the first local supplier to deliver installation materials for base stations to China telecom, China mobile and China Unicom to realize localization. Since 1991, Kaikai has become the site material supplier for Motorola, Siemens, Bell Laboratory and Nokia. During recent years, Kaikai has also grown into a logistics service provider. Since 2002, Nokia has chosen Kaikai as its third party logistics provider for the Chinese market.

Figure 5-12   Ericsson’s third-party logistics provider and its suppliers

Kaikai started to supply Ericsson with GSM site packs in 1999. When, in 2000, Ericsson CDMA came to the Chinese market to build a trial base station, Kaikai followed Ericsson to the trial site. As most of site materials are casting and pressing parts, they are new for Kaikai, but they are not high-tech products. So, the cooperation between Ericsson and Kaikai is a typical “black box” relationship, i.e. Ericsson Nanjing offers product description and technical requirement, and Kaikai makes its own design and production. Kaikai receives purchasing orders from Ericsson, and delivers the products to Ericsson’s 3rd-party logistics provider, Elektroskandia. In 2001, as a single source supplier, Kaikai delivered site pack products to all Ericsson's CDMA base stations in China. Sales were 13 million CNY.
As Kaikai has guaranteed good quality, reasonable price and technical secrecy for its customers, Ericsson thinks it is more economical and convenient to use Kaikai as a local supplier instead of the international supplier used before.

**Interview with the President and Vice President of KaiKai Communication Materials Group in Nanjing, China**

**Q:** “How long has your relationship with Ericsson existed? Please describe briefly the history of your relationship with Ericsson in terms of business volume, type and number of products?”

**A:** “Kaikai is the first local Chinese company to deliver base station installation materials to China telecom, China Mobile and China Unicom to realize localization. Before 1991, all RBS installation material was imported. One set of imported installation materials for each base station cost 40 000 USD. Kaikai started BS installation material production in 1991. One package for one RBS was 30 000 RMB (about 400 US$, 1 US$ is about 8.2 RMB). Ericsson gave the product specification and then Kaikai managed the product design and production, as well as the purchasing (a typical black-box model).

Kaikai started co-operation with Ericsson in 1999 on CDMA site installation materials. We built a CDMA trial station in 2000. Kaikai delivers products to Elektroskandia - one of Ericsson’s distributors in the China market. Elektroskandia then distributes the products to customer sites (or Ericsson’s logistics centre). Kaikai’s business volume with Ericsson was about 130 million CNY in 2001 and included 2400 packs of base station site materials.”

**Q:** “Please describe your supply process. What are normally included in Ericsson’s orders (product name, price, lead time and services etc)? Do you fulfil Ericsson’s order requirements well? If not, please give the reasons.”

**A:** “We guarantee: quality, reasonable price, and customer business secrecy. Once, Dalian, Ericsson’s site in Sichuan, lacked a label for a support frame. It would take 2 months to import this label from abroad. Kaikai delivered it in only 20 days. When an Ericsson site lacked a Safety cap for alternating current, we found one among 19000 different safety caps from our supplier (3M) and sent it to the Ericsson site. To guarantee lead-time, we paid 2000 CNY in transportation cost, even though the delivered product was valued at only 10 CNY. We know that it is only if the operator is satisfied with Ericsson that we in turn can then get more business chances from Ericsson.”
Q: “Are you Ericsson’s single source? If you are, is this good for your relationship with Ericsson? If you are also the supplier for any other companies, please describe your relationships with these customers. What are the main differences in comparison with your Ericsson relationship?”

A: “Ericsson signed a standard “purchasing contract” with us, and now we sell our products to Ericsson according to order. For CDMA site materials, Kaikai is Ericsson’s single source. Kaikai is also a supplier to Motorola, Siemens, Nokia, and Bell Lab. Our relations with the big telecommunication companies are good win-win relationships. Since this year, Kaikai is not only Nokia’s supplier, but it has also become Nokia’s 3rd part logistic partner (for GSM products). We are also trying to be Ericsson’s 3rd part logistic partner. But there is hard competition with Electronics Scandia due to many reasons.”

Q: “What is your forecast process like? Are Ericsson’s forecast plans able to be relied on or not? And if not, why is this? Describe your buffer inventory and sub-order contract with Ericsson, if you have one.”

A: “We have long-term and medium-term forecasts. Kaikai normally keeps 3 months storage for key products and components.”

Q: “Please describe your daily communication with Ericsson and your information linkage with it? What are the problems concerning communication with Ericsson?”

A: “We normally keep contact with Elektroskandia directly, instead of Ericsson.”

Q: “Describe your technology sharing/transferring and supply chain integration activities with Ericsson. What results have you achieved?”

A: “We want not only to be Ericsson’s site materials’ supplier, but also to be Ericsson’s 3rd party logistics partner in the near future. As you see, we have already worked as Nokia’s logistics centre.

In comparison with Electronic Scandia (Ericsson’s current logistics partner), Kaikai has equally good storage capability, while our software situation including information platform, EDI and human resources etc, is a little weaker. However, we have a much greater service competence. We are investing 20 million CNY to improve our capability in a new logistics centre, including personal training and warehouse construction.”
Comments

Ericsson and Kaikai is a good case of a win-win relationship, even though the two companies have no close collaboration on their company levels, but just a simple “black-box” relationship.

5.4 Case 4: The RRU project, a new Ericsson - supplier relationship in China

The Remote Radio Unit project background

Since the second-generation GSM mobile system has succeeded worldwide, the third-generation mobile system, for instance WCDMA, is becoming the new global focus of most telecom system suppliers and operators. After having analysed the WCDMA market situation in China, Ericsson has summarized it as follows: (1) A fast growing economy, thus marketing operators need to rollout coverage quickly; (2) A large share of rural, low capacity sites is required; (3) There is fierce price competition from local vendors. The conclusions drawn by Ericsson are: A low cost RBS and high coverage solution are required for the Chinese market.

How to achieve a low cost RBS coverage solution?
- The major cost in a Macro RBS is made up of the radio parts.
- The cost for the radio parts is relative to output power needed
- In order to substantially reduce the cost of RBS, it is essential to lower output power requirements.

Based on technical analysis and research, the Ericsson China R&D Institute suggested that a simple way to achieve lower output power requirements would be to place the radio parts close to the antenna in the mast to minimize feeder losses. This is why Ericsson started the Main “Remote Radio Unit” Project in China (it is called the RRU project below).

Description of RRU project

The basic idea of the M/RRU project is to separate a WCDMA product, RBS3402 into two parts: the Main Unit of the RBS (MU), and the Radio Unit (RU). The MU, consisting of cabinet and enclosures, will be installed indoors. The RU part, including power module, filter, mechanics and cables, will be outdoors, directly hung in the mast close to the antenna. As it is separated from the MU, the Radio Unit is also called Remote Radio Unit (RRU).

A technical analysis from the Ericsson China R&D Institute shows the difference in output power between a typical rural macro RBS and the new main-remote RBS3402 (see Figure 5-13).
Figure 5-13 Output power comparison of normal RBS and main-remote RBS

On a typical macro RBS the MU and RU have been installed indoors. Its feeder loss (downlink) is about 4.3 dB, and it requires about 20 W output power. The main-remote RBS, RRU is hung close to the antenna, which has minimized feeder loss dramatically. The remote radio unit requires only 6W output power.

The new RBS is small, has lower power consumption, and enables fast Radio Network rollout. It is custom made for Chinese market requirements to meet competition from local vendors. The Ericsson China R&D Institute is responsible for the project. This is the first time that Ericsson has localized both product design and development in China, instead of production in China, and design in Sweden. It is also the first time that Ericsson has tried a new way of supply chain management.

Interactions in the RRU design and development project

Traditionally Ericsson-supplier co-operation starts after product development is finished. It means that Ericsson is used to designing the product itself, and then looking for suppliers who fulfil the requirement for the Ericsson designed product. The RRU project has tested a new way of early; supplier- involved product development and focused on interaction between product design and supply.
In the RRU project organisation (see Figure 5-14), supply is identified as an important function and is active in the product design and development.

- Supply:
  - Supply investigation;
  - Provide sourcing alternatives analysis and make/buy analysis;
  - Commercial agreement negotiation and relationship maintenance;
  - Logistics provision for prototypes.

- Purchased Material Quality Engineer (PMQE):
  - Set up quality standard for suppliers to meet established drawings, processes and quality requirements;
  - Set up QA checkpoints and contents in the process;
  - Help to implement, execute and improve quality on supplier’s site;
  - Formulate working procedure and documentation.

- Production engineer:
  - Production of general list;
  - Secure production of supplier;
  - Define compliable production standards;
- Test set-up.

- Component engineer:
  - Decide components or parts to be used in the product.

- Design:
  - Make drawings of product;
  - Make a functionality description;
  - Secure technical requirement in the product.

- Suppliers:
  - Provide sufficient resources;
  - Co-work in project on design, process, production and quality;
  - Secure sub-supplier’s work;
  - Produce prototype, pre-series and volume product.

The first interaction in the project is focused on the relationship between supply and design. The description of this interaction is shown in Figure 5-15.

The second interaction in the project is focused on the relationship between suppliers and design & development (see Figure 5-16).

---

**Figure 5-15** Interaction Description between Design and Supply

*Source: from Ericsson RRU project description*
Interaction description

In this RRU Design and Development project, suppliers are involved in the whole product development process, and have got clear tasks in each milestone (see Figure 5-17).
Milestones

- Pre-study
- Prototype 1
- Prototype 2
- Pre-series
- Volume production

Tasks for suppliers

INPUT

OUTPUT

Figure 5-17  Suppliers have clear tasks in each milestone of the RRU project
Source: from Ericsson RRU project description

The different interaction of roles in each milestone is described from Figure 5-18 to Figure 5-22.

<table>
<thead>
<tr>
<th>Role</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>• Assign task of project</td>
</tr>
<tr>
<td>Supply</td>
<td>• Evaluate supply availability and business opportunity (future market volume, cost of product and when) and feedback to project</td>
</tr>
<tr>
<td></td>
<td>• Prepare primary supply and supplier information</td>
</tr>
<tr>
<td></td>
<td>• Make supplier’s survey and shape out potential NPC</td>
</tr>
<tr>
<td>PMQE</td>
<td>• Prepare test and verification</td>
</tr>
<tr>
<td>Production Engineer</td>
<td>• Preparatory work on where to find the component</td>
</tr>
<tr>
<td>Component Engineer</td>
<td>• Competence evaluation on process, quality and general</td>
</tr>
<tr>
<td></td>
<td>• Rough analysis of production ability inputs</td>
</tr>
</tbody>
</table>

Figure 5-18  Interaction descriptions in Pre-study
<table>
<thead>
<tr>
<th>Role</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>• Provide design, drawings/specification of products</td>
</tr>
<tr>
<td></td>
<td>• Ask for need of component</td>
</tr>
<tr>
<td>Supply</td>
<td>• Understand requirement of design and give feedback on design req.,</td>
</tr>
<tr>
<td></td>
<td>if there are some options</td>
</tr>
<tr>
<td></td>
<td>• Seek for and decide from where to get them</td>
</tr>
<tr>
<td></td>
<td>• Work out whole time schedule from Prototype 1 until delivering</td>
</tr>
<tr>
<td></td>
<td>volume product</td>
</tr>
<tr>
<td></td>
<td>• Sign NDA (non-disclose agreement)</td>
</tr>
<tr>
<td></td>
<td>• Logistics provision for Prototype 1</td>
</tr>
<tr>
<td>PMQE</td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>Engine</td>
</tr>
<tr>
<td>Component</td>
<td>Engineer</td>
</tr>
<tr>
<td></td>
<td>• Choose and decide Prototype 1 component list</td>
</tr>
<tr>
<td>Supplier</td>
<td>• Secure production ability of product</td>
</tr>
<tr>
<td></td>
<td>• Produce Prototype 1</td>
</tr>
</tbody>
</table>

Figure 5-19  Interaction descriptions in Prototype 1

<table>
<thead>
<tr>
<th>Role</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>• Describe/modify the product spec. upon need of supply etc. (production</td>
</tr>
<tr>
<td></td>
<td>ability, instability maintenance ability),</td>
</tr>
<tr>
<td></td>
<td>• Provide more detailed product spec. to improve production ability</td>
</tr>
<tr>
<td>Supply</td>
<td>• Ask design to make modification of product, if it is needed. Ask for</td>
</tr>
<tr>
<td></td>
<td>more detailed product design to start formal discussion with real</td>
</tr>
<tr>
<td></td>
<td>potential supplier</td>
</tr>
<tr>
<td></td>
<td>• Start to look at tooling and other investment to improve product</td>
</tr>
<tr>
<td></td>
<td>quality</td>
</tr>
<tr>
<td></td>
<td>• Start to negotiate agreement</td>
</tr>
<tr>
<td></td>
<td>• Start to work together with PMQE, production engineer</td>
</tr>
<tr>
<td></td>
<td>• Organize logistics provision for Prototype 2</td>
</tr>
<tr>
<td>PMQE</td>
<td>• Start to investigate more about quality requirement</td>
</tr>
<tr>
<td></td>
<td>• Start to set up working process, QA of production with real</td>
</tr>
<tr>
<td></td>
<td>potential suppliers, closely work together with production engineer</td>
</tr>
<tr>
<td></td>
<td>• Perform audits on supplier and work on improvement measures</td>
</tr>
<tr>
<td>Role</td>
<td>Tasks</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Production Engineer | • Co-work with supplier  
                     • Feedback design about production ability and ensure the design is applicable and fulfilled in production  
                     • Start up testing environment set-up in real potential supplier site |
| Component Engineer | • Review proposed component changes  
                     • Make new decision of component choice and as much as possible adopt China supply base |
| Supplier           | • Secure sufficient resource in both design and production engineering, jointly working together with project  
                     • NPC constantly feedback project concerning design, supply and PMQE the possibility of design, tooling, production, and material sourcing  
                     • Proactively provide alternatives of making efficient solutions  
                     • Produce Prototype 2 |

Figure 5-20 Interaction descriptions in Prototype 2

<table>
<thead>
<tr>
<th>Role</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>• Locked</td>
</tr>
</tbody>
</table>
| Supply             | • Establishment of Supply Chain  
                     • Decision on supplier  
                     • Work out improvement actions with supplier  
                     • Sign all required commercial agreements (GPA, SSA etc) with suppliers  
                     • Organize logistics provision for Pre-series production |
| PMQE               | • Secure deployment and execution of working process and QA systems  
                     • Final audit and approval for volume production of both component and unit |
| Production Engineer | • Final adjustment of requirements for securing final assembling production for unit in NPC |
| Component Engineer | • Locked                                                               |
| Supplier           | • Pre-series production up and running  
                     • Co-working with PMQE on quality, process, testing, tooling, resource etc.  
                     • Approval for volume production |

Figure 5-21 Interaction descriptions in Pre-series
<table>
<thead>
<tr>
<th>Role</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>• Dismiss</td>
</tr>
<tr>
<td>Supply</td>
<td>• Line organization takes over whole commercial responsibility and SC management responsibility</td>
</tr>
<tr>
<td>PMQE</td>
<td>• Dismiss</td>
</tr>
<tr>
<td>Production Engineer</td>
<td>• Dismiss</td>
</tr>
<tr>
<td>Component Engineer</td>
<td>• Dismiss</td>
</tr>
<tr>
<td>Supplier</td>
<td>• Handover to line organization the full documentation and full operation work</td>
</tr>
</tbody>
</table>

Figure 5-22 Interaction descriptions in Volume Production

Main/Remote RBS description and supplier involvement

Figure 5-23 shows a basic composition of the Main / Remote RBS.

![Main/Remote RBS](image)

• Main Unit
  – Indoor/outdoor mounting
  – Two Main Units fit in one 19" rack
  – Connects up to 3 RRU:s
  – -48 VDC

• Remote Radio Unit, RRU
  – 1 RF carriers
  – 8 W Output Power
  – -48 VDC power
  – Compact (<70 l, <30 kg)
  – No moving parts
  – -33° C to +40° C operating

Transmission
Optical fiber
Up to 15 km

Figure 5-23 Composition of the Main/Remote RBS
The main Unit consists of regular Ericsson RBS Hardware such as cabinet and enclosure, and Software for control. Ericsson (Sweden) develops the software, and the hardware is designed and produced by Flextronics. The Ericsson China R&D institute makes the design of the RRU, and the final assembly is carried out by Elcoteq. Four supplier groups are involved in the RRU product development for power modules, filters, mechanics, and cable supply. The complete Main/Remote RBS product development process is explained in Figure 5-24.

RBS 3402 Product Development Process

Supplier selection and supply policy

There are several principles on which the RRU supplier selection is based:

1. To regard the local supplier as first priority, due to advantages of shorter lead-time, lower price (at the same quality level) and flexibility;
2. To consider dual sourcing first; if it has to use a single source, Ericsson will buy the specific IP right from the single supplier;
3. RRU only decides its first tier suppliers, and lets those selected secure their own suppliers;
4. Selected new suppliers will be approved directly by the Ericsson (China) R&D Institute, instead of Ericsson headquarters in Sweden.

The supplier selection process includes four steps: (1) To send general information and technical description to 5-25 potential suppliers, with a request of a quotation...
from each of them; (2) To select 2-3 most likely suppliers based on their quotations, and make an assessment of these selected suppliers; (3) To choose 1-2 final suppliers according to the assessment result; (4) To start to contact product design and involve it in the product development as early as possible.

Assessment tool and assessment profile

ENC Supplier Evaluation Tool (ESET) is an assessment tool. Ericsson (China) uses it to evaluate the process and performance of new suppliers, in order that Ericsson can understand the supplier’s strengths and weaknesses, as well as possible improvement areas. The principle of the tool is taken from Ericsson Corporate Sourcing guidelines. The objective of the tool is to perform a gap analysis of current practice and performance according to Ericsson requirements to help identify and prioritize issues.

The following areas are covered in the assessment:

- Management system;
- Supply chain management;
- Supplier development and management;
- Manufacturing;
- Quality control;
- PRI – Product Change Process; PRI – Change Information; NPI – Process;
- Security and risk management.

![Figure 5-25 Supplier assessment profile](image)
In the evaluation, there is an Excel tool that draws a profile of the supplier assessment from the parameter scoring (Figure 5-25). For each parameter, there is also a possibility of making comments on the scoring and then storing these for future comparisons.

The evaluation scale ranges from 1 to 9 (Figure 5-26) and is divided into Low, Medium and High. If the parameter is scored 1-3, this finding is addressed and corrective action must be planned and communicated to the assessment team within 2 weeks after the report is received. If the parameter is scored 4-6, corrective actions and improvement plans are preferred. When the parameter score is between 7-9, it is at a fully acceptable level.

![Figure 5-26 Assessment parameter scale ranges from 1-9](image)

**Guoyao, a supplier selected by the RRU project**

The RRU product consists of four parts: power module, filter, mechanics, and cable; a dual sourcing policy is considered for the RRU project. Thus, four supplier groups are involved in the RRU product development process. Shenzhen Guoyao Electronic Company is one of the two DC/DC power module suppliers for the RRU product. Another power supplier for the RRU is a Swedish company, “Power Box”.

Shenzhen Guoyao Electronic S&T Co. Ltd. was set up in 2002, and is a typical Chinese private company. It was the younger brother of Guoyao Shijiazhuang, who established a similar design and manufacturing function 22 years ago. In 2003 Guoyao Shenzhen had 2 main customers, Huawei and ZET. Ericsson is its first international customer. Shenzhen Guoyao belongs to China's top level of new technology enterprises.
The company has developed more than six series and thirty kinds of new productions, and has established a quality management system for design, manufacturing and sales of DC/AC, AC/DC high frequency power supplies. The company has received the certificate from TUV certification Shenzhen, China, confirming that the requirements according to DIN EN ISO9001:2000 have been fulfilled.

“Why does Ericsson choose Guoyao as supplier for the RRU product”? A sourcing engineer in the project says: “Among all quotations, Guoyao offers the lowest price without extra design cost, in comparison with other suppliers at the same quality standard level”. The Ericsson assessment team made an evaluation of Guoyao. The assessment result is shown in Figure 5-27

Some weaknesses were found through the audit. The ENC assessment team suggested that Guoyao should improve its production management ability and sustainability. Guoyao reacted to Ericsson’s report and recommendations in positive ways.

Figure 5-27  Assessment Result of Guoyao Shenzhen
Although the DC/DC power module DC/DC is a unique Ericsson component it is not a high-end technical product, the type of RRU project co-operation with Guoyao is according to the “black box” model. Early in 2003, the RRU product design gave a technical description of the DC/DC power box to Guoyao. Using its own R&D ability, Guoyao made the DC/DC component design and sent first a block prototype (4 pieces) to the Ericsson (China) R&D Institute. After feedback from Ericsson, the second block-improved example (with 12 pieces) was sent to both Ericsson (China) and Ericsson (Sweden) for approval.

In the “black box” relationship, a lot of interaction and collaborative activities exist between the RRU project and Guoyao. For instance, since the DC/DC box will hang together with other RRU parts close to the antenna in the mast, there is a high technical requirement for avoiding the effects of thunder and lightning.

Yet, no such technical standard exists in industry. During an interview, both Ericsson and Guoyao said that they were working together in order to find a solution. The Vice President of Shenzhen Guoyao says: “If we succeed in meeting this technical requirement from Ericsson, we’ll send the third block-improved example (with 100 pieces) to them in April 2004. And volume production will then be expected to start in September 2004”.

To answer the question of why Guoyao is interested in being an Ericsson supplier, the VP says: “As a local private small company we lack production and management experience. Through this co-operation with Ericsson we are eager to learn about process management, total quality control and operation management. I believe, we have already established a good starting point for our cooperative relationship”.

A new supplier relationship named “black+ grey box” model in the RRU project

As mentioned above, one of the RRU supply principles is “dual sourcing”. However, there are exceptions in real application. For certain components with unique Ericsson characteristics, high investment for tooling and modelling, and a long pay back period, make it too expensive for Ericsson to use dual sourcing. In the RRU project, the component filter is such a product with an Ericsson special design requirement, and having low production volume and high tooling investment. The project has chosen one supplier to take responsibility for both design and production of the product. Ericsson then buys back the rights to the product’s Intelligent Properties. The RRU supply manager calls this new type of supplier relationship model as “black + grey box”. The advantage of the new model is to benefit from “outsourcing” but at the same time avoid the risk of “single sourcing”.

Comments on the new supply relationships in the RRU project

The project is one of two pioneer cases and an example of the powerful co-operation between sourcing and supplier and their early involvement in design and product
management in Ericsson. The total production cost of the RRU is targeted to decrease by 30%.

To summarize, the project differs in respect to current Ericsson supply policy and strategy as shown in the following points:

1. For supplier selection, the project considers what suppliers are needed instead of what suppliers Ericsson already have.

2. For supplier structure, the RRU project chooses its 1st tier suppliers only, and lets the selected suppliers manage the rest of its supply chain and secure their work.

3. “Single sourcing” is replaced by a “dual sourcing” policy in the RRU project.

4. “Focusing on interaction between supply and design and supplier integration, the suppliers early involvement in the product design and development is crucial for the new supplier relationship in the RRU project” - Comments from the Ericsson (China) Supply Management Team.

5. The “black + grey box” model is applied to some special Ericsson components with low volume production but high tooling investment. It means that a selected single supplier is responsible for the product design and production, but in the end Ericsson owns the IPR. It is a good way to benefit from outsourcing, but avoid the risks of single sourcing.

5.5 Case 5: Supply chain innovation at Haier, a case from a Chinese home products producer

Background of the Haier Group

The Haier Group, which makes refrigerators, washing machines, air conditioners, and nearly 80 other home electrical products, is the number one seller of white-goods in China, consisting of more than 90 plants and companies, and employing more than 30,000 people. Haier exports its products to 90 countries and regions and has more than 60 dealerships abroad, as well as 13 overseas manufacturing factories. From 1984 to 2000, it achieved an annual average sales increase of 82.8%. During the last 20 years, Haier has moved from being a small, almost bankrupt, refrigerator factory in the middle of the 80s to become the second biggest refrigerator producer in the world (after US Whirlpool). Today the amount of

17 The Haier case is based on my interview in Haier University and materials I bought from there.
Haier’s annual sales is about US$ 7 billion (2003). The company has ambitions to be a leading company within the home appliance sector on the world market.

Despite all of its success, the Haier Group President Mr. Zhang, Ruimin was not complacent about the future: “Our strategy is to internationalize. …The main thing is to develop our competencies so that we can compete.”

Material flow bottleneck in Haier

Before 1999, the logistics and supply chain worked in the traditional way. It was pure functional procurement, storage and delivery. However, a fast growing and maturing market has put higher and higher requirements on Haier’s logistics. It is not enough to meet the need of the market with product volume alone, more important is to produce and deliver customer- needed products and services. In 1999, the Haier Air-conditioner division made a review and listed the main problems as:

- Each product group had its own supplier group, and the supplier network was decentralized;
- There was no centralized purchasing price system;
- There was no central warehouse. Many product departments rented storage with poor information control, configuration and delivery capability;
- As a result of long lead-time from suppliers and poor information flow management, unreasonable amounts of stock existed in workshops and warehouses;
- There was a long-lead time to customers and high logistic costs.

A further review showed these problems noted above reflected weakness not only in the Air-conditioner division, but also in the whole Haier Group. An example; over 2236 suppliers were delivering components and materials to different Haier departments - supplier management was decentralised and overlapped. Another example, about 20 factories in the Haier Industrial park rented a more than 200,000 square meter warehouse in the suburb of Qindao city. Calculating with 0.3 CNY/M²/day, the annual storage rent cost Haier over 30 million CNY. Thus, the supply chain was a bottleneck for Haier’s further development.

From “bottleneck” to “core competence”

In Haier, the supply chain is often considered as the 3rd profit source¹⁸. Not understanding the importance of supply chain management, many companies are surprised only by how high the supply cost rate is in the total production cost. The key is to define the role of the supply chain, in order for a company to gain competitive advantage.

¹⁸ During the interview, I was told that 1st and 2nd profit sources are cost and efficiency.
Traditionally the Chinese mindset is to think primarily business, but to neglect supply and physical material flow. Haier has orientated the supply chain as one of the company’s core competences. In order to lift competitive advantage from the supply chain, a revolution of “re-engineering process” has been implemented in Haier since 1999. The strategic target of this “re-engineering process” is to deliver maximized value-added service and products to customers with minimized supply costs. Mr. Zhang points out, “The supply chain re-engineering process is the key to this revolution”.

Centralizing supply chain management and flattening organisation structure

Before the “re-engineering process”, the Haier Group was divided into 7 different product business units. Each business unit had its own purchasing, sales and financial functional departments, as well as many other service function sub-organizations. It was a vertical and complex organisational structure (see Figure 5-28). The first step of the re-organisation has been to move the purchasing, sales, and financial functions from each business unit to centralised Marketing, Sales, Supply Chain, and Capital operation units on the Haier group company level. This has been done in order to perform “Group purchasing”, “Group sales” and “Group financial operations”. The second step has been to move human resources, technical quality control, and the information and equipment management functions from each business unit. These have then been merged as independent service and support units on the company level. After the re-organization, all professional processes in the Haier Group (including both core processes and support processes) are directly facing the market. The third step has been to link the professional processes with the market chain.

The result of the re-organization in Haier has meant a great change; moving from a functional organization to a process network structure, from a vertical to a horizontal business structure (see Figure 5-29).
Supply chain optimization and merging purchasing activities

The centralized Supply Chain Unit is the responsibility of Mr. Liang Haishan, vice president of the Haier Group. The unit consists of three departments: Purchasing, Warehousing, and Transportation. The tasks of the Purchasing department are to supply all components required by different business units, and also to manage supplier relationships. These include; supplier optimization, bidding, purchasing orders, component selection, and managing the global supply network.

As purchasing is an important sub–process in the supply chain and also its starting point, it impacts directly on the whole production and delivery process. The Supply Chain Unit has made innovations in the following ways:

1. Optimizing the supply chain
Before the Supply Chain Unit was founded in Oct. 1999, Haier had a big supplier group with 2236 suppliers. Each product business unit and even sub-business unit purchased from its own suppliers. Reports were often sent to Mr. Zhang Ruimin revealing cases of corrupt behaviour concerning purchasing activities.
Concerning supplier optimization, Zhang argues that it is much more important to enhance the company’s competitive advantage than to just reduce purchasing cost. There are two basic principles for supplier optimization: The first, is to consider the international supplier, i.e. the qualified supplier must have supplied components to an international company, and have a good reputation in the specific business area: The second, is to ensure that the supplier has the capability of participating in Haier’s product design and development. According to these two principles, Haier has made a lean supply chain and reduced its suppliers from 2236 to 750. Among the 750 suppliers, more than 82% are highly qualified international suppliers (Emerson is one of them), and 50 of these suppliers are listed among the 500 biggest global companies according to the American *Fortune* magazine 2002. As a consequence, the number of Haier’s purchasing personnel has been reduced by a third. And the purchasing cost has been reduced by over 10% annually since 1999.

After supplier optimization, Haier has built long-term strategic relationships with its key suppliers, and invited early supplier involvement in product and component design. A good example of this concerns the collaboration with a supplier on the development of a new MeiGaoMei colour TV set. The first time plan for the development of the new product was 6 months, based on Haier's own design competence. After noting it was too long a time to market, Haier made a new decision and invited several suppliers into the product design. As a result, the product design took only 2 months – this shortened the product development time dramatically, and affected positively time to market and time to customer.
“One reason that we use international suppliers is to borrow their strength to enhance our own competitive advantage”, says a Haier purchasing manager in the interview. He gives a good example below: A market investigation revealed that a new style of rolling-washing machine could become fashionable, and thus yield a high profit in 2000. However, it would take too long for Haier to design the product itself, and the generator was especially difficult for them. With close co-operation with its power supplier Emerson, Haier has shortened the new product design time, and succeeded in delivering the new washing machine to market quickly! Today, about 40% of its suppliers have participated in Haier’s new product research and development process.

(2) Merging purchasing activities and group purchasing

Before the re-engineering process, Haier’s purchasing costs were over 10 billions CNY. It purchased more than 150,000 different sorts of components. The first step in merging purchasing was to centralize former individual purchasing to Haier Group purchasing thus realising scale purchasing and a global operation. The strategy was to offer all required materials/components to Haier’s production system through the lowest supply cost. Using the advantage of group purchasing, Haier has now achieved a much better purchasing price on many components. For one key component of a particular TV-set, Haier received a 2nd or 3rd class customer price before mergence. Using group purchasing, Haier has now acquired 1st class customer price - each unit price being 10 RMB cheaper than before, as well as the supply service being better. On this component purchasing alone, Haier has saved 5.8 million CNY. On iron and steel plane purchasing, Haier reduced purchasing cost by 500 million CNY in 1999, and by almost 1 billion CNY in 2001.

The second step of merging purchasing was to reduce the number of types of component. For instance, cables, screws, computer planes, and plastic parts have been merged from more than one hundred to around 50 sorts, and from 50 to less than 10 sorts. Using an open list of all components, Haier lets suppliers choose what and how many components they could merge with the best price and quality. Haier had over 40 wire suppliers in 1999. When an American wire supplier succeeded in merging Haier’s ground wire from over 20 to 3 sorts, it became Haier’s largest wire supplier. Through merging components, Haier reduced its purchasing costs by 4.5% in 2000.

The third step was to build the B2B purchasing platform via Haier Internet. Traditional purchasing is to call a supplier group meeting, and send a paper order. With the help of the German SAP Company, Haier has, since 2000, built up a complete Enterprise Resource Planning (ERP) management system. This has resulted in all purchasing activities, such as orders and payments, being now carried out through the Internet network. There is no need to meet suppliers any more. Mr. Liang Haishan gives three advantages of Internet purchasing: “Speeding up response time, avoiding “grey” business, and reducing handling cost.”

(3) Triple-sourcing policy and open bidding via the Internet Network
One important sourcing policy in Haier is to avoid “single sourcing”, and to use, as much as possible, three suppliers for the purchase of one component. In order to keep control of the purchasing cost, Haier has often to perform open bidding through the Haier Internet to select three suppliers. After the bid, Haier divides the volume of the purchasing order in the ratio of “7-2-1” or “6-3-1” among the first three bidders. When it comes to supply assessment, Haier sends a monthly judgment report to its suppliers, which includes cost, delivery time, as well as quality. Haier’s Internet open bidding has offered a “fair”, “open”, and “transparent” environment to its suppliers.

Centralizing warehouse and JIT delivery

Another big innovation of the re-engineering process was to build a central warehouse to replace the former individual stock houses – in the words of the Haier people: “to make a warehouse revolution”. Before 1999, Haier used to mix factories and warehouses together. With production development becoming greater, and space for stock in the factories becoming less, many Haier factories had to rent their own warehouses in different places, with poor conditions and long transportation times.

Since 1999, Haier has centralized all component stock to its central warehouse. The central model, three-dimensions warehouse, was built in 1999. It covers 7200 square meter fields, and its usable area is 5400 square meters. The three-dimensions warehouse has 9168 tray positions and it can store all the business unit components. It works 24 hours a day. Using the ERP management system and JIT delivery, Haier has reduced average component stock time from 30 days (1999) to 7 days (2002). About 28 people working in the central warehouse have replaced a former 389 people working in individually rented warehouses. By eliminating 65,000 square meters of rented warehouses, Haier has saved 12 millions CNY rent/year.

All production in Haier follows strictly the “making by order” and “just in time” (JIT) system. There are three rules to guarantee the JIT system in Haier: Components stay in the warehouse for not more than 7 days, in production site for not more than 4 hours, and final products stay in the warehouse for not more than 24 hours. Haier calls these rules the three JITs, i.e. JIT purchasing, JIT sending to production site, and JIT delivering to market.

This revolution in warehousing has helped Haier to reach one of its final goals: zero stock, zero distance (to market), and zero operation costs. Figure 5-30 shows the difference before and after the supply chain re-engineering process.
Introducing the “market chain” concept into supply chain management

In late 1998 Haier began to experiment with a market chain strategy to reinforce the market focus. The market chain is inspired by Michael Porter’s value chain, but is quite different in both philosophy and in objectives. The Haier president Zhang Ruimin explains:

“The concept of the value chain developed by Porter emphasizes marginal income and aims to realize profit maximization, while we regard maximum customer satisfaction as our goal. We see the customer as being the most important factor, so in our market chain everybody is a market, and everybody has a market. In this way, insider-employees can begin to feel market pressure even though they are inside the organization: Everybody faces the market, and everybody supplies their best procedures!”

The essence of the market chain is that every unit, every operation and every person is linked directly to the customer, and every one is also someone else’s customer. In this way, everybody in the enterprise, no matter where he is working or how far he is from the firm’s customer, feels direct market pressure. “The market chain is there to best meet the needs of the individual customer”, Zhang Ruimin says.
In Haier’s Supply Chain Unit, each employee has one market, i.e. your downstream process is your customer – this is your market! The whole supply chain is decided by the market. For instance, if a sales person says, “this product’s marketing price is 1000 CNY; and the cost can’t be more than 900 CNY.” Then the Product Unit will sign a contract with the Purchasing department, and both agree that the purchasing cost will be decreased by 10%. During the contract year, the Purchasing Department must supply the materials according to the contract price, although marketing price may increase. Thus, market chain implementation has inspired the purchasing persons’ vitality and creative motivation, and built a solid basis for supply chain innovation. Supply chain innovation concerns purchasing, stock, configuration and internal delivery, sub-packing, planning, and transportation for 18 product units within Haier. It is a complex form of system engineering. Market chain performance has brought external market competition effectiveness into the internal environment. It gives every sub-process a clear target and responsibility and it builds a new economic benefit relationship between departments.

SST: Claim Compensation, Claim Payment, Stop!

In order to make the market chain concept work effectively, there is an important method used at Haier, which is referred to as SST. The acronym SST is derived from the sounds of three Chinese words that define how the market chain should work:

- **S (Suo Chou):** Claim for compensation
  If you do your job well, you should claim compensation from the employees after you (your customers downstream in the market chain);

- **S (Suo Pei):** Claim for payment
  If you do not do a good job, the employees after you (your customers downstream in the market chain) should claim payment from you;

- **T (Tiao Zha):**
  If there is neither a claim for compensation nor a claim for payment, the (computer) system will take it as “no record”. This is the so-called Stop! Which means than the immediate downstream process cannot go on. In case of “stop”, the responsible party should pay the claim.

An example of how SST works can be seen in the relationship between the Haier Supply unit and a production unit. If the production unit asks for a certain component to be purchased for its production, and the supply unit delivers the component at a good price, lead-time and quality, it can expect to be paid for this purchase. However if the supply unit fails, it should not expect to be paid, and the customer might even claim some compensation for being unsatisfied. The final decision as to whether or not to pay, however, is up to the customer – and the customer is always right!

The need for “stop” originated from the recognition that the Haier Group had been growing at 80% per year, but that the quality of its human capital had not been

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increasing so fast. So, it needed some sort of standard to monitor the first two Ss in SST. Thus, the rationale behind the T is: “If you don’t meet the standard, it means Stop!” This standard is set by the customers, and if the customer believes that the product or service is not meeting the standard, they can stop the process.

Comments on the Haier case

Haier has made a lot of innovations in supply chain and supply relationship management: Re-engineering processes, supplier optimization, open bidding and multiple supply sourcing, early supplier-involved product design, as well as introducing “market chain” into the supply chain. The question is: Can we compare Haier with Ericsson in their supply and relationship management? The answer is Yes from both Ericsson headquarters in Kista and Ericsson in China. Although Haier and Ericsson belong to different industrial branches and have different technology and products, both are mature industries. As mature industries, they have the same problems of over capacity and decreasing margins. Thus, a common challenge for both Ericsson and Haier is “supply chain competition”.

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6 Fact-Findings and Cross-Case Analysis

This research is case study based, and having adopted the phenomenological paradigm, uses non-quantifying methods (Hussey and Hussey 1977) in the analytical phase (Chapter 6). The analysis starts from fact-finding from the case studies, and leads to the discussion and analysis of questions, which are generated and named by the researcher using a non-quantifying approach by relating the interpretation of the data to comparable themes and/or categories in the supplier relationship literature. The last part of this chapter is an analysis of company characteristics and how different company cultures affect buyer-supplier relationships.

6.1 Structure of the case study

The five cases studied in this chapter are analyzed by regarding cross-case patterns. Each case represents one type of supplier relationship model. Case 1 is a study of Ericsson and its strategic partner relationships, and is the principal case in this research.

As mentioned in Chapter 4, in order to seek new sources of sustainable advantage for survival, Ericsson has built up strategic alliance relationships with four EMSs after outsourcing its production activities. Ericsson and its EMS partners started their strategic relationships with dreams and hopes, as well as compromises from both sides. Like a romance, after several years of married life the honeymoon was just a memory and both Ericsson and its partners experienced problems and conflicts in their relationships, especially after the first 1-2 years of the “honeymoon” periods.

Case 1 started by observing Ericsson’s strategic alliances with its partners, in order to see what problems existed, and the improvements that would be needed for further development.

Following the principle case, several other cases are selected, in order to make comparisons with case 1 as well as to carry out an in-depth analysis. Figure 6-1 is a summary of the case study structure.

<table>
<thead>
<tr>
<th>Case</th>
<th>Objective</th>
<th>Type of relationship</th>
<th>Involvement level</th>
<th>Selected reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ericsson-EMSs Relationships</td>
<td>Strategic alliance: single sourcing, open books and SC control, black box model</td>
<td>High involvement at corporate level</td>
<td>Principal case</td>
</tr>
<tr>
<td>2</td>
<td>Ericsson-CDC Relationship</td>
<td>Collaboration: single sourcing, open books, technical sharing and integration, grey box model</td>
<td>High involvement at product level</td>
<td>Internal Comparison</td>
</tr>
</tbody>
</table>
6.2 Findings and discussions with those concerned

In more than one year of intensive investigation this study has made many in-depth interviews, close observations, and had follow-up meetings with Ericsson and its partners. The investigation has been conducted at both top management levels as well as with key account and project managers: from Ericsson’s Flow Control Center to its Supplier production factories in Sweden and China. It has communicated with people face-to-face, by mail and phone conversations, by checking web information, as well as through repeated interviews.

Based on data collected from Ericsson and its strategic partner supplier relationships, the following problems were found from the current Ericsson – EMS strategic alliances:

1 The new supplier relationship caused by “outsourcing” puzzles Ericsson. Ericsson is used to keeping its production in house, but one consequence of “outsourcing” is that the EMS providers are more and more involved in Ericsson’s supply chain. In this case study, many interviewees from the EMSs, expressed the wish that Ericsson implement “real outsourcing” and thus release control of the EMSs’ downstream supply chain. One strategic partner has clearly shown its ambition of not only being a module producer, but also to start carrying out final product assembly and testing as well. Ericsson’s top and middle supply management wondered if Ericsson would lose its core competence as a consequence of the outsourcing process and, furthermore, that Ericsson might even itself be replaced.

Figure 6-1  The case study structure

<table>
<thead>
<tr>
<th></th>
<th>Ericsson – Kaikai Relationship</th>
<th>Co-operation: Single sourcing, black-box model</th>
<th>Low involvement at corporate level</th>
<th>Internal comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Ericsson's new supplier relationships in RRU project</td>
<td>Collaboration/co-operation: dual sourcing, early involvement, (black + grey) box model</td>
<td>High/low &amp; early involvement at project level</td>
<td>Internal comparison</td>
</tr>
<tr>
<td>5</td>
<td>Haier's supplier chain</td>
<td>Collaboration/co-operation: SC as core competence, re-engineering processes, open-bidding, multi sourcing, early involvement, and market chain concept, (black + grey) box model</td>
<td>High/low &amp; early involvement at corporate level</td>
<td>External comparison</td>
</tr>
</tbody>
</table>
by its partners in the future. As Fahlen comments: “Yes, to be replaced is the intention with outsourcing, but “how” and “how much” is the outsourcing company’s decision”.

2 It is difficult to find common goals for a strategic alliance. Investigations show that two strategic partners often have different business models and inventory turnovers, as well as different cost reduction targets. The result is like the Chinese saying: “without a common goal, one cannot follow the same path”. As one Director of Ericsson JV & Supply in China, comments: “I am not surprised that there are so many conflicts between Ericsson and its strategic partners, as buyers and suppliers often have opposite goals”.

3 Some partners have no driving force for collaborating with buyers, as they cannot find the benefit from the collaboration. In strategic alliances, Ericsson's focus is clearly on cost reduction. As Ericsson expects the strategic alliance to be a mutual open relationship, it requires its partners to “open their books” in order to bring forth a joint effort to reduce costs. As a consequence, Ericsson has nearly all the benefits and advantages when negotiating their purchasing agreements. It appears that the suppliers tend to be reluctant and less interested in such joint collaboration. One question raised here is: What is the driving force for supplier relationship management? Is it cost reduction only, or is it a wider view of competitive advantage enhancement?

4 The “single source policy” puts Ericsson in a dilemma. As Ericsson’s strategic alliances are associated with single sources, Ericsson feels unsure of the monopolistic supplier’s production cost. Data shows that most interviewees from Ericsson express the opinion that the suppliers’ “open books” and “visibility” are particularly important for Ericsson. Thus, Ericsson not only puts a strict “open book” requirement on its strategic partners, but also wants control of their downstream suppliers. The “single source policy” can cause conflicts between Ericsson and its strategic partners. As one of the interviewees from Flextronics says: “This is not real outsourcing, and Ericsson controls us too much”. At the same time, Ericsson faces the risk of discontinued business from its monopolistic suppliers.

From the problems mentioned above, four questions follow:

1 Does “outsourcing” carry with it the risk of the focal company losing core competence?

2 Is it possible to have shared goals between strategic partners?
What is the driving force of supply management? Is it cost reduction, or competitive advantage enhancement?

How does one get away from the “single source” dilemma?

6.2.1 “Outsourcing” and “Core competence”

From the end of 2002, Ericsson has changed its outsourcing structure: They keep a volume production base in-house, and only use contracted “capacity suppliers” (see Figure 6-2) for production above this base. The reason for taking part of the production capacity back is the fear they have of losing their core competence through the outsourcing.

As one vice president of SCM network application, core unit supply & sourcing at Ericsson comments: “It is important for a company to keep to the four “Cs”, i.e. Competence, Competition, Capacity, and Customer ownership. However, Ericsson has lost these 4 “Cs” because of its vertical dividing and outsourcing strategy”. She then continues: “Ericsson takes back assembly and final testing, which are regarded as its “core competences. Module production is outsourced to the EMSs. On the other hand, Ericsson would like to outsource more of its design and technology development”.

![Outsourcing production flexibility](image)

**Figure 6-2** Ericsson new outsourcing strategy (2002)

According to Spekman et al. (2000), outsourcing is a form of supply-based management where the outsourcing organization deliberately rids itself of the assets,
Questions from the case study are: What should be outsourced? Does outsourcing bring with it a risk to the company of its losing core competence? The key to answering these questions is to define what core competence is, and how it is to be distinguished from the non-core activities of the focal company. The following discussions concern this issue:

Discussion 1: “Core business” is a variable concept, and supplier relationships are complicated in real situations. However, “core business” steers supplier relationship types.

Notes from an interview with the Vice President of Ericsson AB for Sourcing Supplier Management

Ericsson classifies its relationships according to “core business”, i.e. if the product/component is Ericsson’s “core business”, we have a close co-operation with the supplier. Otherwise, there is only a little co-operation at interface level, in such things as purchasing and logistic relationships. However, the real situation is more complicated, and we cannot describe Ericsson-supplier relationships using only one model.

1 Ericsson – supplier relationships depend on whether the product concerned belongs to Ericsson’s “core business”, or not:

No – little co-operation at interface level for purchasing & logistics

Core business

Yes

Ericsson owns both design and production

Ericsson designing, testing, and supplier producing

Ericsson – supplier partnership

Cooperating on design, supplier producing

Cooperating on both design & production

2 If one product is identified as Ericsson’s “core activity”, the business concerned can vary as:

Non-core business - as standard component or standard assembly

Integrating Ericsson systems

Testing and service
Each supplier relationship with Ericsson can vary with different products:

- Ericsson's non-core business product, like cabinets - Less co-operation
- Ericsson “core business” product, like enclosure products – close relationship with Ericsson

As an example; the Ericsson – Flextronics relationship varies with different products.

Ericsson’s “core business” product is a timing concept:

- To be considered as Ericsson “core business” now – much co-operation
- Might become non-core activity product, in the future – less co-operation

Discussion 2: Core business Support Company’s version; variations as business environment changes –Notes from an interview with the VP of Ericsson (China) for Joint Venture and Supply:

Today Ericsson's “core business” is still radio technology. In the near future, it might switch to digital technology. Earlier, as we can see, Ericsson’s radio communication system was realized very much by hardware. Now most of these functions can be realized by software. Typical hardware products for Radio Base Station technology, such as MMSs, routers, computers, power modules, cabinets, and cables etc, can today be bought from others or their production outsourced. Ericsson’s “core competence” is to assemble them into system products, and to provide system solutions. In addition we must perform system service at a high profit and be attractive for the market. It is in this way we can secure our future. Therefore, system solutions and service are Ericsson’s “core business”.

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As we can buy many technologies and products today, supply chain management is becoming one of Ericsson’s “core businesses”.

Key points of “core business” and its characteristics are summarized below:
- “Core business” consists all the activities that support the company’s vision.
- “Core business” can be deployed in house as well as be totally or partially “outsourced”.
- The character of the “core business” is continuously changing due to the changing business environment, even though the vision may be the same.

Discussion 3: The Haier concept: “we consider supply chain management and not core technology as our ‘core competence’”.

Learning from Dell Computer, the goal of Haier is to become a service provider instead of a home product producer. An interviewee from Haier says: “In Haier, the concept of core technology ≠ “core competence” is not only talked about by our CEO, but also accepted by Haier people in general. As a mature industry, the hardest competition in the home product area is not so much concerned with having advanced technology, but in meeting customer needs fast and best. Thus, we consider supply chain management as one of our ‘core competences’”.

Discussion 4: “‘Core competence’ can be shared. But, keeping everything in house means no core” - From an interview with Harald Johansen, former VP of Ericsson Production and Purchasing.

Johansen, with 25 years experience of Volvo’s purchasing and supplier management and 5 years in Ericsson’s production and sourcing, gives a concrete comment as to what Volvo’s “core competence” is, in comparison with that of Ericsson and Flextronics. He says:

(1) It is difficult to define what “core competence” is in general. But we can say that Volvo’s “core competence” is “quality + safety”. It is not necessary that a company must own all “core competences” itself. “Core competences” can be shared with others. Yet, it is very important to find a good partner. Volvo has created “safety” as “core competence” through close collaboration with its partner Autoliv. On the other hand, Autoliv could not have succeeded in safety design if it had stayed within Volvo.

(2) In the Ericsson case, we may compare different “core competences” within Ericsson and Flextronics as below:
In general, R&D is Ericsson’s “core competence”. Yet, if we divide R&D into two parts, “R&D on specific innovations” and “R&D in application”, Ericsson is not so good in the latter.

It is better that Flextronics owns purchasing and assembly than that Ericsson keeps everything itself, as these two areas concern mainly mechanical activities. I believe, in principle, that “outsourcing” is more effective than in house production, when it comes to cost reduction. Keeping everything in house means in fact no core! So, I don’t understand why Ericsson is pulling back part of the production from the EMS providers and keeping its “capacity productive base line in house”. If the reason is only one of price control then it is unnecessary, as it is easy to ask for a 3rd party assessment or even to ask other suppliers for a target price.

Discussion 5: An academic version of what “core competence” is – a quotation from “Managing the Global Supply Chain” (Schary & Skjött-Larsen, 2001, P. 57-58):

Core competences drive the enterprise. The concept defines activities that an organization should retain for competitive advantage. They create opportunities for price & profit margins that exceed the market. Other activities should be retained or outsourced depending on the logic of the individual situation and whether the activity in question earns competitive returns.

The core is a shifting target; as competition changes and new technologies emerge, new activities become the core and other activities can be shifted to other partners.

Core and outsourcing are complementary concepts… Outsourcing creates external supply chains.

Schary and Skjött-Larsen clearly describe the concept of “core competence”, its connection with the company’s today and tomorrow, as well as its relationship between “core” and “outsourcing”.

<table>
<thead>
<tr>
<th>Main Activity</th>
<th>Ericsson’s Core Competence</th>
<th>Flextronics’s Core Competence</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;D</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Design</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Purchasing</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Assembly</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Figure 6-3  Different “Core Competence” between Ericsson and Flextronics
As a summary of the above discussion, we conclude: a company’s “core competence” determines the company’s competitive advantage and supplier relationship type. Without understanding this, the company will have difficulties in surviving and competing with others. When the business environment varies, “core competence” might change into no-core competence, and it then is possible to shift the “core competence” to other partners. However, “outsourcing”, as a complementary concept, is like cutting a bit of an apple, but never the core of the apple. In this case, it is clear that Ericsson has had the radio communication systems’ design and production as its “core competence” for a long time. However, as a dynamic concept, this old “core competence” could be replaced by a new one. For instance, systems solution design and supply service might be a new “core” for Ericsson.

6.2.2 Why is it difficult to have common goals in a strategic alliance?

There is a famous Chinese fable:
When a farmer was walking along a frozen path, he found a snake, frozen solid, on the path. The farmer took the snake home and laid him by the fire, and even held him in his arms. When the snake woke up, he immediately bit the farmer’s chest! As the farmer was entering a coma before death, he asked the snake: “why did you do such a thing after I saved your life”? The snake replied: “You knew I was a snake when you helped me”!

This fable tells us that some essential things will never change. As we know the buyer and supplier relationship is basically adversarial, and the question is: is it possible without struggling, to set common goals for a buyer-supplier strategic alliance?

From the “The traditional American Dictionary”, “alliance” has the following meanings:

(1) A close association of nations or other groups, formed to advance common interests or causes;
(2) A formal agreement establishing such an association, especially an international treaty of friendship;
(3) A connection based on kinship, marriage, or common interest; a bond or tie;
(4) A close similarity in nature or type; an affinity;
(5) The act of becoming allied or the condition of being allied.
From the five explanations above, we can see that an alliance may have common interests, but not necessarily a “common goal”.

Figure 6-4  The conflicting goals between buyer & supplier in relationship development

Figure 6-4 illustrates the conflicting goals between buyer & supplier in developing their relationship. A “bottleneck” is created when the buyer has no option for alternative supply. He becomes vulnerable and in the hands of the supplier who has the advantage of a supply monopoly. The buyer, whose business is heavily dependent on this supplier, will seek to reduce risk, and have as a goal to move out of this position and create competition among his suppliers. He might as a first step seek a single source strategic partnership, but then find the supplier meeting this requirement, is only trying to avoid the highly competitive open market by taking advantage of having a monopoly supply position. A better position for the buyer is
to seek more than one supplier and then create a “leverage relationship” where suppliers can be balanced against each other.

Bearing in mind the strategic alliances existing between Ericsson and its EMS’ partners, their respective reactions are not surprising as the strategic partners and Ericsson have conflicting goals with their relationship development.

One in the Ericsson supply management team says: "A supplier and a product provider can never have common goals". However, if we limit this ambition to the project or product level instead of company level, it will be different. According to the “quasi-firm integration” theory from Lamming (1993), it is possible to set common goals for certain special buyer-supplier relationships. Case 4 in this study shows that the project-oriented, quasi-firm relationship offers a common goal for both partners during the project period. Case 2 describes a successful collaboration between Ericsson and Chengdu Cable, where the collaboration is focused on a specific cable product and not on company level.

6.2.3 The relationship’s driving force: Cost reduction or creating competitive advantage?

A traditional buyer-supplier relationship would consider cost reduction, as a driving force while a more “enlightened” view would also deem gaining competitive advantage as very important. The two ways of driving supplier relationships show different results in the case studies. In Ericsson’s relationship with Flextronics, Ericsson is too eager to reduce cost through joint efforts with Flextronics, and neglects the “win-win” thinking. “This is the biggest challenge in building successful buyer-supplier relationship management” (Christopher, 1998). The result of too much cost reduction focus may lead to: (1) Flextronics becoming averse to collaborating with Ericsson; (2) A chain reaction occurring when, as Ericsson pushes Flextronics too much on cost, Flextronics (or other Ericsson’s 1st tier suppliers) put the same pressure on its downstream suppliers. This might result in the last supplier in the supply chain breaking down, and then the whole supply chain will fail in competition with others.

As in the game of the prisoners’ dilemma, the two important considerations are:

(1) Teams will collaborate if they know that the payoff will give them advantage;
(2) They will compete when and if they believe they can gain advantage from doing so.

Case 2, concerning the collaboration of Ericsson and Chendu Cable on the cable product is an example of “win-win” thinking, and uses enhanced competitive advantage as the driving force. As a result of the collaboration Ericsson acquired lower cable price and flexible local delivery, and CDC, as the local supplier, has learnt cable production technique from Ericsson and reduced its cable production.
costs. Thus, both partners enhanced their competitive advantage and are better off as a result of the collaboration.

So, cost reduction and enhancing competitive advantage represents the two extremes of supplier management. The more traditional view of cost reduction driving supplier management is a narrow view, and may bring short-term benefits. However, with competitive advantage enhancement driving supplier relationship management, we have a more enlightened view, which will bring self-driving motivation and a long-term positive impact on the whole supply chain.

Focus on cost reduction only, will hinder a buyer-supplier relationship on its journey towards a “win-win” situation. Whereas enhancing competitive advantage will, as well as in all probability include cost reductions, convey skills and expertise to one’s suppliers through the relationship. It is a sensible way to create “win-win” relationship management in order to reach the primary goal of supply chain management: 1+1 >2.

6.2 “The single sourcing dilemma”

In order to control purchase prices, Ericsson has required its single source strategic partners to open their books. As well as this it has also tried to control the partner’s suppliers. However, no supplier is willing to play with entirely open books. Several of the interviewed EMS suppliers complained about Ericsson controlling their suppliers too much. As Flextronics maintains: “If Ericsson executed less control of Flextronics and its suppliers, it would contribute more to the whole supply chain performance.”

At the same time, as a result of its “single sourcing” policy, Ericsson is more and more dependent on its single suppliers. This “single sourcing” might entail risks for the buyer, leading finally to a total loss of buyer power.

The dilemma for Ericsson is: As a prerequisite for the strategic partnerships, Ericsson has linked each product family with one single EMS provider. From the Ericsson point of view, it is a sign of “trust” for its single partner, and should thus motivate reductions in supply handling costs. Yet, it is this “single sourcing” policy that results in the requirement for “fully open books” and a hard cost reduction drive from Ericsson; the “single source” suppliers feel mistrustful and react by being more and more reluctant to participate in joint common efforts and collaboration, at the same time knowing they can rely on the power of their monopolistic sourcing positions.

“Multiple sourcing” reduces dependency on individual suppliers, and limits the risk of discontinuity of supply. Furthermore, “multi-sourcing” promotes competition and stimulates suppliers to reduce their product cost through their own motivation. Finally, the buyer will get benefit from the supplier’s cost reduction, as the buyer can use its buyer power to lever supplier relationships with variable purchasing volume and price between different suppliers. Figure 6-5 and 6-6 illustrate the
supplier’s cost reduction driving force in the different situations of “single sourcing” and “multiple sourcing”.

Figure 6-4 shows, in a “single sourcing” situation, how the supplier's cost reduction happens only when the buyer pushes it directly. The supplier has no motivation itself, but only external pressure from the buyer – The single supplier feels: "I was forced by our buyer to lower the price, and my customer has stolen money from my pocket!"

![Figure 6-5](image)

Figure 6- 5 Single source cost reduction pushed directly by buyer

Figure 6-6 describes the “dual sourcing” situation. The driving force of cost reduction comes from internal motivation due to open market competition, as the buyer can easily shift orders between different suppliers – The supplier changes its attitude: "I want to be a winner in the competition!" In an open market situation, if product quality and other conditions are the same, price becomes the key for competition. Figure 6-5 shows that supplier A is a loser in time point 1 due to a higher price than that which supplier B offers. And it becomes a winner in time point 2, as its price is lower than its competitor’s at this moment.

Thus “dual” or “multiple sourcing” with open competition will effectively resolve the “single sourcing” dilemma and stimulate the supplier's self driving-force for cost and price reductions. As the buyer can use purchasing to lever supplier relations, it will avoid the risk of losing control of the supply chain. The Haier case, with its “triple sourcing policy and open bidding via Internet gives a good enlightened example of sourcing management.

However, in answer to the question of why Ericsson does not use “dual sourcing”, a Director of Ericsson Sourcing & Localization in Nanjing says: “It is difficult to
have “dual sourcing” for some components with high tooling investment and long payback periods, as it would increase our supply handling costs.”

<table>
<thead>
<tr>
<th>Supplier A</th>
<th>Supplier B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 6-6 The suppliers reduce price by own driving force due to open competition

Concerning Ericsson’s “single sourcing policy”, different single suppliers make different comments:

Comment 1: “We are happy if Ericsson chooses “dual sourcing”, because we believe that we are the best” – from an interview with Emerson.

Comment 2: “Ericsson’s “dual sourcing” will just waste resources and investment, as double sourcing cannot give Ericsson double safety. It is better for Ericsson to have a “single sourcing policy” “ – from an interview with Flextronics.

To summarize, it is not surprising that suppliers have different opinions concerning a “single sourcing policy”. The most important thing for Ericsson is to understand the following fact: “Single sourcing” not only results in conflicts between Ericsson and the supplier, but it also puts Ericsson in a “win-lose” relationship in the long-term. However, a flexible sourcing policy can be used, as the RRU project has successfully demonstrated, depending on different business situations and timing.

6.2.5 Summary of the discussion

Reflecting on the above discussion, one conclusion is: Ericsson exaggerates the close supplier relationship, particularly its strategic alliances with the EMS providers. It is this over-close relationship that creates a series of problems for Ericsson, such as fear of losing “core competence”, missing common goals, conflicts in cost reduction, as well the single sourcing dilemma.
It is clear from the literature that firms consider the relationship aspect important, but the case examples show it is often disconnected from the output that the firm may expect. The key issue is to choose the appropriate relationship to deliver the desired output (Cousins, 2001). Thus, relationships between companies should be connected to business driven projects and not to the idea that, "we’ve found the right partner for ever". The overall goal is to develop such relationships.

One Ericsson manager says: “It is not just Ericsson, but we are perhaps worse than others. Once we’ve started to go in a particular direction, we always try to do it in a perfect way and therefore the relationships tend to become “exaggerated” … The risk is that a “win-win” relationship might become a “win-lose” relationship someday - our partner will become a ‘snake’ and bite us”.

A vice president of Core Unit Supply & Sourcing, Ericsson who had previously had more than 10 years experience in Electrolux supply sourcing management, makes the following comments on Ericsson’s strategic alliances with its EMSs:

"We need to move out from the current situation. Relationships with our EMSs should move to “leverage”, and the co-operation with our unique technical designer should become “strategic partnership” ".

Although literature tends to show close relationships to suppliers as being the superior strategy for making the most of supplier relationships, this case study argues that a close relationship is not always the best one. As increasing supplier relationship involvement can increase conflict, it may become necessary to reduce the degree of relationship (Gadde & Snehota, 2000).

On the other hand, the initial case study also shows different types of supplier relationships co-existing within one and the same company. Case 3, concerning the Ericsson - Kaikai co-operation for site products shows that a non-close supplier relationship is a viable option. And the external case of Haier’s supplier relationships illustrates the fact that high and low supplier performance varies with different suppliers and timing. Case 2 and Case 4 suggests that supplier relationship involvement in the project and at the product level is effective for close collaboration. An interview with Ericsson’s top supply management reveals that supplier relationships vary according to a product’s life cycle time (see Figure 6-7).
Figure 6-7 Product maturity and Supply chain management

Figure 6-7 shows that when a product reaches the mature phase, production capacity goes up more than market demand. Competition concerning the product’s quality, lead-time and price in this mature period is more ruthless than in the product’s transition period. Thus, supply chain management becomes an extremely important factor for a company wanting its mature products to survive in this tough market competition. It is also the time, as the figure shows, to have a new product structure, either up to the top, or dead-value.

6.3 Company characteristics: cultural differences between Ericsson, Volvo, Flextronics, and Haier

Cultural differences between Ericsson and Volvo

How does different company cultures affect different supplier relationships and the focal company’s supply chain management? This research has focused on two focal companies: Volvo in the study in part one and Ericsson in part two. Following is an
analysis of cultural differences between these two companies, and their influence on the respective companies’ supplier relationships.

Johansen, with his 30 years management experience in purchasing and production for both Volvo and Ericsson, makes the following comments:

1 “Inward” and “Outward” culture
   “As a gigantic international company, Ericsson is used to owning the whole business process itself from design to production in house. Ericsson’s culture is mainly an inward one. Volvo, being a smaller international company, usually owns the main product design and assembly, but keeps more outward communication and contacts. It is used to relying on a good common sense commitment with its external suppliers. In comparison, Ericsson focuses more on internal relationships and communications between them, as the company has overlapping internal organizations and confused internal relationships. Figure 6-8 shows the essential cultural difference between the two companies.”

   Figure 6-8 Ericsson’s inward culture and Volvo’s outward culture

2 “Outsourcing” changes company relationships from “intra-firm” to “inter-firm” There are three factors that are essential to ensure a successful “outsourcing”: The work process, the relationship and trust. Volvo has a clearer picture of work processes, relationships and confidence between itself and its suppliers. Whereas Ericsson, very often after outsourcing, transfers the original work processes onto its suppliers. This, of course, creates problems of relationship and trust between Ericsson and its outsourced partners.

Two reasons may explain outsourcing failure: choosing the wrong co-operative partner, or failing to manage the three essentials; work
process, relationship and trust. It is possible that Ericsson has failed in the latter.

Ericsson should let the EMSs define their own work processes. It should then think about how to enter and exit relationships with its OEM suppliers. Finally, it should trust its EMS partners, and have only indirect relationships with the EMS’s own suppliers through the supply chain - let EMS providers themselves choose their suppliers.”

Regarding purchasing competence, the differences between Ericsson and Volvo are shown in Figure 6-9:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Ericsson</th>
<th>Volvo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial: Development and negotiation</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Technique: Value-based quality and cost</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>In-bound logistics: Supply chain management</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

Figure 6-9 Purchasing competence comparisons between Ericsson and Volvo

“There are two ways for a focal company to manage its supplier relationships: either by direct control or by indirect support through the supply chain.”

Indirect support through the chain

Direct control

Figure 6-10 Different ways of managing supplier relationships

“It is very important that the focal company supports and helps its suppliers indirectly through the supply chain, instead of controlling
them directly. Volvo is good at supporting suppliers at different levels through the supply chain. On the other hand, Ericsson prefers direct control of its suppliers in the different tiers. This is partly due to its company culture background (Figure 6-10).

Cultural differences between Ericsson and Flextronics

In this case study, a lot of facts reflect the different cultural backgrounds between the buyer and its suppliers affecting the relationship development. Ericsson and Flextronics, as one pair of strategic partners in the supply chain, have quite different company cultures. Figure 6-11 summarizes the company culture comparison between Ericsson and Flextronics:

<table>
<thead>
<tr>
<th>Item</th>
<th>Ericsson</th>
<th>Flextronics</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural style</td>
<td>European culture: people oriented</td>
<td>American culture: Business oriented and result driven</td>
<td></td>
</tr>
<tr>
<td></td>
<td>relationship driven</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization structure</td>
<td>The middle level is difficult to penetrate</td>
<td>The middle level is easy to penetrate</td>
<td>See Figure 6-13</td>
</tr>
<tr>
<td>Organization chart</td>
<td>Hierarchy: deep, multi-dimensional, complex</td>
<td>Flatter</td>
<td></td>
</tr>
<tr>
<td>Culture focus</td>
<td>Inward culture</td>
<td>Outward culture</td>
<td></td>
</tr>
<tr>
<td>Decision making</td>
<td>Compromised decision making</td>
<td>Very quick decision making</td>
<td></td>
</tr>
<tr>
<td>Business culture</td>
<td>Discussion even after decision</td>
<td>Discussion only before decision.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hard to let decisions take effect</td>
<td>Loyalty to decisions</td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>Slow</td>
<td>Fast</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6-11 shows a comparison of the different cultures within Ericsson and Flextronics.

A normal company’s organization structure is as Figure 6-12.
From the case study, several interviews from different suppliers expressed the opinion that Ericsson’s middle management level is very difficult to penetrate (Figure 6-13).

Figure 6-12 A company’s organization structure

Figure 6-13 Different degrees of penetration between the two companies
Cultural differences between Ericsson and Haier

The Ericsson culture is technology-oriented. A good example taken from Ericsson in Hong Kong: One day, a telecom systems operator in Hong Kong invited several telecom system suppliers to a meeting. The customer said: “We have only one conference room. It is about 200 m². Can you arrange a WCDMA system demo for us in this site?” The Ericsson participant answered immediately: “Oh no, it is absolutely impossible to make a demo in such a small place. To meet our Ericsson standard, a WCDMA demo requires a site of not less than 1560 m²”. However, the Nokia participant responded: “Why yes, Sir! No problems, we can manage it for you!” Of course, Nokia was chosen by the operator. Finally, after the other suppliers had left, the customer told the Nokia participant with a smile: “Please don’t worry, our demo site is in fact more then 1560 m² - today was just a test to see how much our suppliers listen to us and design the supply chain according to market demand”.

From this case we can see that Nokia is very good at adapting to customer demands and the local market situation. On the other hand, Ericsson is still very much a technology-focused company. A customer in China says: “Ericsson, like a car salesman, tries hard to sell its ‘Mercedes Benz’ to us. However, what we want to buy is just a ‘Volkswagen’”.

Business culture in Haier is very much market-orientated. One important Haier philosophy is “making by order” and even “making by customer design”. Haier people believe: “Producing products with no order is just making storage”. A customer once ordered via Internet a special refrigerator with the door opening to the left. A 7-day delivery time was requested. After one week, the customer received the ordered product at his home, complete with left opening door – even though Haier had never produced such a refrigerator before.

Another difference between the Ericsson and Haier cultures is shown in the companies’ organizational structure. From interviews, it can be seen that suppliers often grumble about the difficulties in finding the “right” contact person in Ericsson, due to its complex hierarchical matrix structure. It also takes a long time for feedback from Ericsson to reach the suppliers. E.g., to get approval for a new supplier or a new component one can wait anything from 6 months to a year. Whereas Haier’s organizational structure, after the re-engineering process, is a “flat” process structure. An important concept in Haier is “zero management level”. It means zero distance for information transfer from the customer to Haier, and zero distance for information transfer between departments within Haier.

An example of Haier’s quick response to customer demand is given below: one afternoon, it was the Haier Group managers meeting. Michael, President of Haier in America, mentioned that one of Haier’s chest freezers was found by one of his American customers to be too deep to put in and take out food. He wondered if Haier could design a new style freezer with a half chest and a half drawer in the bottom. Early the following morning, Michael was surprised to receive in his e-mail a new product design based on his suggestion. After having made a new comment on the design of the handle, Michael got an improved product design named...
“Michael” - The whole process, from suggestion to the finish of a new design, took less than 24 hours! As a result, Haier sales of the improved freezer increased by 10% on the American market!

### 6.4 Case Summary

Summarizing the above discussion, the answers to the questions raised in chapter 6.2 are:

1. In determining if “outsourcing” will strengthen or weaken “core competence”, the key for a focal company is to identify its “core competence” and handle the outsourcing process accordingly, concentrating on the three essentials: process, relationship and trust.

2. Two independent companies being buyer and supplier to each other never have, as a matter of principle, common goals. It is not surprising that strategic alliance practices are difficult to implement. However, for supply chain management, the buyer and supplier must, at the very least, exist on a certain level of consensus to forge a common view. The case study argues that when a relationship is on a project or product orientated level, the buyer and supplier can have a shared perspective in which both partners can accomplish compatible goals under certain business conditions and with the right timing.

3. A supplier relationship management driven by competitive advantage enhancement is a more enlightened relationship than one driven by cost-reduction. It brings a self-driving motivation, and with it a long-term positive impact on the whole of the supply chain.

4. A flexible multiple sourcing policy can resolve “the single sourcing dilemma” and stimulate the supplier's own driving-force for cost reduction through open competition. As a focal company can use buyer's power to shift orders between suppliers, it can avoid the risk of “win-lose” endemic in the “single sourcing” situation and promote a “win-win” relationship in the long term.

5. A good understanding of company cultural differences and cultural interaction has a positive effect on supply relationship development. Learning from each other through relationships can help both partners to see their own weakness and thus make improvements through competition and co-operation.
7 Theory Building and Conclusion

7.1 Conclusions from the case studies

A number of conclusions can be drawn from this study. It is apparent from these findings that although much of the literature espouses the advantages of resource creation through supply chain integration and praises the benefits of close collaboration through e.g. strategic alliance, this empirical investigation of buyer-supplier relationships in the telecom industry argues that no general "best" kind of relationship exists in real industrial life. It is more important for a company to choose the most appropriate relationship applicable to each individual supplier depending on business situation and timing. The conclusions from the case studies are briefly summarized below:

1. The most suitable supplier relationship differs for different products. This relationship depends on the degree of business importance and the complexity of the supply market
2. Supplier relationships change with product life cycle timing
3. A project or product-oriented relationship is recommended.

7.2 A dynamic customer-supplier relationship model based on the research

The essence of this study is to build a normative decision-making theory for a focal company’s selection of the most appropriate buyer-supplier relationship in different business conditions. The new theory is explicitly based on five supplier relationship cases in mature infrastructure industries, focusing on one mobile communication system producer and its supplier relationship management. Following the logic of inductive reasoning, it is hypothesized that this theory is applicable to the specific business environment of a focal company being a buyer, and to its supplier relationships for innovative and high-tech products in general.

The supplier relationship can be described using two different models as follows:

Model one: For different products, relationship strategy varies with the respective product's "business importance" and "complexity of the supply market" - A buyer-supplier relationship model for different products in different business situations is concluded from the study (Figure 7-1)
Figure 7-1 Relationship strategies for different products in different situations

The first model specifies a two-dimensional input for the strategic level rules to be followed for the selection of appropriate supplier relationships, according to the products' relative degrees of strategic importance (as listed below) for the focal company:

- Key to “core business”
- Time sensitivity
- Cost impact
- Core competence

These suitable supplier relationships vary from strategic partnership to leverage relationship and open-market relationship.

However, the complexity of the supply market has an important impact on what kind of relationship is most appropriate. The resulting model (Figure 7-1), suggests that the most ideal supplier relationship is selected from the combination of the particular product's strategic importance and the complexity of its sourcing conditions:
When the product is highly strategic and the market is less complex, there is no need for a strategic partnership. Here the focal company should choose a “leverage relationship” giving it the opportunity to lever by using buyer power.

Model two: For a particular product, the appropriate relationship strategy varies with the product life-cycle timing - A dynamic buyer-supplier relationship model is built from the research, proposing different relationships to be applied in different periods of the product’s life cycle (Figure 7-2)

**Relationship Strategies for a Product in Different Product Life Cycle Timing**

![Relationship Strategies Diagram](image)

Figure 7-2 Relationship strategies vary with different product life cycle timing
This second model argues that the supplier relationship varies with the product maturity process. When the product is in its innovation phase, it is wise to build a strategic relationship with a single supplier in order to collaborate on the product design and development; a “grey box” relationship is adequate in this period. When the product comes to the “transition” phase, as it matures, a “co-operative leverage” relationship is recommended for the production process. Applying the leverage relationship, the focal company can lever different suppliers (using at least “dual sourcing”) for price and volume. This relationship type can not only avoid the “single sourcing dilemma”, but also gain cost reduction benefit through open competition among the suppliers. When the product becomes “mature” both “business importance” and “complexity of the supply market” is low; here a non-close relationship type such as “open market” or “open box” is appropriate. This dynamic model is illustrated in Figure 7-2.

In order to change a supplier relationship from “strategic partnership” to “leverage relationship” smoothly, the “black+ grey box” model is recommended in certain business situations, i.e., if the buyer owns the product IPR, it will be easier to shift the supplier relationship from “strategic partner” to “leverage” and from “single sourcing” to “dual sourcing”, as well as “multi-sourcing”.

There is a need for further definition of the underlying prerequisites for applying the above models - As the buyer and supplier have, in fact, diverging motivations and goals, it is not surprising that the company level strategic relationship between Ericsson and its EMS’ providers is quite disharmonious. However, project or product orientated co-operation has proven to be a good way to avoid conflicts in a close collaboration between two companies. Thus, a project/ product-oriented, quasi-firm relationship model is to be recommended whenever a buyer and supplier become involved in a relationship other than an open market one, especially where close collaboration is required.

Thus, to apply the buyer-supplier relationship models built from these empirical case studies, it is a prerequisite that the focus is placed on a specific project, product or service. The models apply to dynamic processes, not to interacting company organizations in general!

### 7.3 Implications and contributions for practitioners

As a case study, the basic goals are to make a contribution both to practical business and the academic community. Based on considerations of the case study in Chapter 4, there are several selected central points for the focal company's business.

One general word of advice is that Ericsson needs to change its management concept and move towards more effective supplier relationships. Traditional knowledge of the cost savings associated with efficient buying, close relationships with single sourcing, and lower purchasing costs through open book pressure is, on its own, not an adequate measure of good supply chain management. To focus solely on cost saving and to make a binding relationship with one supplier, the case study
argues, falls short of excellence in sourcing and supplier management and generates more conflicts in the long-term. It is a changed concept of management that could help Ericsson resolve the problems mentioned above, these being: risk of losing “core competence”, being in a “win-lose” relationship, lacking the common goals and the driving force of strategic alliance, as well as having to deal with “the single sourcing dilemma”. To summarize, Ericsson should consider changing its supplier relationship management in the following ways:

1. Using “outsourcing” as a strategic decision rather than a tactical solution - While it was lacking the necessary cash flow due to over capacity, and margins were decreasing as a result of market pressure, Ericsson made its outsourcing decision in a hurry. Before the decision making, it had no clear strategic assessment of the question, “why outsourcing”? After selling most of its factories, the cost saving effect was not as good as expected. At the same time, Ericsson felt it risked losing core competence. Thus, Ericsson pulled back part of its production to in house manufacture. The situation is, as the Chinese saying: “you can’t just treat your foot alone when it is aching”. “Outsourcing” is a strategic decision but not a tactical solution. It is important to have a strategic assessment for top management in order to be able to answer the question, “why outsourcing?”

2. It is then important to identify and describe what “core competence” is, in order to know “how?” and “how much?” to outsource. As we have discussed above, it is only then the risk of losing your “core competence” can be avoided.

3. Changing from a “monopolistic single sourcing” to a “multiple sourcing” policy: In today’s industrial society, “multi-sourcing” is the general trend in supplier relationships. It is time for Ericsson to come out of its box. Under multiple sourcing conditions, suppliers motivate cost reduction by open competition instead of by direct pressure from the buyer. Furthermore, the buyer can gain the benefits of cost reduction through leveraging adjustment of the volume and price between multi-suppliers. Although “multi-sourcing” might increase the handling cost for some special products, case 4 of the RRU project in Ericsson has revealed: for a product with a high handling cost but a long pay back period, it is reasonable to start with “single sourcing” for the product design, and then pay both the IPR (Intelligent Property Right) and production cost to the supplier. As Ericsson is the owner of the IPR, it is easy enough should Ericsson want to change the sourcing from single to multiple. This case shows us how we can benefit from “outsourcing” and, at the same time, avoid the risk of “single sourcing”.

4. The driving force of the relationship should be changed from one of cost reduction to one of competitive advantage enhancement. The
reasons for this are that cost reduction driving tends not to embody a “win-win” relationship, and “open book” is not realistic in the real industrial society. Thus, it is more “enlightened” to drive the supplier relationship with competitive advantage enhancement and so create more trust, learning and benefits for both partners through the new relationship.

5 Moving the current strategic alliance with the EMSs to co-operative leverage relationships: Combining model one and model 2, we can see that Ericsson’s focus on a close relationship with its EMSs is exaggerated. If the current EMS relationships with Ericsson involve only the production process, there is no need for Ericsson to bind itself to its EMS providers as strategic partners. High integration and close collaboration increase conflicts between buyer and supplier. The buyer should choose co-operation or open-market relationships with suppliers as much as it can, in order to avoid these unnecessary conflicts.

6 Changing the supplier relationship from a static model to a dynamic one: as model 2 argues, it is not wise to rely permanently on a fixed relationship with one supplier. The relationship ought to change with the product maturity process. Traditional long-term relationships should be replaced by flexible and changing ones.

7.4 Implications and contributions for researchers

Following the literature review and the empirical case studies, the key research questions presented at the beginning of Chapter 1 are answered and summarized below:

1 There are different types of customer-supplier relationships classified in the supply chain management theory. Spekman et al. (1998) shows a brief picture of the key transition from open-market negotiations to collaboration, which include (1) open-market negotiation, (2) co-operation, (3) coordination, (4) collaboration. However, Spekman classifies only relationship types without any analysis of why relationships change and how they are selected. Testing Spekman’s classification theory in reality shows that it is difficult to distinguish between “co-operation” and “co-ordination” as these two relationships have no clear definition or border.

Cox (1996) classifies a stepladder of external and internal contractual relationships as consisting five different levels: (1) arms-length partnership, (2) preferred supplier, (3) single sourcing, (4) network sourcing, (5) strategic alliance. The relationship varies with the relative degree of strategic importance and asset specificity. Cox
studies a one-dimensional model of “relationships and “asset specificity, and argues that relationships vary with the relative degree of strategic importance to “core competence”. Yet, relationship selection is not only dependent upon the relative importance of “core competence”, but also very much on the “complexity of the supply market” Thus, a one-dimensional relationship model is not enough when choosing an appropriate relationship type in a real industrial society.

The case study examines several buyer-supplier relationships used in reality: strategic alliance, collaboration, single sourcing, and cooperation. Alternative relationship types currently in use in reality are more complex and flexible than those viewed academically. They depend upon top management strategic decisions, business situations, risks and opportunities, as well as upon company culture.

Kraljic’s sourcing management model seems to be the most usable for supplier relationship management in industry. However, two weaknesses are found in Kraljic’s model: (1) The model is too complex to use; (2) Being a static model, it lacks a dynamic view.

In order to create the most appropriate supplier relationship model for a focal (buyer) company, some important conclusions from this study are given below:

(1) For different products, supplier relationships vary with “business importance and “complexity of the supply market” - a strategic buyer-supplier relationship is drawn from the study.

(2) For a product, supplier relationship strategies vary with the product life-cycle timing - a two-dimensional dynamic supplier relationship model is built from the case study.

An important underlying pre-condition for applying the most appropriate relationship model is expressed here: The relationship model is focused on a specifically defined project or individual product or service; It is a dynamic process. It does not relate to a company organization from a traditional point of view.

7.5 Limitations and further research

This case study has involved more than ten different suppliers from four countries and four global companies. It is nevertheless an inadequate basis upon which to consider the outcomes in general. This is so, notwithstanding the complexities of the circumstances and relationships. It is a single, but nevertheless “rich” case setting.

These models are supposed to evaluate supplier relationship management for Ericsson and similar companies. This theory is quite new and can probably be of
some benefit as an evaluation tool. As such, I believe that the coupling between theory and real life must be confronted and conclusions drawn.

This thesis has a new theory building case study approach. Therefore, the research results are only valid within the case study settings. The model is not complete, given that it is bounded both by the case data and the unit of analysis. The theory is therefore a necessary but not sufficient condition for action. In both cases, it represents opportunities for further testing and research. The next step would be to verify the research results with extensive research materials and broader industrial areas. Two interest areas are listed as further study directions:

1. A case study investigates the most appropriate buyer-supplier relationships in different business conditions, when the focal company acts as a systems supplier.

2. Test to see if the buyer-supplier relationship models are suitable for other mature industries in general.
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