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Outsourcing of Typebound Packagings at VCC – A Viable Option?

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ABSTRACT

The car industry is today characterised by low increase in demand and problems with over-capacity, and globalisation drives the companies to take various measures in order to remain competitive. Cost cutting, rationalisation and increased efficiency is greatly sought after in order to lower the ever increasing development costs as much as possible.

One of the most common measures taken has been to focus more upon the company's core competencies and cutting-edge activities by outsourcing functions that are viewed as being just peripheral or supportive for its operations. The result of this is that more and more activities and functions that were previously managed in-house, is now bought from external service providers. One of the areas that have been subject for outsourcing at VCC is the development and ownership of Typebound packagings – packaging devices that are uniquely constructed according to the components they are to carry into the Trim and Final Assembly Plant.

We have been asked by Volvo to look at current packaging strategies and the possibility to outsource the development, responsibilities and ownership related to Typebound packagings.

What is important is that VCC has to get something in return when deciding to outsource this. We have concluded that there are many more issues than just costs that have to be taken into account. Efficiency gains, partnership potentials, operational complexity, and last but not least future strategic fit are highly important aspects when considering entering a venture like this. The question is if this venture won't just lead to higher cost in the long term, and also without actually generating any greater benefits to VCC.

Key Words: outsourcing, core competence, packaging strategies, typebound packagings, investment, partnerships, future strategic fit

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We also would like to thank all the people at Material Planning & Logistics (MP&L) and other business units who allowed us to make interviews with them. Without your knowledge and help, this research wouldn't have been possible to carry out. Again, many thanks for your willingness to give us your time. In addition, we also would like to thank Marie Carlsson, Ingemar Björck and Helena Sundberg at Emballage Poolen, VLC, for the valuable input they gave us regarding the topic. Furthermore we have to thank all those article suppliers and packaging manufacturers that agreed to answer the many questions we had for them, especially Patrick Hugenholtz, Managing Director at Conteyor. A final thanks goes to our supervisor at Handelshögskolan, Peter Rosén, for providing us with directions and ideas of how to carry out the research.

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List of Abbreviations

BMS	: Business Management System
CIR	: Capacity Increase Request
EDI	: Electronic Data Interchange
EPP	: Expanded Polypropylene
EPS	: Expanded Polystyrene
FMC	: Ford Motor Company
FM&SP	: Facilities Materials & Service Purchasing
KU	: Konstruktions Uppdragsgivare
MP&L	: Materials Planning & Logistics
OEM	: Original Equipment Manufacturers
OtD	: Order to Delivery
P1	: Car Platform 1
P11	: Sedan model
P12	: Sports wagon model
P2	: Car Platform 2
P23	: S80
P24	: S60
P26E	: V70
P26L	: XC70
P28	: XC90
PA	: Packaging Administration
PAG	: Premier Automotive Group
PCR	: Product Change Request
PD	: Product Development
Plant A	: Body Shop
Plant B	: Paint Shop
Plant C	: Trim and Final Assembly Plant
PMR	: Packaging Material Receipt/Delivery Note
PO	: Purchase Order
RFQ	: Request For Quotation
SMF	: Synchronised Material Flow
SOP	: Start of Production
TB	: Typebound Packaging
TIKO	: Volvo's computer based purchasing system (Time/Cost)
UPP	: Now called R&D (Research & Development)
VCC	: Volvo Car Corporation
VCG	: Volvo Cars Ghent
VCT	: Volvo Cars Torslanda
VCU	: Volvo Cars Uddevalla
VLC	: Volvo Logistics Corporation
VMC	: Virtual Manufacturing Centre
3D	: Three dimensional construction

List of Figures, Tables & Appendices

List of Figures

List of Tables

Appendices

1 Introduction

1.1 Background

Approximately 25 years ago, the term outsourcing was given attention by corporations in most of the world's modern economies, with reduced costs being the driving force behind it. Firms have, during the largest part of the 20th century, aspired to gain total control over their assets, distribution channels and other vital resources, and the self-sufficient company was seen as the ideal. This was due to the perception that every firm's real value existed in the management mechanism which controlled the entire production process, i.e., the transformation of raw materials into finished products which could then be directly capitalised in the market.

The past three decades have been characterised by changes in trade and competition, which have placed increased pressures and demands upon the general industry as a whole. Low-cost regions such as South-East Asia and South/Latin America made a rather rapid entry into the global market, and pounded them and their consumers with cheap, mass-produced merchandise. By this, competition tightened and ever-increasing demands were put on better quality, shorter lead-times and lower prices. In order for the companies in the Western World to live up, and to adapt, to these increasing demands, focus had to be shifted from production to market orientation.

This is the reason why there has for several years been a prevailing trend that manufacturing companies focus their operations on their core activities and competencies, and outsource some of their other activities, such as logistics operations, to third parties. As a result of the implementation of these strategies, the need for co-operation between companies has also increased.

In today's' car industry, the global competition is immense. This industry is characterised by a low increase in demand and a high over-capacity. One of the reasons that the car manufacturers become global actors is that they have to establish themselves in growing markets such as Asia and South America. As global actors, these companies can lower their costs and increase their

efficiency by selling a product to different markets basically standardised but externally very differentiated. Thus, to maintain demand for the companies' products, a decisive factor has been to rapidly and frequently be able to introduce new models and variants. This has resulted in rather high development costs, which can be seen as one of the major reasons why outsourcing in recent years has played a major role for car manufacturing companies.

The high competitive pressure has forced the car industry to use all means possible in order to increase production efficiency in terms of rationalisation, implementation of new and flexible production concepts, and a higher degree of specialisation. At the same time as the companies have rationalised the product through an increase in standardisation, the hardening competition put demands on the diversification through an increase in customer adaptation. The higher degree of specialisation results in that companies, to a greater extent, concentrate on what they internally define as their core competence.

The result of this is that more of the activities and knowledge that was previously managed in-house is now bought from external suppliers. In other words, production and services are outsourced.

At Volvo Car Corporation (VCC), this outsourcing process has been evident in many fields for the last decade. Cleaning services, parts of the payroll functions and facilities maintenance are some of the areas that are now being managed by external service providers. However, peripheral functions such as these are not the only ones that are or have been considered for outsourcing. Now, activities closer to VCC's core competence – which is to develop, design and to manufacture cars – are becoming candidates for this process as well.

One of these areas is part of the inbound logistics function. Volvo Logistics Corporation (VLC) is today a separate company as a result of Ford's takeover of VCC from the Volvo Group. However, VLC, formerly named Volvo Transport, continues to handle and coordinate all the transport-assignments ordered by VCC. All Standard Packagings, which is one of the two packaging groups utilised by VCC, are also provided by VLC. Standard Packagings are

packaging devices used for an array of products and components that are to be assembled onto the cars produced in the Trim and Final Assembly Plant at VCC. Volvo pallets and various dimensions of plastic boxes are examples of these Standard Packagings. VLC's Emballage Pool administers the storage and allocation of these packagings.

What we are to investigate is the second group of packagings used by VCC, the special packagings - also called Typebound (TB) Packaging. These TB packagings are specifically designed and used for carrying a specific component or article that is needed at the assembly line. In other words, they cannot be used for any other purposes than carrying the specific article they are designed for. These TB packagings are now also seen as a subject for outsourcing in one way or another. For the car platform in current production, P2, most TB packagings are VCC-owned. A strategic decision was then made for the new platform P1 that goes into production in 2004. This implied that along with the purchased components and articles from the Article suppliers, the development of TB packaging should be the Article suppliers' responsibility as well. In other words, that the supplier of a component would also provide the packaging of it, and that this should be added and included in the article price.

It is, however, not yet clear what the outcome of this will precisely look like in terms of total costs.

Since the development process of new car models and platforms start many years before start of production (SOP), the future proceedings related to the platform coming after P1 are not yet fully defined. The question of having a different system and owner/responsibility structure for TB packagings than the ones existing for P2 and P1, has been generally discussed at the Purchasing and Logistics functions at VCC. Some kind of external service provider arrangement has served as a starting point for the ideas surrounding these discussions.

The question is what these potential service provider arrangements would look like. What are the impacts upon the organisation such a strategic shift would

imply? What changes and actions are needed to be carried out within VCC in order to develop a viable option to existing practices?

1.2 Problem Definition

The process of developing, constructing and administering the TB packagings is both very costly as well as extremely complex. Volvo would like to have an investigation and an evaluation made regarding current procedures and practices, as well as having outsourcing alternatives related to external service provider arrangements to be analysed and evaluated.

1.3 Purpose

The purpose of this paper is to firstly analyse current procedures in terms of development, ownership and responsibilities of TB packagings. This consists of identifying present procedures, and evaluating advantages and disadvantages of the current systems used. On the basis of this analysis, we will develop and evaluate possible alternatives related to the outsourcing of activities and responsibilities to external service providers.

The assignment includes an analysis and evaluation of tasks such as:

- Development of TB packagings
- Responsibility, liability & maintenance issues
- Ownership structure
- Impact on organisational structure (supply chain/logistics organisation)
- Outsourcing and Logistics Relationships
- Qualitative demands and requirements placed at external service providers
- Effects on price/costs of strategic shift
- Long-term strategic fit

1.4 Scope & Limitations

Our aim is to provide VCC with an overarching view of how these potential outsourcing scenarios would look like, why they are viable, the pros and cons of them and how they will have an impact upon current structure and procedures. The paper focus on situations at a strategic level rather than at a detailed operational level. Therefore, detailed technical aspects of the outsourcing scenarios are not considered.

Furthermore, costs are not the primary focus of this thesis, partly because these are extremely hard to estimate in situations that do not exist. However, cost examples from current procedures for P1 and P2 are used to substantiate our analysis.

In addition, we are only looking at those TB packagings that are used in Plant C (Trim and Final Assembly Plant), not in any of the other plants.

2 Research Methodology

In this chapter we will describe how we approached the problem and the strategy we used to collect the information we needed to evaluate and analyse the problem.

2.1 Research Design

A research design is the basic plan that guides the data collection and analysis phases of a research project. The framework specifies the type of information to be collected, the sources of data and the data collection procedure. The research objective logically determines the characteristics desired in the research design, and this is dependent upon the stages of the decision making process for which information is needed (Kinnear & Taylor, 1979).

Most methods of conducting research can be classified into three broad categories:

- Exploratory research
- Descriptive research
- Causal research

These classifications are made according to the objective of the research. In some cases the research will fall into one of these categories, but in other cases different phases of the same research project will fall into different categories.

Exploratory research has the goal of formulating problems more precisely, clarifying concepts, gathering explanations, gaining insight, eliminating impractical ideas, and forming hypotheses. Exploratory research can be performed using a literature search, surveying certain phenomenon, focus groups, and case studies. When surveying people, exploratory research studies would not try to acquire a representative sample, but rather, seek to interview those who are knowledgeable and who might be able to provide insight concerning the relationship among variables. Exploratory research may develop

hypotheses, but it does not seek to test them. Furthermore, exploratory research is characterized by its flexibility.

Descriptive research is more rigid than exploratory research. As opposed to exploratory research, descriptive research should define questions, people surveyed, and the method of analysis prior to beginning data collection. In other words, the who, what, where, when, why, and how aspects of the research should be defined.

Causal research seeks to find cause and effect relationships between variables. It accomplishes this goal through laboratory and field experiments.

In our research, the exploratory research method has been used so as to fulfil the purpose of this paper. This because our research is based upon the gathering of data and information from people in the organisation that are well incorporated in the investigated procedures. The authors are basically starting out with having no insight or prior knowledge whatsoever regarding the subject in question. Then, piece-by-piece, the various activities are being scrutinised and mapped to grant understanding of the processes, its sub-processes and surrounding activities in order to propose and evaluate viable solutions to the stated problem definition.

2.2 Qualitative and Quantitative Method

Usually one differs between two different methodical approaches within social science and other fields. This is done from the basis and characteristics of the information investigated – soft data or hard data – and this will reveal whether a quantitative or qualitative method is preferred.

Qualitative methods encompass only a minor degree of formalisation. The primary objective of this method is to provide a wider understanding of the subject studied. The aim of this method is not to see whether the information is generally valid. Instead, the important thing is that - by adopting different ways of collecting information - a deeper understanding of a problem's complexity

can be grasped, and how the entity of it is fitted within its context (Holme & Solvang, 1997).

Quantitative methods are, in contrast to qualitative methods, rather formalised and structured. This method is heavily characterised by control from the researcher. It defines the relationships that are of particular interest concerning the question at issue. The method also defines which answers are conceivable. Disposition and planning is characterised by selectivity and a distance in relation to the source of information (Holme & Solvang, 1997).

By the sheer nature of the investigation we have been assigned to carry out, the qualitative method is by far the most efficient and suitable approach for this kind of research. This in order to accomplish the ultimate purpose of this paper. The aim of our way of conducting the research is to gain a holistic view and understanding of:

- Which functions and variables that are involved in the processes
- Why they are involved
- How they have an impact upon decisions and measures
- Their affect on final outcome
- The potential of implementing alternative solutions to existing practise, and
- How this will be structured and managed

Due to the characteristics of the information needed to gain a clear insight into the aspects mentioned above, the technique of semi-standardised interviews has been used. Therefore, our study relies heavily upon interviews with people knowledgeable about the problems and processes of our subject. We have contacted and interviewed both people within VCC and people outside the organisation, such as external suppliers, consultants and potential insourcing companies. The nature of the questions has been such that an open discussion has evolved during the interviews, which was our intention in order to obtain information regarding topics previously not taken into consideration. In addition to interviews, some information has been acquired through observations. More about this is explained in the next part.

2.3 Methods for Collecting Data

Our research is based upon literature studies and upon the collection of data, information and other vital material from experts and other knowledgeable people in their fields of expertise. And, as mentioned earlier, much information has been gathered through interviews. Below, our methods of collecting data are outlined.

2.3.1 Secondary Data

Secondary data are already published data collected for the purpose other than the specific research needs at hand. The main advantage of using secondary data is the savings in cost and time. It is possible for the researcher to obtain far more data in a given time period than if he were to gather purely primary data. This implies that any research should always start out with reviewing secondary data available before pursuing primary data (Kinnear & Taylor, 1979).

There are several issues that one should consider when using secondary data:

- Whether the data is useful in the research study
- How current the data is and whether it applies to time period of interest
- Errors and accuracy - whether the data is dependable and can be verified
- Presence of bias in the data
- Objective of the original data collection

The secondary data we have gathered are split between the major chapters in this paper, namely the theoretical part and the empirical study. For the theoretical part, we have used secondary sources such as academic literature, Internet sources and various articles and reports. When it came to the empirical part, VCCs' Business Management System (BMS) – which is incorporated in Volvos' Intranet – has been a major source of information. Various kinds of internal documents, catalogues, brochures, guidelines and working procedures have also been used.

2.3.2 Primary Data

Often, secondary data must be supplemented by primary data originated specifically for the study at hand. Primary data can be obtained by communication or by observation. Communication involves questioning respondents either verbally or in writing. This method is versatile, since one only needs to ask for the information - however, the response may not be accurate. Communication is usually quicker and cheaper than observation. Observation involves the recording of actions. Observation is less versatile than communication since some attributes of a person may not be readily observable, such as attitudes, awareness, knowledge, intentions, and motivation (www.quickmba.com).

The primary sources of information have, in our case, been extracted through face-to-face interviews and discussions with knowledgeable people in their fields of expertise. A few interviews carried out through e-mail and phone correspondence have been done as well. Informal discussions with our supervisor at VCC have provided additional vital information, which has guided us in taking the right approaches and directions.

2.4 Reliability and Validity

2.4.1 Reliability

Obviously, reliability means that the results of a study should be reliable. Reliability is concerned with the consistency, accuracy and predictability of the research findings. (Kinnear & Taylor, 1979) If nothing changes in a population, two investigations with the same purpose and the same method should give the same result (Svenning, 1996). In short, reliability describes how well a particular object or phenomena actually is measured.

Since we have used a qualitative research method, the interviewing process has some characteristics that one has to be aware of, namely:

- *Flexibility*: The possibilities of following up mentioned ideas for further research, and that a discussion, rather than just plain information, involve opportunities to obtain deep and complete answers.

- *Subjectivity*: The answers received are subjective, which insinuates that personal opinions and valuations varies heavily depending on who one interviews and in what position the person subjected to the interview is in. A number of surrounding circumstances may also affect the outcome of the interview.

The main reason for using interviews was partly because of the flexibility involved in them, and partly due to the fact that it was the best way to obtain accurate information regarding the processes we intended to investigate. The interviews that we carried out were well structured, and sent out in advance to the respondents in order for them to make preparations. This to acquire the most accurate answer possible in every given situation. We recorded all the interviews (all agreed to this) not to miss out on any answers of the questions asked. After an interview was carried out, a written copy of it was sent to the respondent so he or she could verify its contents and give approval of presenting it in our final report. As within most companies, internal politics and its effects upon the expression of individual thoughts are present at all times. However, the fact that we informed the people beforehand that the recorded version would be for the authors' ears only, along with the verification and approval process, relaxed the atmosphere a great deal during the interviews.

However, one problem – although it may be seen as rather natural – was that some respondents were speaking according to his or her situation, meaning that some answers were biased and sometimes lacked objectivity. This was evident in the interviews carried out with VCC's article suppliers, since they knew that we were going to pass the information forward to VCC. We noted that they sometimes were a bit too ingratiating towards our questions. But overall it can be said that the reliability regarding the interviews is at a rather high level, since the respondents are well integrated in the various processes.

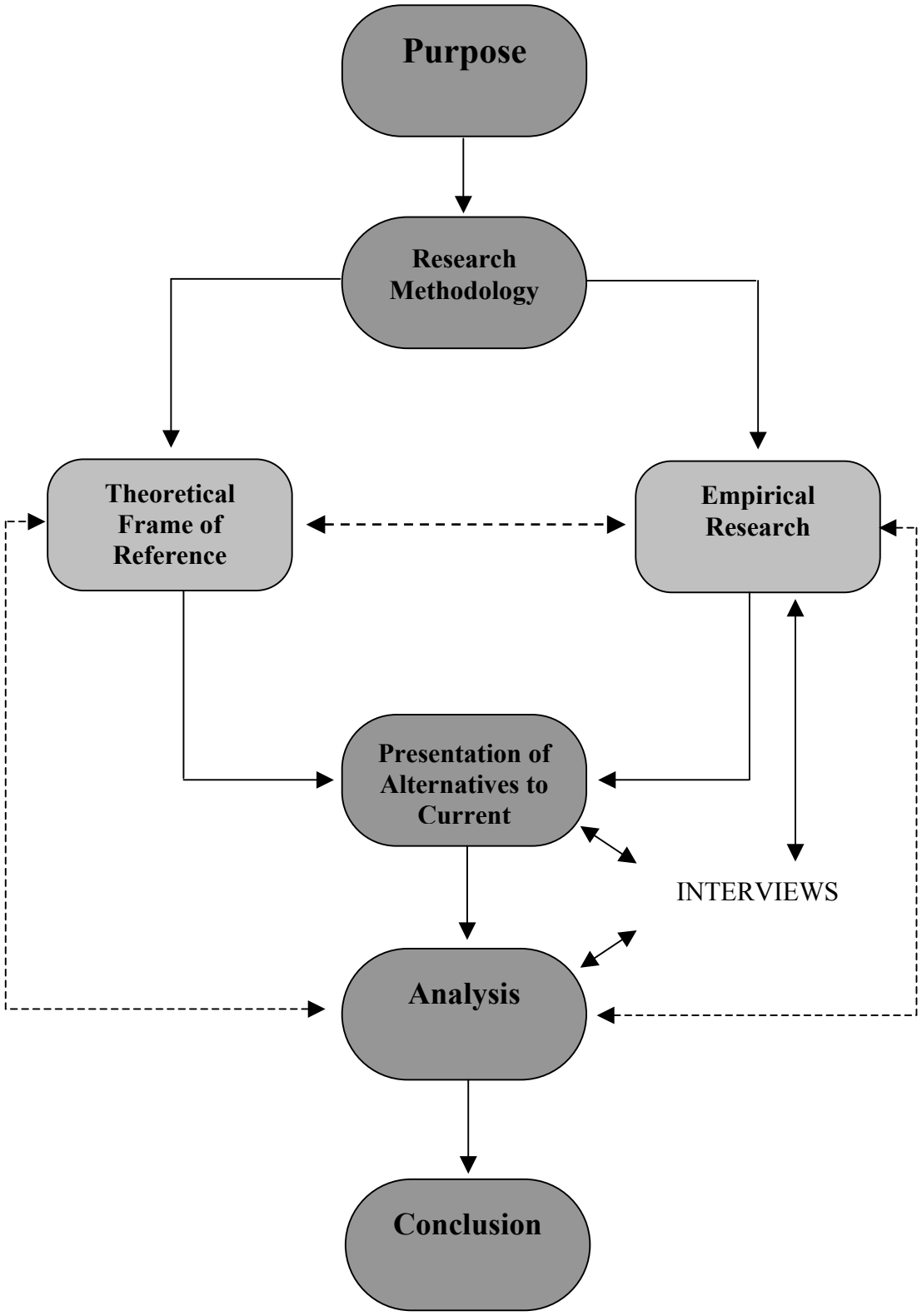
The fact that we have used estimated costs in some of our calculations has slightly hampered the reliability of the research. The use of estimated figures has been necessary since no other alternative exists in order to make cost computations. Furthermore, one has to keep in mind that cost calculations are not the foundation of the thesis. The estimates used in the research have the sole task of providing indications and to substantiate the findings in the rest of the research.

2.4.2 Validity

Validity is the measurement of the conformity of what a measuring instrument is supposed to measure and what it really measures (Körner, 1996). In other words, validity describes to what extent the right thing is measured.

By the sheer nature of our thesis subject, there has not been any straight path to follow when conducting it. In addition, our study has not comprised any standardised surveys or interviews, which could have provided us with various measures such as correlations, deviations and other relational data and information. Instead, our research builds upon an aggregation and compilation of views, ideas and facts around what we have considered to be critical to the proceedings of the research. Apart from discussing with people within VCC, a number of interviews have been carried out with people external to the company, providing additional expertise. These external sources have mentioned the same basic aspects and criteria being vital to the discussion of the problem identified by the authors and VCC. This fact is seen as strengthening the validity, since similar views and opinions regarding the critical issues to consider has been expressed by other external sources.

2.5 Thesis Disposition



3 Company Introduction

The aim of this chapter is to grant the reader some insight into the company, namely what it produces, its corporate focus and strategies, and the markets it is serving (A Guide to Volvo).

3.1 Corporate Information

3.1.1 Ownership

Since 1999, VCC has been part of the Ford Motor Company – the world's second largest car manufacturer. This position gives VCC access to Ford's resources in the fields of technology, purchasing, marketing, distribution and financing. The accumulated synergies make it possible to raise volumes, cut costs, improve profitability and, not least, lead the development of new products.

3.1.2 PAG Membership

Alongside Jaguar, Land Rover, Lincoln and Aston Martin, VCC is part of Ford's division for premium cars – the Premier Automotive Group (PAG). VCC is also a "Centre of Excellence for Safety" inside the Ford Motor Company. The Volvo brand is owned by AB Volvo and the Ford Motor Company in a joint trademark company. Other car brands that are part of the Ford Motor Company are Ford, Mazda and Mercury.

3.1.3 Volvo – Vision & Mission Statement

Volvo differed from other manufacturers through its long standing dedication to safety even before the concept became an issue in the public eye. Safety, Quality and the Environment are core values that permeate operations, products and attitudes at VCC. The target group consists of modern families: "affluent people world-wide, looking for balanced lifestyle, who desire a premium car experience that offers safe excitement for the whole family". This statement strongly coincides with VCC's corporate Vision and Mission:

VCC's Vision: "To be the world's most desired and successful premium car brand"

VCC's Mission Statement: "To create the safest and most exciting car experience for modern families"

3.1.4 Markets and Sales

In the period between 1927, when Volvo was founded, and 2001, VCC has produced around 12 million cars. The company has a broad geographical spread, selling cars in just over 100 countries. VCC invoiced sales in 2001 comprised 420,477 cars (422,131 in 2000). In Figure 4.1, the total sales per market area is displayed. And in Table 4.1 we can see VCC's biggest and most important markets

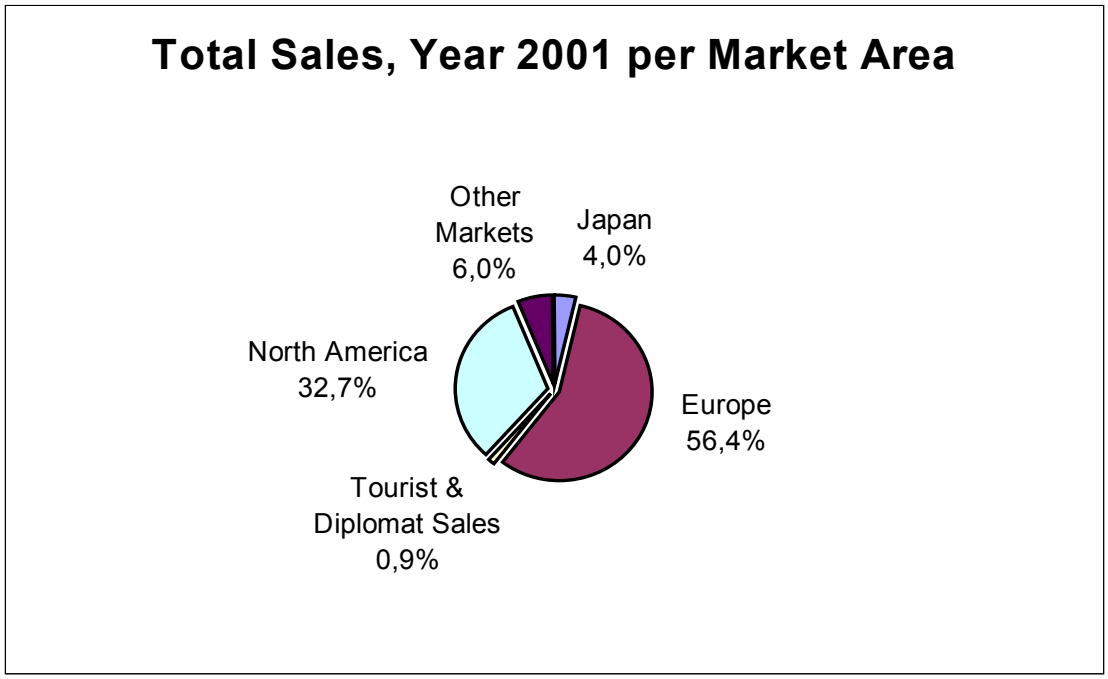


Figure 4.1: Total Sales 2001 per market area

USA	126,000
SWEDEN	48,000
GERMANY	42,500
GREAT BRITAIN	41,600
ITALY	19,800
THE NETHERLANDS	17,200
JAPAN	17,000
SPAIN	13,800
BELGIUM	10,500
CANADA	8,700
TOTAL	**345,100**

Table 4.1:Invoiced sales in the ten largest markets, Year 2001

3.1.5 Purchasing and Suppliers

About 25 per cent of a car's material in terms of value is made within VCC, including parts such as engines, manual gearboxes and body components. The remaining 75 per cent, consisting of such items as instrument panels, interior trim and electrical systems, is purchased from about 345 external suppliers located in twenty or so countries.

In order to cut development and production lead-times, many suppliers are involved from the initial design and engineering stages. Effective co-operation and interaction with suppliers are an important competitive tool for VCC. Increasing numbers of suppliers are establishing operations close to the various VCC plants in order to cut transport times and reduce the need for stocks. A number of suppliers deliver their components in a precise sequence, with a maximum lead-time of four hours. What is more, increasing numbers of components are supplied in complete sub-assemblies or systems, further cutting building time in the final-assembly process. The biggest supplier countries are shown in Table 4.2.

SWEDEN	34
GERMANY	22
BELGIUM	10
FRANCE	8
JAPAN	6
THE NETHERLANDS	6
SPAIN	5
GREAT BRITAIN	4
USA	2
OTHERS	4

Table 4.2: The biggest supplier countries, Year 2001 Proportion of total purchases

3.1.6 Product Development and Design

The product strategy of VCC is based on a platform approach, which makes it possible to utilise the same basic concept to quickly produce a wide range of car models to meet the needs of different groups of customers. Crash safety, emissions, fuel consumption, durability, climate, aerodynamics etc. are tested in specialised laboratories. A large proportion of the tests and the product design are carried out in virtual reality using sophisticated computers, which results in greater precision and less development time. Testing takes place at VCC's proving grounds in the south and northern-most parts of Sweden and also in Phoenix, Arizona.

4 Theoretical Frame of Reference

The theoretical research deals primarily with outsourcing and its advantages and disadvantages as well as the importance of logistics relationships. Furthermore, aspects surrounding costs and leasing are also highlighted. This chapter aims at clarifying the underlying aspects and views, which serve as a foundation for our research.

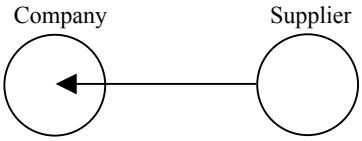
4.1 Outsourcing in Theory

4.1.1 Definitions

Many have tried to define the term outsourcing and there are therefore extensive variations in the notions and definitions of it. According to Augustsson and Bergstedt Sten (1999) there are three different definitions.

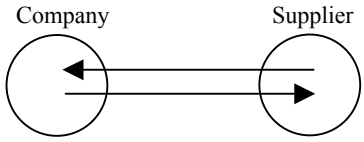
"Outsourcing as externalising existing activities". In practice, this means that the company transfer activities to an external supplier, which results in a shrinkage of the company's operations.

"Outsourcing as purchasing". Here, the term outsourcing refers to a company's acquisition of externally produced goods/material needed to support the organisation, instead of using its in-house production capabilities to provide it. This definition comprises activities which were previously carried out internally, as well as those new to the organisation.



"Outsourcing as relation". In this perspective, outsourcing means that the company contracts out an existing activity to an external supplier, which in turn

carry out the activity on the company's behalf in exchange for a sum of money. The precondition is that the specific activity has previously been carried out internally.



Rothery and Robertson (1996) have in the book *"The Truth about Outsourcing"* given a more wide and general definition of outsourcing:

> *"Outsourcing really means finding new suppliers and new ways to secure the delivery of raw materials, goods, components and services. (It means that you) use the knowledge, experience and creativity of new suppliers which you did not use previously."*

According to these authors, the term outsourcing is itself somewhat too restrictive to describe what is really going on, and suggest titles such as lean management, sub-contracting, joint manufacture ventures, and co-makership to narrow the definition in each particular case. But in any respect, the outsource could be defined as a service outside the organisation acting as an extension of the company's business but responsible for its own management, while outsourcing could be defined as employing an outside agency to manage a function formerly carried out inside a company.

An additional concept in this field is the definition of the term insourcing. Logically, this should mean the opposite of outsourcing, but this is not exactly the case. Again, Augustsson and Bergstedt Sten (1999) have clarified three different angles. The first perspective is, as mentioned above, that insourcing is the opposite of outsourcing through "sourcing from within", i.e., that the company is supplied by internally produced goods, materials and services. Another aspect of it is the formulation to "insource something", which means that the company recaptures an activity that it earlier had outsourced. A third definition of insourcing is to describe what the supplier is actually working with, in other words what it carries out on behalf of the company that outsource the activity.

To sum up, we will in this paper use the following definitions of outsourcing and insourcing respectively:

Outsourcing:

Out-contracting of activities and functions, which have previously been held and carried out internally, to an external supplier that – in exchange for money – supply the organisation with the activities and functions in question during a pre-specified period of time (Augustsson and Bergstedt Sten, 1999)

Insourcing:

By this, we mean the take-over – with all its implications and aspects - of one or more activities previously carried out by the outsourcing company, by an external service provider. Simply put, this third party (i.e., the supplier) is now by this an insourcing company.

4.1.2 The Value Chain and its Analytical Role in Outsourcing Decisions

A rather basic but fundamental tool for conducting an evaluation process – regardless of what area or function that is subject for investigation – is the value chain analysis. This is based on the concept of a value chain, and it is described in Michael E. Porter's book Competitive Advantage. This is how he describes a value chain:

> *"The value chain desegregates a firm into its strategically relevant activities in order to understand the behaviour of costs and the existing and potential sources of differentiation. A firm gains competitive advantage by performing these strategically important activities more cheaply or better than its competitors"*

Porter argues that in order to understand which competitive advantages a certain firm has, its various activities need to be identified and analysed. The firm cannot be viewed as an entity, but as an integration of various functions. One way to model a firm's activities is by mapping those vital functions as a

value chain. These activities are the cornerstones by which the firm creates value.

Porter's Value Chain is illustrated below in Figure 4.2.

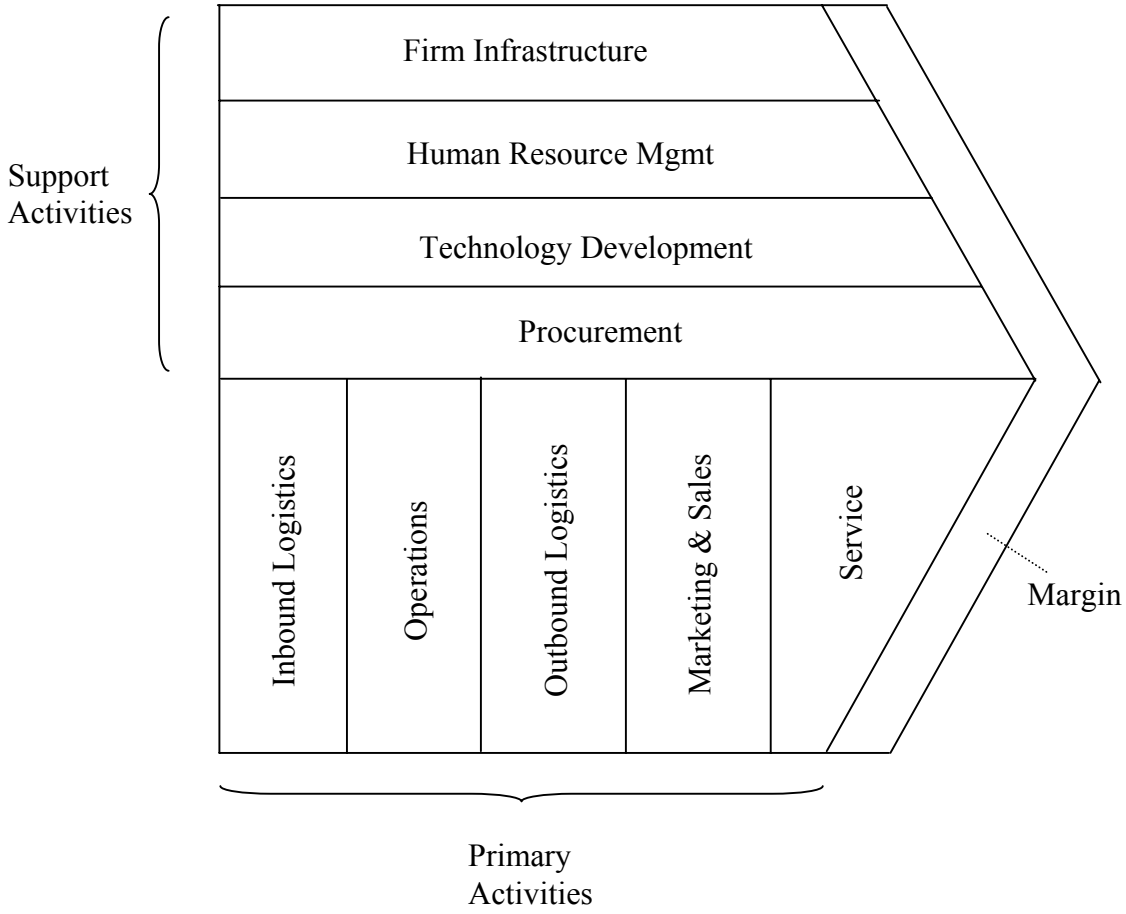


Figure 4.2: Porter's Value Chain

The activities in the value chain are divided into two distinct groups, primary activities and support activities. The split between the activities is made due to the fact that, in general, they exist in every firm and that they have proven to play a major role in a competitive point of view.

If the company in question has a detailed value chain, it is easier to spot which activities that possesses a major share of its assets, costs and revenues. By having knowledge regarding these circumstances, it is easier to decide whether certain activities should be performed internally or externally. In other words, a detailed value chain allows a firm to identify components of the business that may be eligible candidates for outsourcing (Rothery and Robertson, 1995). The

value chain shows the linkage of these components to other parts of the organisation, the role they play and the basis for deciding whether they are strategic, a source of competitive advantage or an operation that needs to be performed at maximum efficiency or lowest cost. It is important that the links between the activities, which can grant competitive advantage, are co-ordinated and optimised. So by scrutinising these links, the need for better co-ordination can be spotted. Without accurate co-ordination, outsourcing will not solve the problem of an activity that is subject to it.

4.1.3 Motives for Outsourcing

There are a large number of reasons and drivers behind the outsourcing process and why a manager or company should consider outsourcing one or several functions. Many of them occur through the developments in so called world-class techniques, such as business process re-engineering, organisational restructuring, and benchmarking. In addition, the strategic importance of alliances leading to more real partnerships, and the whole process of leaner management, has grown considerably in just a few years. In addition, corporate globalisation has also been a strong driver behind outsourcing. Metalls Utredningsavdelning (1997) illustrate in Figure 4.3 the relationship between globalisation and outsourcing.

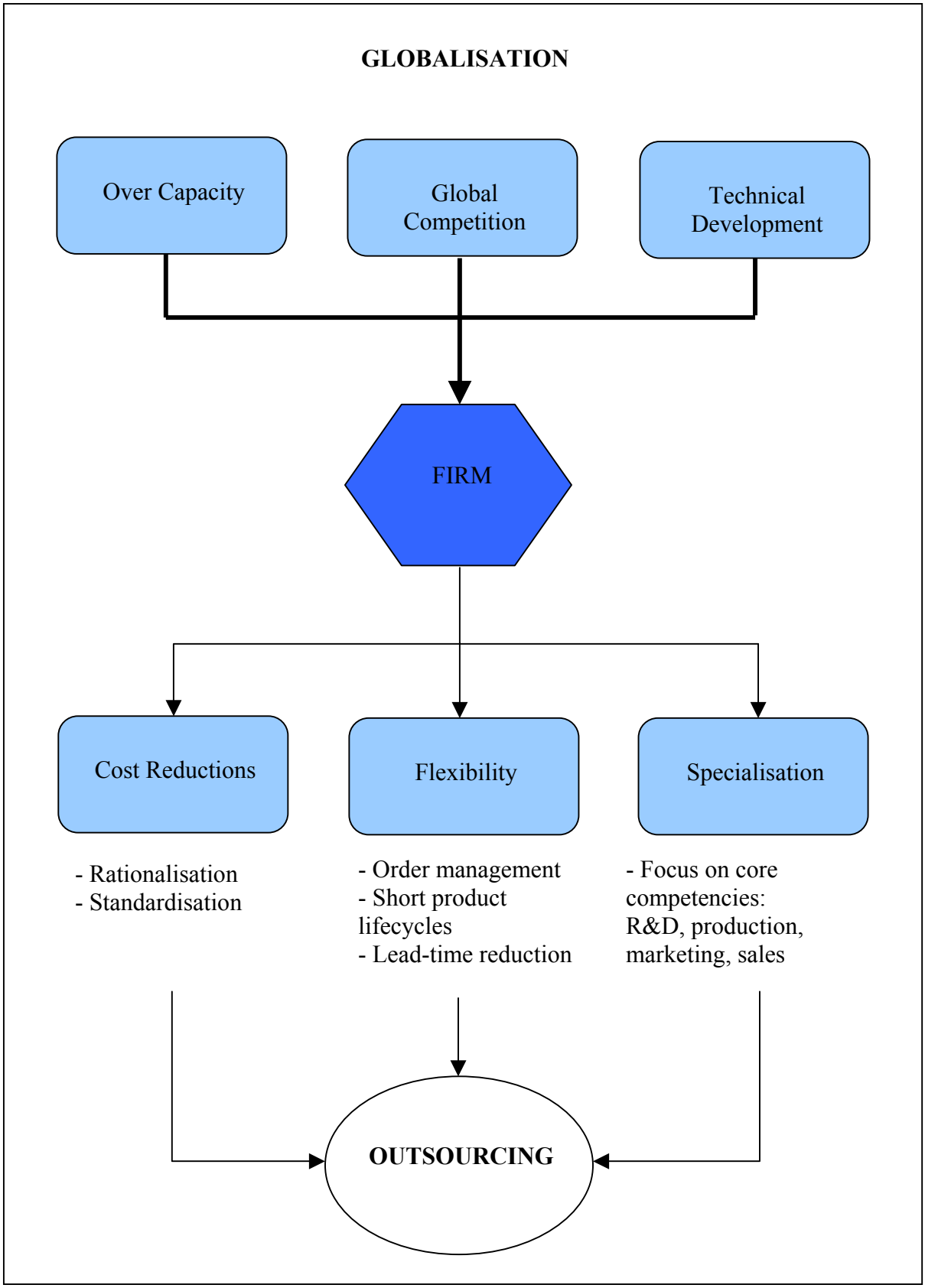


Figure 4.3: The Relationship between Globalisation and Outsourcing

Next, we are going to give a brief outline of the aforementioned drivers and some other common motives for outsourcing an activity. According to Bragg (1998) the most important are:

- Acquire new skills
- Focus on strategy
- Focus on core functions
- Avoid major investments
- Assist a fast-growth situation
- Handle overflow situations
- Improve flexibility
- Improve ratios
- Reduce costs

4.1.3.1 Acquire new skills

The in-house skill of a company may be inadequate for a given function, which in turn may result in minimal improvements to the function in the future. By handing over the function to a supplier who specialises in it - and who therefore is highly competent in the most current procedures and technological advances as well as in its administration - the company can overcome the problem. This reason is common when a company require high levels of expertise in a function (e.g., engineering, IT).

4.1.3.2 Focus on strategy

Managers typically spend a lot of time handling the detailed operations of their functional areas - the tactical aspects of the job. By outsourcing a function while retaining the core management team, the tactical part can be given to a supplier which allows the team to spend far more time on strategy-related issues such as product developments, market positioning and long-term financing.

4.1.3.3 Focus on core functions

A firm has a rather small number of functions that are critical to its survival. It may want to focus all of its energy on those critical ones and distribute all other, less vital functions to third parties who are capable of performing them well. By this, management will not have to be bothered with any of the details associated in running them. In fact, Quinn and Hilmer (1994) are of the opinion

that one of the most positive effects of outsourcing is the reduction of the executive time spent on managing peripheral activities. According to Axelsson (1998), the activities should be divided into five categories to be able to identify its core activities. These categories consist of cutting edge activities, core activities, support activities, secluded activities and peripheral activities, see Figure 4.4.

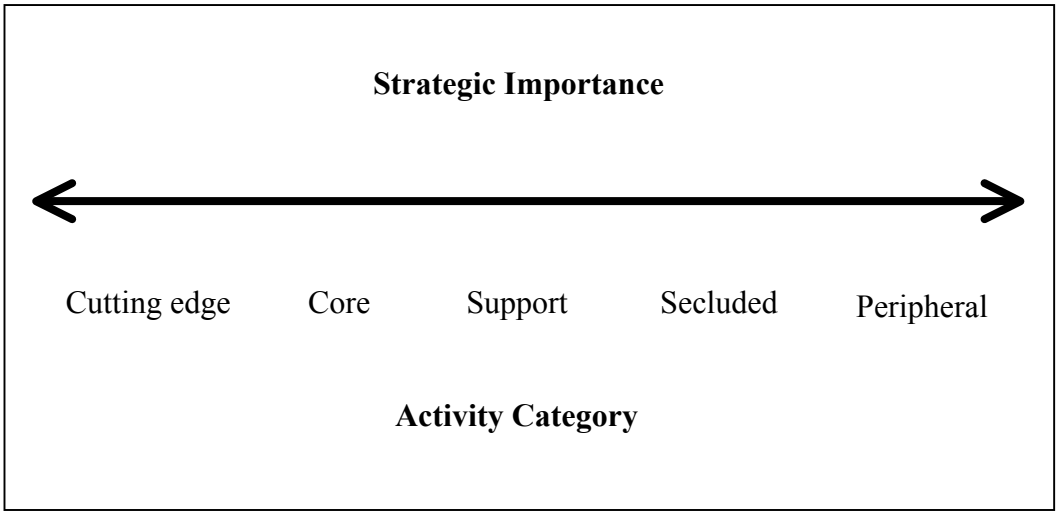


Figure 4.4: Activity Categories

Cutting edge activities – From a future strategic perspective, these activities are the ones that are critical for the firm's competitiveness. These have to be prioritised and developed on a continuous basis in order to remain competitive.

Core activities – These activities are the foundations of the organisation and its competitive position. These are the cornerstones in day-to-day business, and it is around these that the firm will shape its operations.

Support activities – In order for operative issues to work, certain activities that support the core activities are required. These are called support activities. The importance of these activities has to be carefully analysed, so that the success of the core activities is not compromised. But it is normally at this stage that outsourcing is taken under consideration.

Secluded activities – These activities are integral parts of the firm's main process but can be separated from operations in areas where they are not related to the core activities. They can, for example, be components in a greater entity.

Peripheral activities – These activities are not involved in the firm's main processes, and can therefore be outsourced to a third party without having any adverse effects upon the organisation (e.g., janitorial and cleaning services).

Having this view in mind, an activity that is positioned close to the cutting edge activity will most likely continue to be carried out internally, while one that lies closer the peripheral may be suitable for outsourcing to an external supplier.

4.1.3.4 Avoid major investments

A firm may find that there is an activity that is not as efficient as it could be due to lack of investment in it. If the firm keeps it in-house, it will eventually have to make a major investment in it in order to modernise it. By outsourcing the activity, the firm can permanently avoid having to make this investment. In addition, the firm can get rid of having an excess of fixed assets, which may clear the balance sheet from unwanted effects and improve certain ratios.

4.1.3.5 Assist a fast-growth situation

If a firm is rapidly acquiring market share, the management will be stretched to its limits by the vastly increased volume of business. Additional help in running the company may be needed, and one solution could be to allow an external supplier to take over one or more activities.

4.1.3.6 Handle overflow situations

There could be times of the day or year when a function is overloaded for reasons that are beyond the firm's control. In situations like this, it may be cost-effective to retain a supplier to whom the excess work will be transferred when the internal staff is unable to keep up with demand. This is a reasonable alternative to overstaffing the in-house function to handle overflows that occurs only a small percentage of the time.

4.1.3.7 Improve flexibility

Similar to the above point but with the exception that the supplier gets the entire function, not just the overflow business. When a function experiences huge fluctuations in the volume of the work it handles, it is easier to eliminate the fixed cost of an internal staff and move the function to a third party which will only be paid for the actual work done. By this, a fixed cost will be converted into a variable cost. So the price of the supplier's services will fluctuate directly with the transaction volume it handles. Outsourcing can also offer a greater technical flexibility. Companies, which have tied up capital in huge investments in a certain technological area, often tend to lag behind in adopting to new technologies and the opportunities achieved through them. By instead purchasing this new technology, it will be easier for the company to keep up in the rapid technical development. Outsourcing can also contribute by shortening the lead-time between the development phase and full scale production through transferring parts of the development responsibility to a third party (Metalls Utredningsavdelning, 1997).

4.1.3.8 Improve ratios

Many firms are driven by their performance ratios for both internal as well as external purposes. This due to the willingness to improve and display positive departmental figures for internal use and corporate figures for potential investors etc. As an example, the outsourcing of a function that involves transferring assets to a supplier will increase the firm's return on assets, which is one of the most important financial measurements. The functions that are most likely to improve this ratio are those heavy in assets, such as maintenance and manufacturing.

4.1.3.9 Reduce costs

Economic aspects of outsourcing are of major importance since the company is, in most cases, not willing to pay more for the outsourced services/products than the actual cost for carrying it out internally. Although costs cannot be cut in many situations through outsourcing, there could be rather significant cost

savings if it is carried out correctly and selectively. Due to advantages of economies of scale that insourcing companies can grasp through servicing many companies, they can produce more cheaply. The client (the outsourcing company) can reduce its tied up capital in machinery and inventory, and at the same time reduce the need for investment in new equipment and other assets. The insourcing company can also purchase assets from a company and then lease the assets back as part of an outsourcing deal, and thereby giving the company an up-front cash infusion. In addition, external suppliers could be seen as an attractive alternative since the company could reduce its permanent staff, which is eligible to general payroll tax and other social fees. By this, administration cost may also be reduced.

4.1.4 Pitfalls and Risks of Outsourcing

While there may be many good reasons to outsource a function, there are also a number of risks associated with doing so. These can range from minor pricing issues to inadequate performance by a supplier of a key function. Paradoxically enough, it seems that both the motives as well as the risks of outsourcing are based upon similar reasons. According to theory, the most common risks are as follows:

4.1.4.1 Loss of/weakened core competence

According to Augustsson and Bergstedt Sten (1999), it is wrong to argue that outsourcing generally imply risks of jeopardising the firm's core competence. However, a firm that commits to an inadequately planned outsourcing venture where the firm has not carefully chosen what they can outsource, for what purposes, and for what they themselves need to control and develop the internal competence around, is extremely risky. There is therefore an evident risk of losing invaluable knowledge and key people by outsourcing a function. Many in this field have argued, "A very common mistake is that companies haven't made a thorough enough analysis of what their core competence is". To find out which areas that are of critical importance and must be kept internally is not easy, but nonetheless not less important (Höij M. 2002).

4.1.4.2 Escalating costs

Many companies do not know how much the function under scrutiny is actually costing them. It can therefore be hard to estimate whether the operating costs of having the function outsourced is too high in relation to the services provided. It is of course also important to have in mind that the insourcer will demand not only cost coverage, but also some profit. Thus are extra margins introduced into the chain of activities (Berglund, 1997).

4.1.4.3 Loss of control

Control of assembly quality and problem investigation are both made significantly more complex when major sub-activities are outsourced - it is difficult to conduct continuous improvement, team building and unbiased problem solving across business boundaries (Gibson 1998). The fact that the company does not have direct control over product/service quality, deliveries and other critical performance measurements can pose a big problem. In the operative perspective, lost control over delivery precision is common. Problems experienced in the short term could be caused by technical inadequacy, while long term problems can occur if the supplier is subject to financial problems. It is therefore important to choose suppliers carefully (Augustsson and Bergstedt Sten, 1999). Another problem is that the firm cannot control how the supplier treats information that, by the firm, is classified as confidential.

4.1.4.4 Reduced flexibility

If an outsourcing venture is to be successful, time and money needs to be spent on relationship building activities by the organisation. Relations with suppliers have to be handled with care, and follow-up and feed-back procedures must work properly. The chance of getting the greatest value out of an outsourcing relationship is highly dependent upon the openness of information flows and the mutual trust and respect for each other's operational skills. However, a survey made by the market research company Input, reveals that one of the supplier's biggest shortcomings is the ability to adopt to clients' demands on

new technology. Many clients outsource functions to get access to this new technology, but it seems that in many cases the transition is far slower than suspected (Wallström M. 1996).

4.1.4.5 Long contracts

The longer the contract the better, most suppliers are likely to argue. Five to ten year contracts are not unusual. The risk with this is that developments in the served markets are hard to predict, and may offer unpleasant surprises. This is the reason why it is not always good to tie the company to a supplier for too long periods of time.

4.1.4.6 Over-optimism & Jump the Bandwagon effect

An underestimated risk is that available information about the success of outsourcing is usually skewed in favour of success stories. An excess of this type of information may lead company management to the conclusion that it must outsource a function (so called “band-wagon effect”) when in reality the number of outsourcing successes are fewer than reported. The timing of stories about outsourcing causes this skewing problem – they are almost always published for outsourcing deals that have just been signed, when no problems between the parties have yet surfaced (Bragg 1998).

4.1.5 Summary and Discussion – Motives and Pitfalls of Outsourcing

The aforementioned part was concerned with the key aspects surrounding outsourcing – what it is, how to evaluate its prospects and the motives as well as the pitfalls of it.
In summary, the distinct advantages of outsourcing include converting fixed costs to variable costs, balancing workforce requirements, reducing capital investment requirements, reducing costs via suppliers' economies of scale, accelerating new-product development, gaining access to invention and innovation from suppliers, and focusing resources on high-value-added activities. Outsourcing also allows a firm to concentrate its resources on a set of core competencies that allow it to achieve definable pre-eminence and provide

unique value for customers. As competition continues to drive down prices, companies are under pressure to increase manufacturing flexibility, decrease inventory requirements, and shorten time-to-market. In addition, a company can by outsourcing develop its core competence to provide formidable barriers against present and future new entrants, while gaining superior market position, transforming its workforce, and reaching new levels of performance.

Andersson (1997) argues that a strong motive for outsourcing is lower in-house performance/cost ratio compared to when the service is outsourced. However, he points out that if the decision to outsource should be motivated in figures, all logistics costs related to the decision must be taken into account. The problem with this, as he found out in his licentiate thesis (Andersson 1995), is that very few companies can produce all the necessary cost figures in order to make the comparison between an in-house operation and an outsourced alternative.

So on the other hand, it is easy to blindly stare at the potential benefits of outsourcing. As mentioned earlier, the venture is embedded with risks from several possible sources. It should be remembered that the risks of actually loosing core competence through loss of key people, problems in relationship building and trust, lack of technological flexibility, opportunism and contractual entrapments, are substantial. Last but not least, outsourcing may lead to a steep escalation of costs.

Andersson (1997) means that the ability to perform a logistics activity in-house, without implying any investments in either knowledge or equipment/facilities and whether time is a scarce resource or not, is decisive for the decision to outsource or not. On the other hand, if it turns out to be viable to perform certain logistics activities in-house, the question arises whether or not this logistics activity really is part of the company's core competence - or at least that it provides superior added value. If so, the option not to outsource has to be analysed more thoroughly.

4.2 Strategic and Logistics Alliances

Outsourcing creates opportunities for positive synergy by bringing the core competencies of two companies together (Halldorson, 2001). However, outsourcing decisions have not met their full potential due to two primary reasons. First, outsourcing decisions have been looked on as tactical decisions with primary emphasis on cost cutting. Second, outsourcing contracts have been viewed as adversarial rather than as co-operative relationships. The most successful outsourcing companies have strong relationships with their suppliers, hold high-level strategic reviews, and have an effective process for continual improvement that is driven by performance measures and end-user satisfaction measures (Ehie, 2001).

To realise the full potential of outsourcing, companies have to ensure that there is a strategic fit between the company and the supplier, and that the supplier has the requisite expertise the company seeks. Automobile manufacturers and other original equipment manufacturers (OEMs) have been very successful solving many of the managerial challenges associated with outsourcing decisions. More recently automobile manufacturers have reached a greater level of sophistication in outsourcing the design, manufacture, and assembly of increasingly complex systems and modules, thereby shrinking the immediate supply base to a set of first-tier suppliers (Ehie, 2001).

4.2.1 Strategic Alliances

According to Bowersox and Daugherty (1989), an alliance is characterised as a co-operative relationship in which the parties seek to establish jointly rewarding relations in an atmosphere of mutual trust. A strategic alliance is defined by them as:

> *"A business relationship in which two or more independent organisations decide to work closely together to achieve specific objectives"*

In Figure 4.5, Gustafson (1988) positions the different partnerships involved in a strategic alliance as follows:

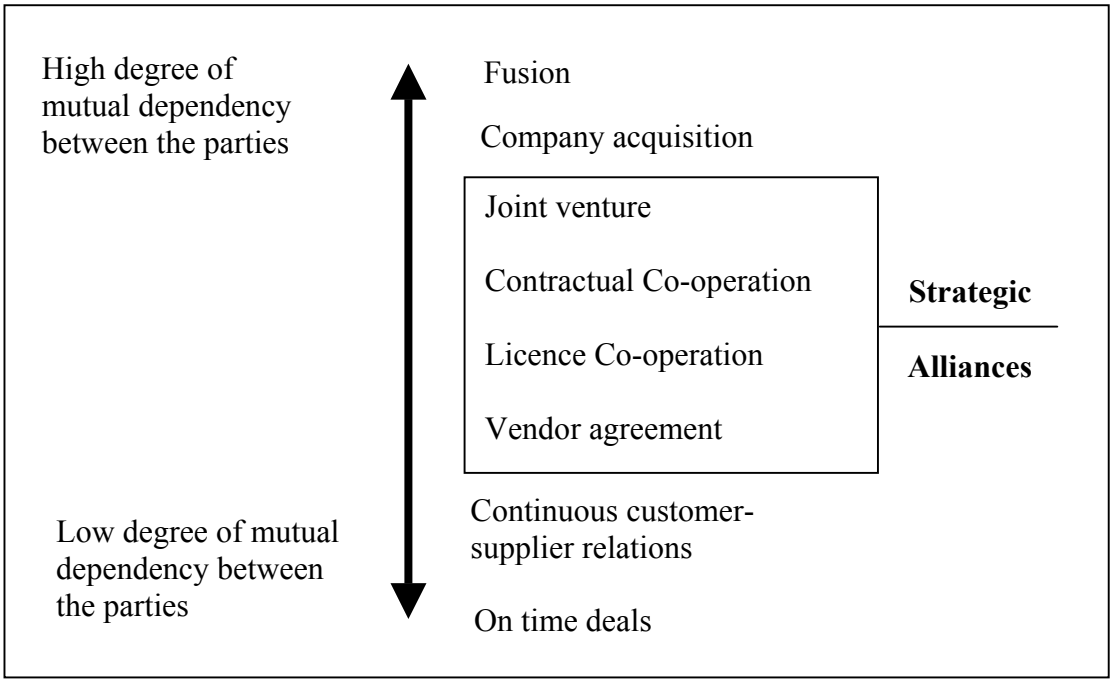


Figure 4.5: Degree of Strategic Alliance

Gustafson (1988) divides strategic alliances into four main forms, vendor agreements, licence co-operations, contractual co-operation and joint venture. Of these four, contractual co-operation is believed to be the most adequate form when defining an alliance in logistics.
A contractual co-operation is established without the creation of a new organisational unit, i.e., a jointly owned company. However, it does not necessarily involve the manufacturing of a product, it can also involve a specific service. According to Gustafson, this form of a strategic alliance could give a company an opportunity to concentrate its resources on its area of core competence, and at the same time reduce the weaknesses in other areas.

The outsourcing itself does not imply the existence of an alliance. However, according to Bowersox and Daugherty (1989), long-term and formal alliances in logistics is the best way in which the parties can integrate their businesses to achieve common advantages and a win-win situation. This integration is achieved through contacts between large numbers of members in the organisations at several hierarchical levels of the participating firms. This will

be further explained later in the part Relationship Building, Co-ordination and Integration.

Bowersox and Daugherty (1989) also argues that what is essential in a logistics alliance, is that the service provider assumes some of the risk in the logistics process. The benefits and burdens have to be based on equal sharing between the parties in the alliance. That means that these have to be equally shared no matter how much bigger or economically stronger one of the parties is in relation to its partner.

4.3 Logistics Alliances

Andersson (1995) has broken down these aforementioned strategic alliances and put them into a logistics context. Further on, he has made the following classification of logistics alliances:

- Partnership agreements
- Third party arrangements
- Integrated service agreement

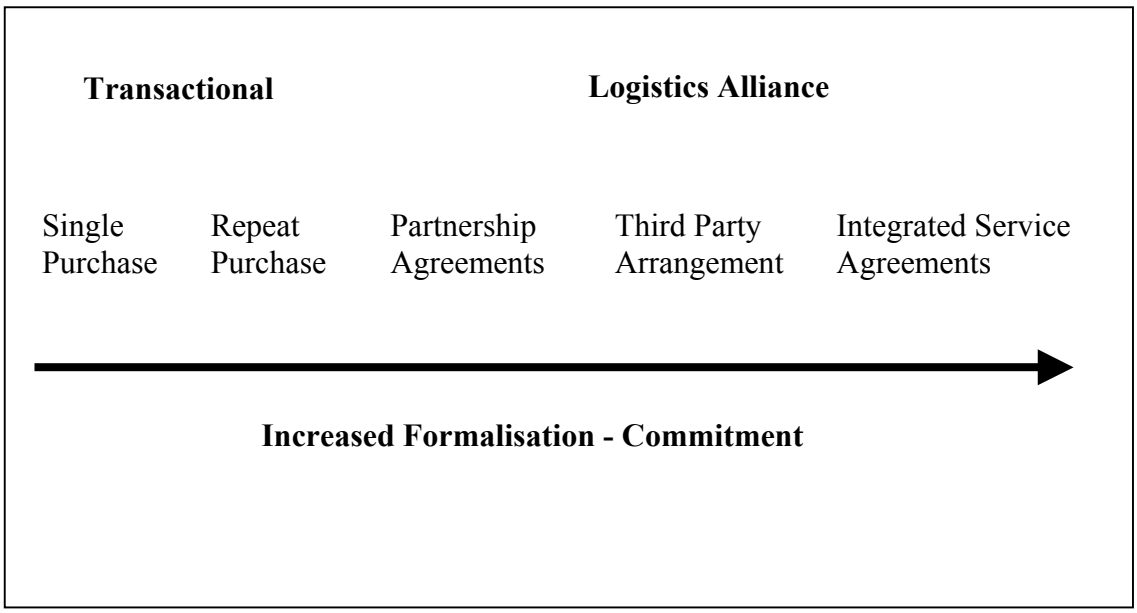


Figure 4.6: Buyer – Seller service relationship

These three groups of logistics alliances are differentiated by the degree of formalisation and commitment. A partnership is the most informal type of logistics alliance. The basic idea behind this arrangement is that the partners should be able to create joint benefits while retaining independence.

A third party arrangement is often more formalised and is characterised by formal agreements. The main benefit of this type of agreement is that is offers a formalised framework for the external service provider and the outsourcing company to modify their logistics practices in order to jointly achieve benefits.

The integrated service agreement is the most formalised strategic alliance in logistics. In these alliances, part or all of a turnkey distribution system is offered.

4.4 Driving Forces and Key Success Factors of Logistics Alliances

The driving forces and effects of the logistics partnerships, and the reasons for these, will be given attention in this part. Critical success factors will also be discussed.

4.4.1 Driving Forces for Engaging into Logistics Alliances

Some of the most important generic driving forces for engaging in logistics alliances are expectations of positive cost and service effects (Andersson 1997). The desire to reduce investments is also linked to the cost aspects. It could be a question of transforming fixed costs to variable costs, but it can also be related to changes in the operations such as a reduction of the investment needed for restructuring a supply chain. But by far the most important driving force is the outsourcing company's ambition to concentrate on its core business. These driving forces are illustrated in Figure 4.7 below and briefly discussed.

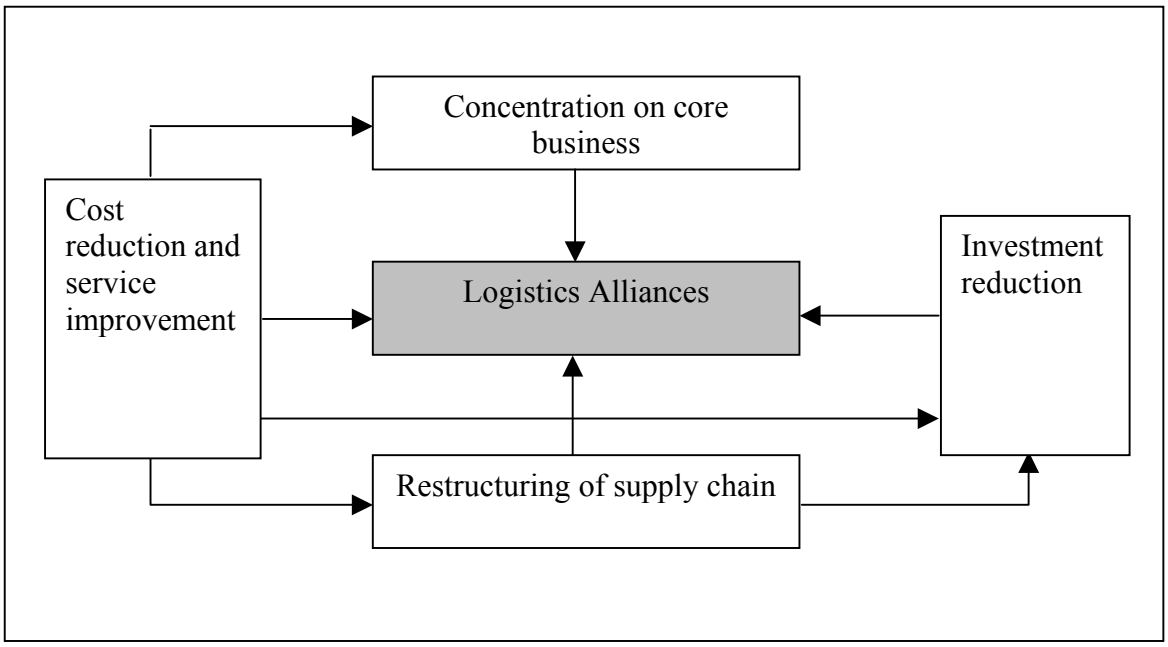


Figure 4.7: Major driving forces behind the set-up of logistics alliances

4.4.1.1 Cost and Services

Expected reductions of costs and improvements of services are either directly or indirectly powerful driving forces for establishing logistics alliances. These can be viewed as the ultimate goal of all actions taken by the outsourcing company.

4.4.1.2 Concentration on Core Business

The most important driving force, behind setting up logistics alliances, is "corporate initiative to focus on core business". Andersson has in his research found that top managers want to use logistics alliances in order to be able to spend less time on logistics, and especially to be able to spend less time on the management of logistics workforce.

4.4.1.3 Restructuring of Supply Chain

Another reason for companies to buy logistics services in alliances is to allow them to restructure their supply chains. Linked to this driving force is fast implementation of new structures and the ability to make greater changes of the supply chain structure.

4.4.1.4 Investments

Outsourcing is to a great extent regarded as a way to reduce various forms of investment. However, in several cases the investment reduction aspect is more or less a question of bookkeeping benefits related to the transferral of fixed costs to variable costs.

The overall positive economic effects of the partnership could be summarised as follows:

The logistics operation's performance could be improved due to the insourcing company's:

- Economies of Scale and Scope
- Efficient operations
- Lower cost structure
- Better bargaining power
- Range of services
- Knowledge of various kinds
- Fast implementations of new systems

The outsourcing company's indirect costs could be reduced due to:

- Reduced headcount
- Reduced number of service providers (less negotiations, contracts, contacts etc.)
- Less management time spent on non-core activities
- Reduced investment base

4.4.2 Key Success Factors of Logistics Alliances

Andersson 1997 propose a number of success factors related to the set-up of a logistics alliance. These are summarised next:

- Well-defined requirements and measures
- Transparency and standardised information
- Well-defined procedures
- Joint start-up teams
- Joint design of the alliance
- Communication on all levels
- Close relationship
- Top management support

These points are, of course, some of the major important factors influencing the success of a partnership, but they are not enough on their own to make it successful. Before the partnership can experience the long-term benefits, working procedures must have been successfully set up. The question is how this is accomplished, and how to ensure that the ongoing operations go smoothly. In the next part, we aim to provide a theoretical framework for this – Lateral Coordination in a logistics outsourcing relationship.

4.5 Relationship Building, Co-ordination and Integration

So far, we have described what kind of alliances and partnerships there are, and the characteristics of them. This part deals with issues regarding relationship-building activities, the co-ordination of them, and the requirements put on a logistics partnership to be successful. The approach draws mainly on the theories of organisational design, and is based on the view that certain organisational mechanisms that are typically used within one company can be applied to facilitate the co-ordination task between two different organisations.

4.5.1 The ability to build Relationships

Having defined what kind of partnership to form, the outsourcing firm must develop its ability to build a strong relationship with the insourcing company. An organisation must have a process for building successful relationships. A company must also have the organisational ability to use this process. In other words, the managers responsible for implementing a new outsourcing relationship must understand the key factors for a successful partnership. The organisation's outsourcing intentions and the strategic rationale for outsourcing has to be summarised in order for the relationship to be a success. Below are some vital issues that have to be understood and addressed (Blumberg, 2002):

- Processes to be outsourced and the broad objectives for outsourcing
- Relationship of outsourcing to the overall corporate strategy
- Links between the outsourced process and a company's core competencies
- Strategic forces that are driving an organisation into a relationship
- Scope of coverage (international, across business lines, etc.)
- Critical risks involved
- Expected duration of the relationship.

How to coordinate activities in a potential relationship between VCC and an external service provider is an important area to consider. A deep-reaching

study of how to coordinate activities in a logistics outsourcing relationship has been carried out by the researchers Janne Huiskonen and Timo Pirttilä at the Department of Industrial Engineering and Management, Lappeenranta University of Technology, Finland. Since their research is put in the context of a logistics outsourcing relationship, it provides a suitable foundation and understanding of what could be applicable in VCC's situation surrounding organisational and relationship-building activities in an outsourcing scenario. Therefore, the following part of theory is entirely based upon their research in this field; Lateral coordination in a logistics outsourcing relationship.

4.5.2 Lateral coordination in a logistics outsourcing relationship

4.5.2.1 Co-ordination requirements in a logistics outsourcing relationship

> *"every organized human activity ... gives rise to two fundamental and opposing requirements: the division of labor into various tasks to be performed and the coordination of these tasks to accomplish the activity".*

The level of these mentioned requirements depends upon the characteristics of the specific task that is to be carried out along with its environment. The coordination mechanisms then have to be selected on the basis of the coordination requirements, since the costs and benefits of the mechanisms vary. To be able to select effective coordination mechanisms, it has to be understood what causes the coordination requirements in different situations.

The coordination requirements depend on the need to combine specialized capabilities and resources in a complex and uncertain environment. The higher the output requirements (i.e., service levels) and the inter-dependence between the sequential sub-tasks, the more demanding the coordination task. In the logistics outsourcing relationship the coordination task is even more challenging, because two different organisations are involved in a boundary spanning value chain process.

4.5.2.2 What to coordinate?

Coordination tasks in logistics processes can be divided into two basic categories: the management of daily operational activities, and improvement of processes. It is typical that during the execution of operational processes, situations occur where the employees have to use their consideration and make decisions on-site without wasting time by asking their supervisors. In these situations, spontaneous communication directly between the two organisation's employees is an effective mean for making fast decisions. On the other hand, the improvement of processes and capabilities requires more pre-planning and formal coordination. One possible way to organise process improvement efforts

is to form teams with members from both organisations that are well informed of the process to be improved.

4.5.2.3 Definition of lateral coordination

In lateral co-ordination, an organisation employs lateral (i.e., horizontal) forms of communication and joint decision-making processes, which cut across vertical lines of authority. This strategy moves the level of decision making down to where information exists instead of referring a problem upward in the hierarchy. Managers and employees in different units and functions solve the problem at their own level by contacting and co-operating with people in those units and functions that are affected by new information. The main purpose of lateral co-ordination, and the consequent lateral organisational capability, is to increase decision-making capacity and flexibility in responding quickly to changing situations. By increasing lateral lower level communication, two important benefits are gained: management time is relieved to the most important decisions, and access to local information in decision making is maximised. This maximises the organisation's ability to deal with multiple dimensions (customer segments, partners, suppliers, products, skills, technologies, etc.) of the decision environment simultaneously, and thereby make different types of decisions faster.

4.5.2.4 Types of lateral coordination

Lateral organisation forms must fit to the amount of coordination needed. In the order of the increasing amount of coordination, the three basic types of lateral mechanisms are informal coordination, formal groups, and integrating roles. Informal coordination is achieved through spontaneous communication between the persons involved in the issue. This kind of voluntary behaviour speeds work and response time to customers and suppliers. Formal groups including members from different functions may be formed to resolve issues requiring additional decision-making capacity. These are typically management teams or project groups. The integrating role is the most complex form of lateral organisation. It is specially designed to facilitate communication and

resolve conflicts between two interdependent departments and to bypass the long lines of communication involved in upward referral in a hierarchy.

4.5.2.5 Lateral coordination mechanisms in the logistics outsourcing relationship

Lateral coordination between two collaborating companies may use similar mechanisms as those used between functions within one company, but the organisational boundary brings also certain limitations to them, see Figure 4.8.

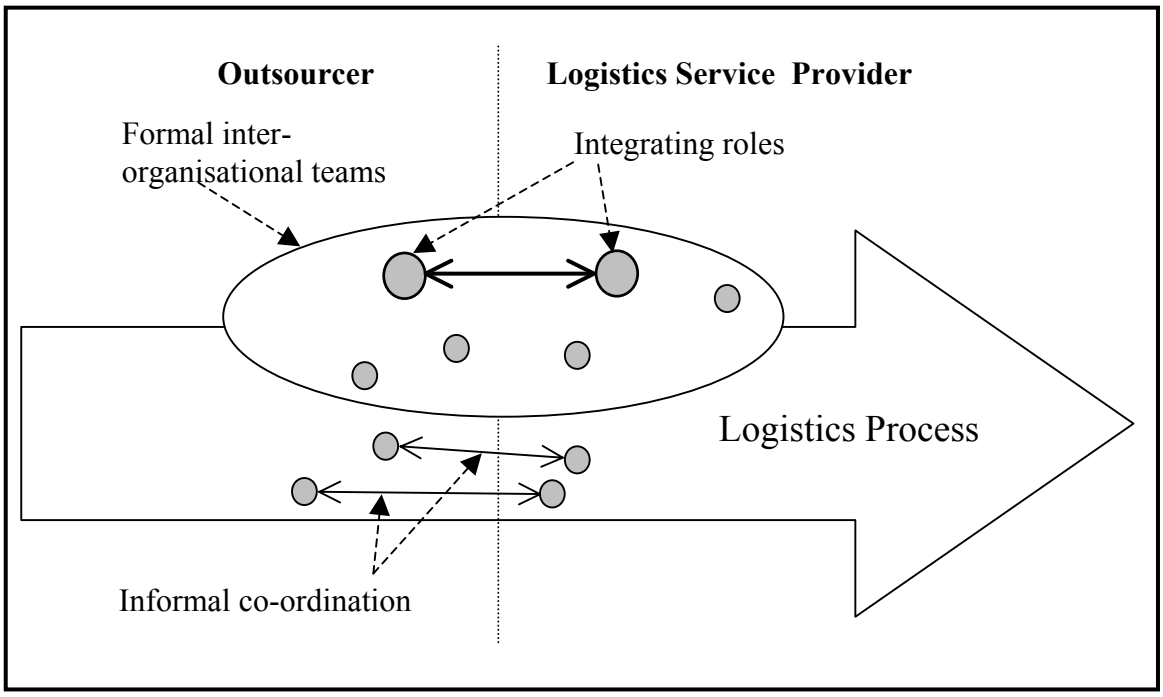


Fig. 4.8. Lateral co-ordination mechanisms in the interface of two companies.

Informal coordination is achieved through spontaneous communication between the employees of both organisations operating the boundary spanning logistics processes. *Formal inter-organisational teams* consisting of employees from different levels of both organisations may be created for problem solving and improvement purposes. *Integrating roles* are needed to establish inter-organisational teams and coordinate their work so that collaboration between the two organisations is achieved without the need to refer to the top of the hierarchies. In a logistics outsourcing relationship, all the three types of coordination mechanisms are usually necessary. It is useful to plan their use in

an organisation from the very beginning of formation of such a relationship. For effective use of the different mechanisms it is necessary to understand the characteristics of the coordination requirements and the respective mechanisms, see Figure 4.9.

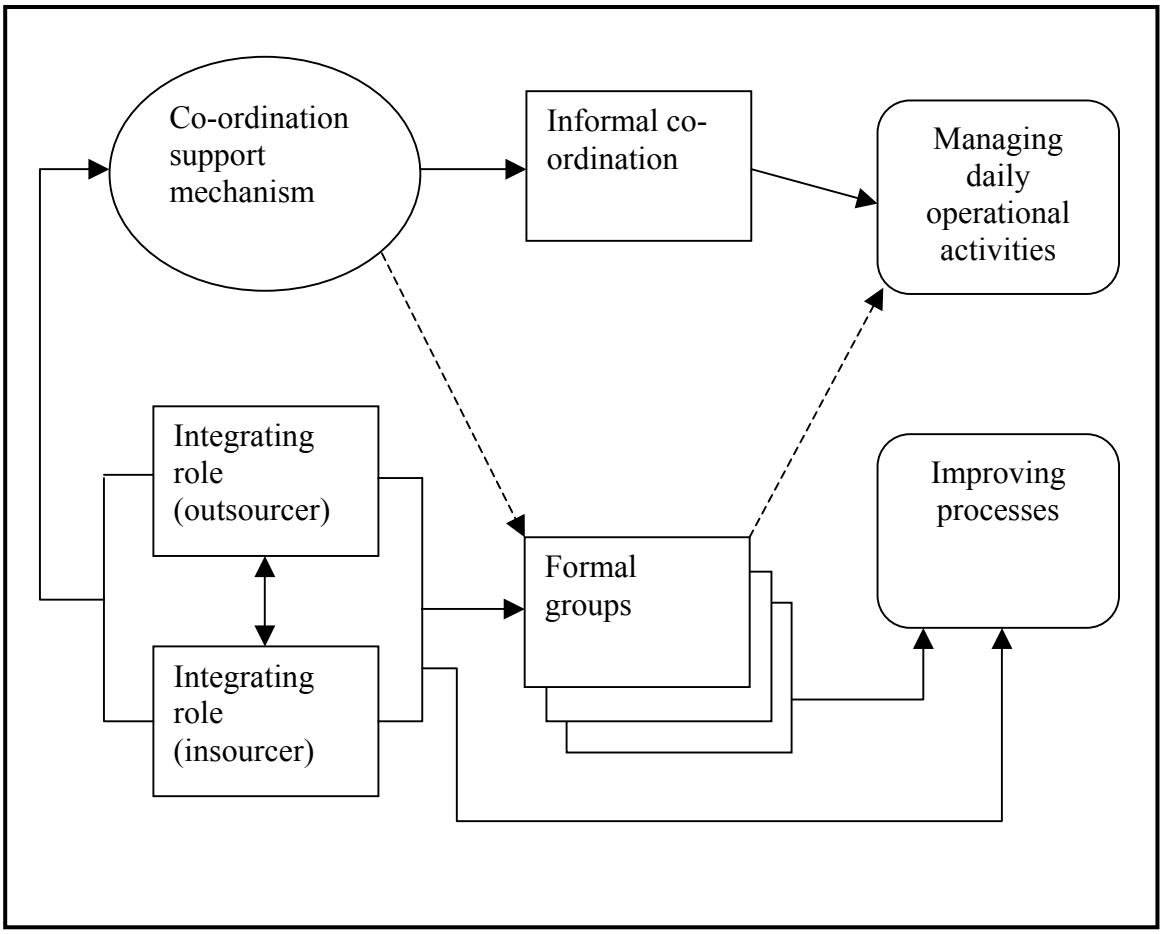


Figure 4.9: The relations of coordination requirements and coordination mechanisms.

For the coordination of daily operations, informal coordination is the most effective. Some amount of informal coordination takes place naturally, but for most purposes it is important to design and use organisational support mechanisms. These facilitate and enhance spontaneous communication and coordination over the organisational boundaries at the operational level. The most important supportive organisational means to increase informal coordination are co-location of workers, joint training and other social events, consistent reward and measurement systems, and integrated information and communication systems.

In addition to informal coordination, persons in integrating roles – one in both companies – are needed to take the overall responsibility for the particular relationship. The important point is that, though logistics operations are outsourced, logistics coordination needs to remain and this requires resources that may be of different type than what was needed in the situation before outsourcing. The integrators' task in the formation stage of a new relationship is to co-plan the operational processes and practices and resolve the emerging conflicts. Later they may take a more coordinative and supportive role through planning and using the lower level coordination mechanisms. This is because day-to-day coordination is far too time-consuming and the integrators' resources have to be spared for the most important and complex coordination tasks only. The integrators' own role, therefore, consists of three important coordinative tasks: designing supportive mechanisms for informal coordination, establishing the formal groups and coordinating and leading their improvement work, and communicating and resolving conflicts together with the integrator in the partner company.

4.6 The Problem of Defining Costs

4.6.1 Logistics Alliances – do they add cost or value?

Andersson (1997) means that a common question is whether the formation of a logistics partnership is not just a matter of adding a player and letting the outsourcing company pay the service providers profit. If all activities can be performed in-house to the same cost (or lower) and at the same service level, and that the outsourcer in addition has to pay the profits of the service provider, it is likely that the logistics partnership is not a good solution. However, as partly mentioned earlier, there are a number of other aspects that have to be considered:

- Need of flexibility
- Lack of certain resources
- Desire to change fixed costs into variable costs
- Change of supply-chain structure

Most of the effects of logistics alliances (efficient operations or economies of scale) are not unique to this type of partnership. Several of the desired and experienced effects can be achieved in an in-house operation with the exception of concentration on core business, investment reduction, and the transformation of fixed costs to variable costs.

It must be observed that the outsourcer cannot just hand over responsibility for the logistics to a service provider and thereafter stop thinking about it. The outsourcing company has to have good general logistics knowledge in order to create goals for the logistics, which fit the overall goals of the organisation. The outsourcer needs to have sufficient knowledge to buy the logistics service, to define the processes, to define performance objectives, and to evaluate the insourcer's performance. These skills must be maintained when outsourcing a function.

4.6.1.1 Inaccurate True Costs

Andersson (1997) argues that the costs have to be transparent in order to help both sides in an outsourcing situation to guard against opportunistic behaviour. However, he believes that the possibility of measuring cost and performance differs between firms, not only due to varying activities but also to separation of activities into smaller units and varying degrees of over-head costs.

He means that it is difficult to measure logistics costs since the accounting systems do not give an adequate support for monitoring costs along a material flow. If there is insufficient cost and performance information regarding the in-house operations, this will lead to decreased control possibilities and bad management since the internal pricing, in many cases, will not reflect the true costs. Opportunism is not supposed to be a problem in some logistics partnerships (due to the type of relationship combined with for example an open book situation). In such a situation, the problem is supposedly not that the insourcing company may obtain excess profits by hiding true costs, but instead that neither of the parties can say whether the services are provided in a cost-efficient and competitive manner. This problem is however similar to the one the outsourcer faces when the activities are performed in-house.

Anderson refers to Quinn and Hilmer, which argues that it can be very hard to get a good idea of the costs of performing a certain activity in-house, or at least it can be harder to identify the in-house cost in comparison to the explicit costs of dealing with external service providers. Internal governance costs can be extremely high but since they are much harder to identify in comparison to the explicit transaction costs of dealing with external service providers, the internal costs are often not included. Thus, the make or buy decision will be biased in favour of in-house solutions.

The most obvious cost of the use of the price mechanism is the cost of discovering what the relevant prices are. Andersson argues that this can be compared with the problems that many outsourcers are facing in third party relationships. How can they find out what a reasonable price for the service is when there are no comparable offers with which the partnership could be

compared? This lack of information (of relevant costs/prices) implies that the cost effects of a partnership can be very hard estimate.

4.7 Leasing of Assets

4.7.1 Definition - Leasing

A leasing agreement is defined as: An agreement where a lessor on specified terms during a specified period of time, provide a lessee the rights to utilise an asset in exchange for payments (FARs Samlingsvolym, 2002).

4.7.2 Classification of leasing arrangements

4.7.2.1 Finance Leasing

Under finance leasing, the rental covers virtually all of the costs of the asset, and therefore the value of the rental is equal to or greater than 90% of the cost of the asset. One effectively acquires all financial benefits and risks without actually acquiring legal title. The leasing rate is computed to collect the full value of the asset (plus finance charges) during the contract period. One usually has the option to extend the lease and as the company would have paid for almost the full value during the initial lease period, the rental payments for subsequent periods will be minimal. In a finance leasing, the assets have to be accounted for by the lessee as a fixed asset in the balance sheet. The obligation to in the future pay the leasing fees is accounted for as a debt in the balance sheet. However, these are not deductible (FARs Samlingsvolym, 2002).

4.7.2.2 Operating Leases

The lease will not run for the full working life of the asset and the lessee will not be liable for its full value. The lessor or the original manufacturer or supplier will assume the residual risk. This type of lease will normally only be used when the asset has a probable resale value; for instance aircraft or

vehicles. The most common form of operating lease is known as contract hire. Essentially this gains the customer the use of the asset together with added services. A very common example of an asset on contract hire would be a fleet of vehicles (www.1st-leasing.co.uk). In operating leases, the lessee does not have to account for these assets in its balance sheet. The differences are further illustrated in Figure 4.10.

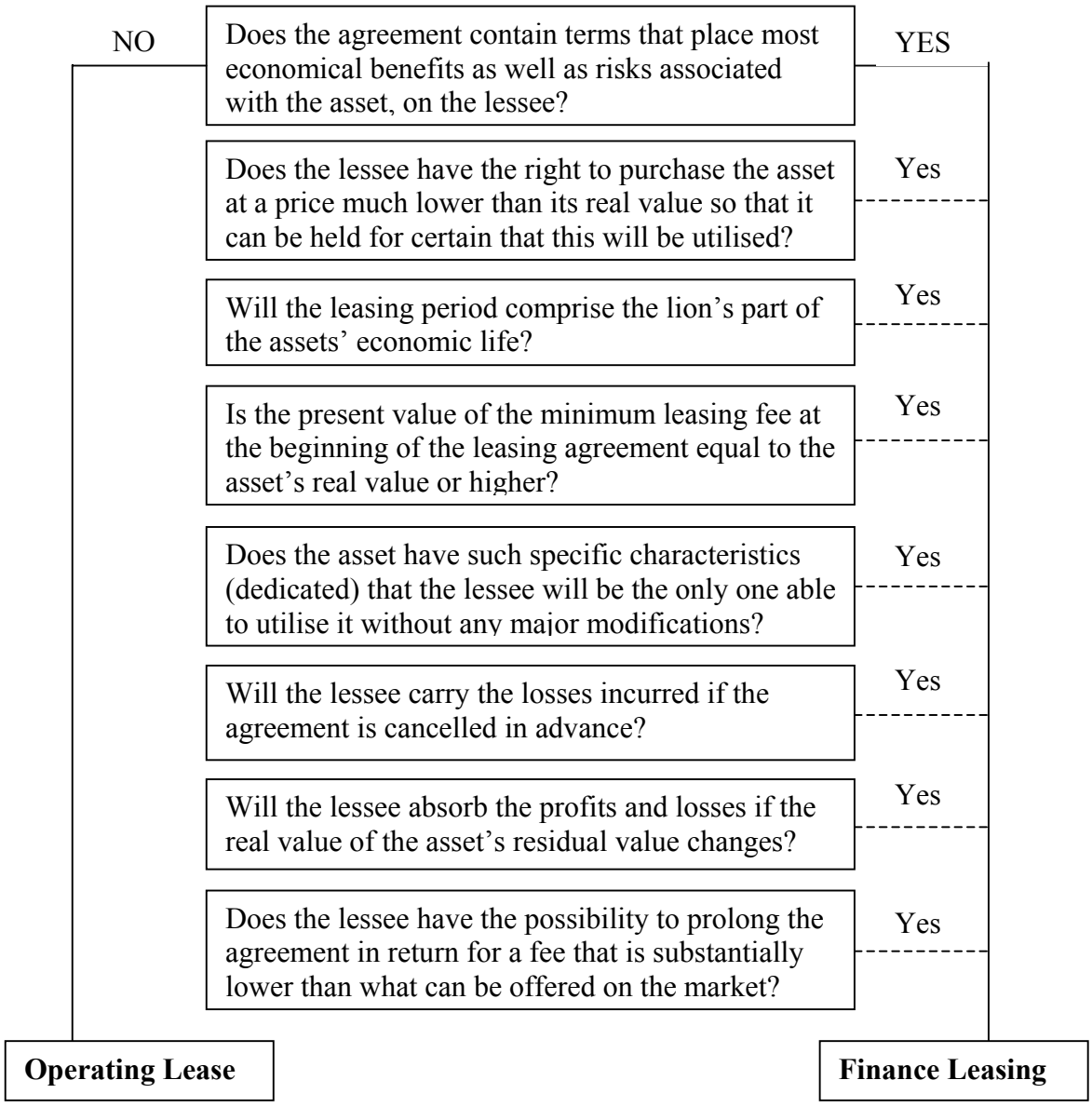


Figure 4.10: Classification of Leasing Agreements

4.7.3 The Advantages and Disadvantages of leasing:

4.7.3.1 Advantages

- Better Cash Flow

Leasing provides access to the asset with minimal up-front payments and spreads the cost over time. The company is to pay for the asset with the income it generates, while minimising the drain on its working capital.

- No debt

An operating lease preserves the company's credit options and does not influence its credit limit since it is generally not classified as a debt, but as an expense (this advantage does not apply to financial leasing).

- Maximise Financial Leverage

The lease can often finance everything related to the purchase and installation of the asset, and may free up cash-flow to pay for other activities.

- Simplified cash flow management

Lease payments are usually flat, making cash management more predictable and easier than with a variable rate loan. The fixed interest rate of a lease also helps if interest rates rise.

- Tax advantage

Operating lease payments are generally tax deductible just like depreciation charges but are made with pre-tax money. Cash purchases, in contrast, are made with after-tax money.

4.7.3.2 Disadvantages

- More expensive

A finance lease is usually more expensive than an outright cash purchase as the payments include finance charges. However, leasing may cost less than other forms of financing.

- Fixed Term.

It may be impossible, or at least costly, to terminate a leasing contract early.

- Fixed Interest Rates

Interest rates are usually fixed throughout the lease, which may prove a disadvantage in times of falling interest rates (www.1st-leasing.co.uk).

5 Empiric Research

5.1 Introduction

In our report, the ultimate purpose of the empiric research is to understand the current packaging strategies for P2 and for the up-coming P1. P2 is the common platform for the cars currently in production: P23 (S80), P24 (S60), P26E (V70), P26L (XC70) and P28 (XC90). Likewise, P1 is the common platform for the cars that are to be produced in 2004, P11 and P12.

In order to gain this understanding, we have investigated the various processes involved in the development of Typebound (TB) packagings. The areas subjected to this research are the organisational structure of the Purchasing division in which our principal Supply Chain Development are part of, and their responsibilities. VCC's production processes (Order to Delivery) and project development processes are also outlined.

Then we aim to explain what TB packagings actually are, and for what purposes they are used. This part is based upon the first interview we had with our supervisor at VCC, Björn Mattsson. From the answers we got, we investigated the details surrounding the development of TB packagings, working procedures and the involved stakeholders, the roles of these stakeholders, and the flows in which these packagings are involved. To gain a holistic view, we also take a brief look at Volvo Logistics Corporation (VLC) and its supervision of the Emballage Pool and Standard packagings.

As mentioned above, this is made to understand the packaging strategies for P1 and P2. The reason for this, in turn, is to come up with viable solutions regarding the outsourcing of ownership and responsibility to external service providers. These alternative solutions will be presented in part 6. The evaluation of both the current strategies as well as the scenarios we are to present, is carried out in the Analysis part of this research.

The information regarding current practices was obtained both from interviews we carried out at the involved departments at VCC and through VCC's Business Management System (BMS) on its intranet. The interviews used in this part can be seen in Appendix 7.

5.2 Organisation & Structure

5.2.1 Introduction

In this first part, we will describe the Purchasing organisation and our principal, the Supply Chain Development department. This will be followed by explanations of which processes and other activities our principal is involved in when a typical car project is initiated. We will also explain the other departments and their activities that are working in the logistics arena at VCC.

5.2.2 The Organisation

The bulk of all logistics operations and activities are placed under the central Purchasing organisation, named 53000, which is responsible for the whole purchasing function at VCC. Figure 5.1 below illustrate how this organisation is split into sub-groups, which each have their particular responsibilities.

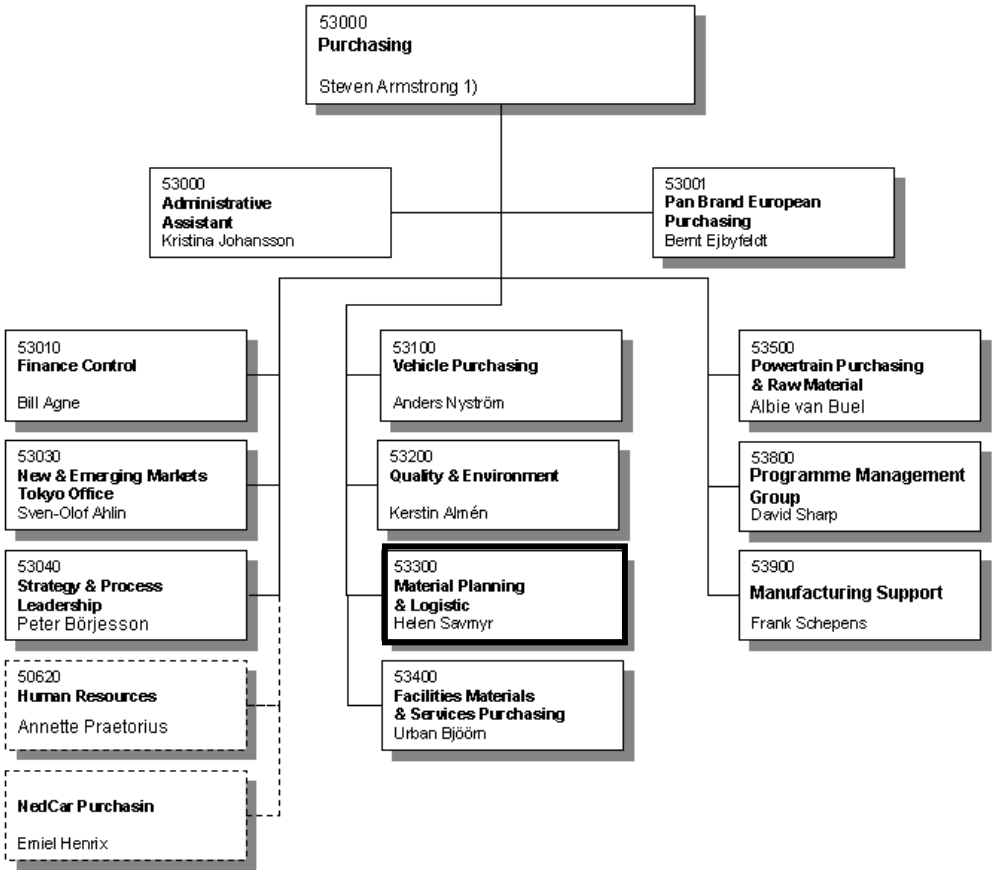


Figure 5.1: The Purchasing organisation

5.2.3 The Principal – Supply Chain Development Business Unit

The business unit that employed us to conduct this research – the Supply Chain Development Department – lies under Material Planning & Logistics (MP&L), which is one of the sub-groups that are illustrated on the previous organisational map. In addition to our principal, Capacity Planning, Vehicle Programs Development, Material Planning, and MP&L IT Development, are parts of MP&L, see Figure 5.2 below.

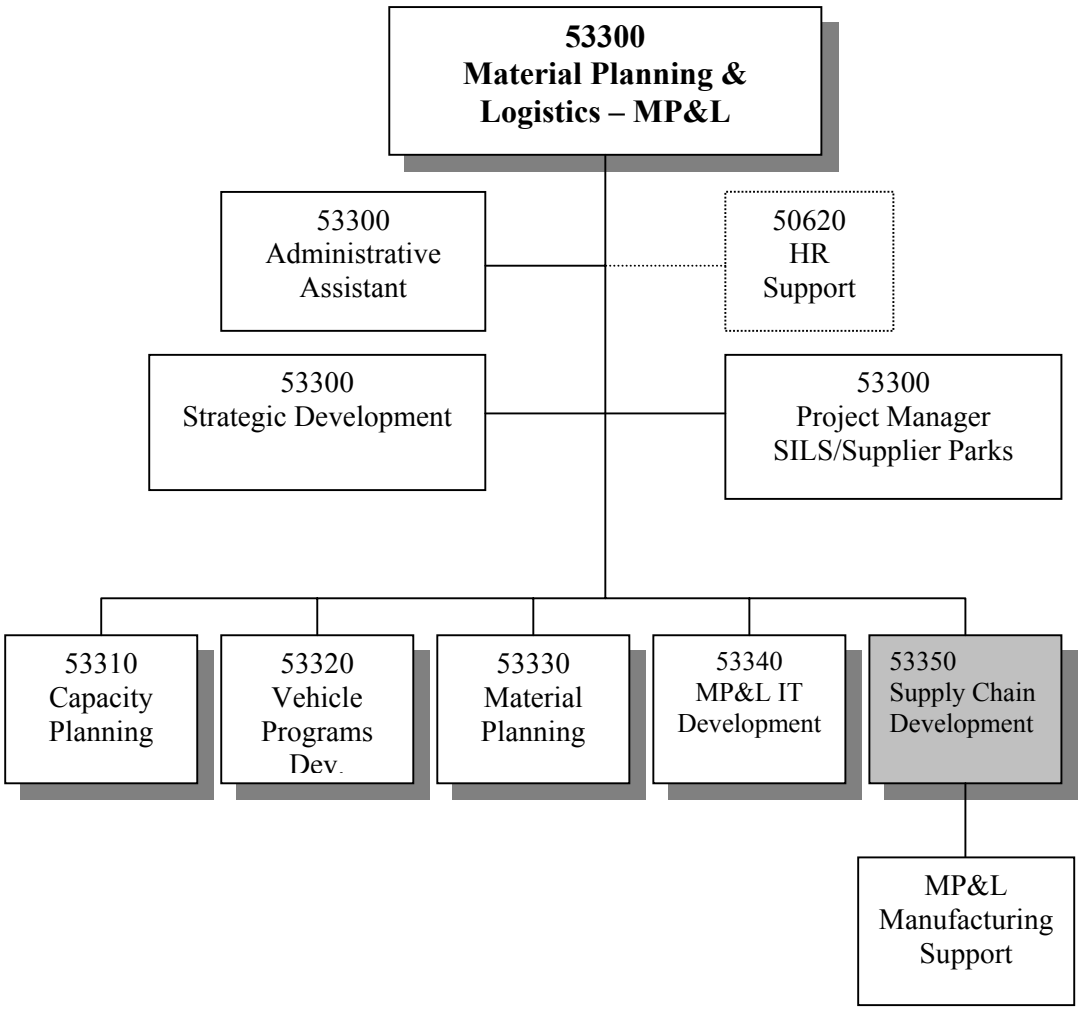


Figure 5.2: The MP&L organisation

5.2.3.1 Brief Activity Descriptions: MP&L and its business units

53300: Material Planning & Logistics, MP&L

The head of this organisation is responsible for the overall development and to guarantee and secure that the material flow in the inbound logistics function works within the Order to Delivery process (OtD, explained at a later stage) and the PD process (Product Development). Particular consideration is placed on lead-times and volumes as well as on production material suppliers within the logistics arena. In addition to this, it handles the following major tasks regarding logistics operations:

- Vision
- Strategy
- Cost Development
- Competences

53310: Capacity Planning

- Secure the purchased/acquired capacity and make it known within VCC
- Act as the Purchasing Organisation's (53000) interface to VCC's other organisations needing information regarding capacity issues
- Make sure that processes, tools and routines are developed for capacity securing within 53000
- Manage investigations concerning capacity change / increase (Capacity Increase Request, CIR) and decrease
- Ensure that purchased capacity is adopted to variations in market demands
- Ensure that information regarding production volumes is spread across 53000

53320: Vehicle Programs Development

This business unit is responsible for all logistics activities within the PD process for "first tier suppliers", i.e., in the Concept phase, Pre-study and Industrialisation stages*, with focus on time (Project gates), costs and quality.

53330: Material Planning

- Initiate projects and product changes at external assembly- and manufacturing companies
- To represent 53000 in ensuring that new industrial structure is funded by R&D
- Analysis, corrections and time-setting of new product structures
- Secure orders of tools, production material and other equipment
- Introduction of continuous changes and improvements so that material scarcity, costs, excessive inventories, production disruptions and quality problems are avoided

53340: MP&L IT Development

- Should work as a competence centre for MP&L in IT and EDI
- Define and develop MP&L IT strategy
- IT connection with suppliers within MP&L
- Follow-up of MP&L IT in car projects

53350: Supply Chain Development

- To define process-ownership for OtD Material Distribution
- Responsible for transportation and relations with Volvo Logistics (inbound)
- Transport development in co-operation with Ford and PAG
- Standard packaging and relations with Volvo Logistics (packaging)
- Typebound packaging with process-ownership for construction and ownership
- Packaging development in co-operation with Ford and PAG

* These stages are described in more detail later in the chapter

MP&L Manufacturing Support, a sub-unit of Supply Chain Development, is responsible for:

- Logistics within 53000 according to Joint Procedures, after hand-over
- Problem-solving after coordination from VCC Manufacturing Plants
- Capacity-, flow-, and maintenance optimisation of typebound packaging
- Cost efficiencies and quality improvements of VCC's logistics processes

Having explained all the departments and their responsibilities within MP&L, we will now take a look into how VCC actually build their cars and where in this process our principal takes part.

5.3 The Order to Delivery Process

Apart from a few exceptions, all production of cars within VCC is carried out in an Order to Delivery process. Briefly, this means that every single car is built with its unique specifications placed forward by the end-customer. There are basically infinite numbers of different options a customer could combine in order to obtain the optimal vehicle according to his or her preferences. With the Order to Delivery process, VCC manages to obtain a high degree of customisation, thus providing high customer value. However, such a system puts high demands on corporate activities and synchronisation of the various organisational functions. This process is shown in Figure 5.3.

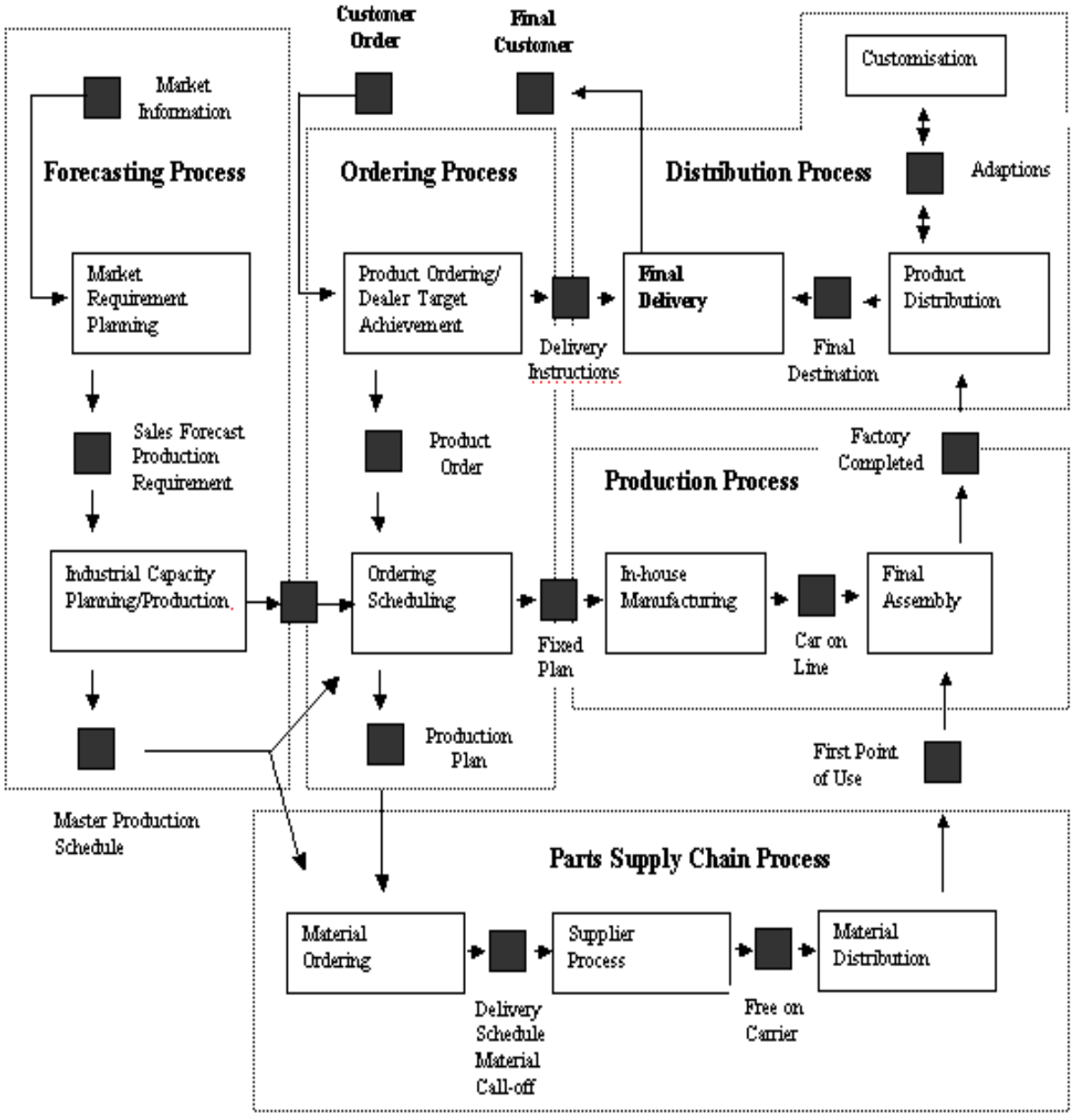


Figure 5.3: The Order to Delivery process at VCC

5.3.1 The various functions of the Order to Delivery process

The core functions of the Order to Delivery process are the following:

- Forecasting process
- Ordering process
- Production process
- Parts Supply Chain process
- Distribution process

5.3.1.1 Forecasting process

The basic function of the forecasting process is to forecast demand. This is done through consideration and evaluation of market information. By this, a sales forecast is retained and planning of an array of production related activities can begin.

5.3.1.2 Ordering process

In the ordering process, the incoming customer order is managed and a complete order scheduling can be performed. It is vital that the forecast done before the industrial capacity planning is close to actual market demand to minimize complications that may later appear in the production process. This due to the fact that almost all the planning activities and co-ordination measures is being carried out well in advance. When the ordering scheduling is completed, a production plan is sent to those involved in the supply chain process. This in order for them to arrange all components and parts needed from outside suppliers.

5.3.1.3 Production process

A fixed plan is sent to Plant A (body manufacturing plant) which commence the work of building the ordered car. The body is then painted in Plant B and sent to Plant C (Trim and Final Assembly Plant) for final assembly. This last plant is of course the one where the huge flows of articles enters. Decisions

regarding which articles and the quantity of them that should be delivered to the right place and at the right time are then planned and outlined in the parts supply chain process.

5.3.1.4 Parts Supply Chain Process

In the parts supply chain process, material is ordered according to the production plan sent from the ordering scheduling. The responsibility of this function is to secure the material flow from outside suppliers and to bring the components in to the Trim and Final Assembly Plant. Here is where our principal, Supply Chain Development, is involved. Some of their responsibilities are the development and supervision of the packaging devices in which articles and components are packed. The packaging solutions are extremely important in order to enable process-effective assembly of the cars.

5.3.1.5 Distribution Process

When final assembly is completed, some additional adaptations to customisation can be made. Thereafter, the finished product is channelled through the distribution process to dealers and customers via the final delivery function.

5.4 Product & Process Development

So far, we have described the Purchasing Organisation, MP&L, where our principal is positioned and what it is responsible for. VCC's production system, the OtD process, has also been outlined. This part deals with VCC's Product and Process Development system. Regardless of where in VCC's organisation one work, every sub-organisation involved in the planning of activities has its own particular Product and Process Development procedures. In order to illustrate the development process of Typebound packaging, MP&L's Product and Development process chart is used, which focuses only on activities related to logistics. This shows where in the chain of events that packaging issues are planned and worked on. The stages and activities are then explained. See Figure 5.4.

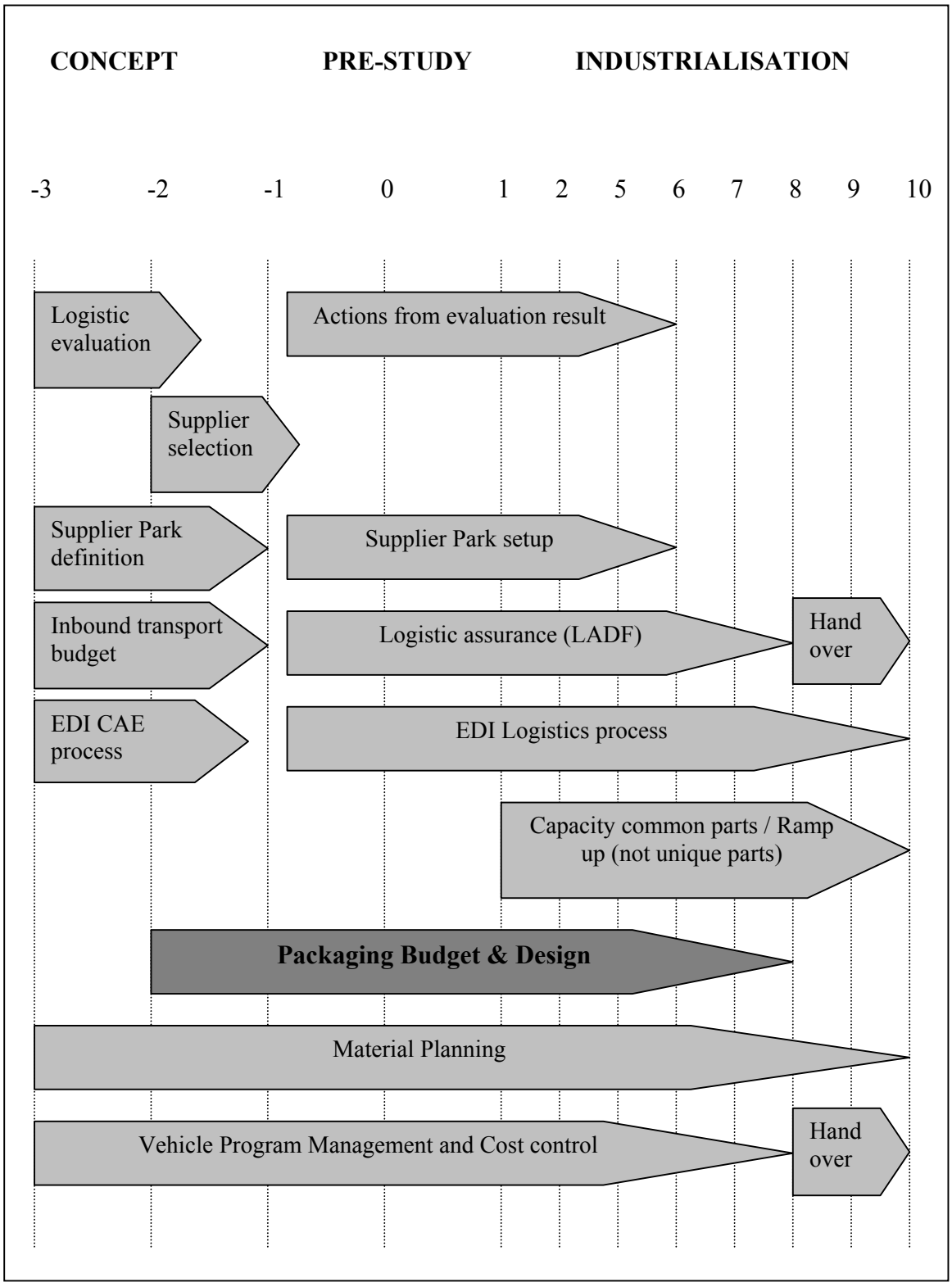


Figure 5.4: Product and Process Development, MP&L

The figure illustrates the production and process development for a car model project in a logistics and supply chain setting perspective. There are three main phases in this development: the Concept phase, the Pre-study phase and the Industrialisation phase. These phases are in turn divided into so-called "project gates", ranging from gate -3 to gate 10.

5.4.1 Concept Phase: Gate -3 to -1

This phase starts around 3,5 - 4 years before actually building the new car, SOP (Start of Production). In terms of the product itself, proposals of rough features and design are evaluated, and then the basic structure of it is drawn and constructed virtually. A product price and Entry Ticket (the total development cost of a car model) is estimated and set. In terms of processes, a preliminary industrial structure is analysed and evaluated, i.e., supplier park descriptions, supplier selection and EDI requirements. All systems in the car are defined, and so are also all the systems in the processes needed for production. Logistics requirements are defined and the selection of article suppliers begins. It is also in the concept phase where investigations of the need for TB packagings commence.

5.4.2 Pre-study Phase: Gate -1 to 1

In this phase – ranging between three and one and a half years prior SOP – the car model's preliminary design is finished, and detail construction starts. The Entry Ticket plus the Added Value (manufacturing cost) are also defined. Finally, the product design is finished and the bulk of all projects needed for manufacturing starts. The Supplier Park set-up process is initiated, and so are the activities related to logistics assurance along with the EDI logistics process.

5.4.3 Industrialisation Phase: Gate 1 to 10

This phase ranges between one and a half years prior to SOP to three months after SOP. Firstly, all the materials and equipment needed for producing the car is completely defined. Then starts the construction of prototypes. Pre-tryouts and tryouts are carried out in order to verify correctness of production

processes and materials. At Gate 8, SOP is initiated in the manufacturing facilities. At Gate 9 the product quality is evaluated and if everything seems all right, the cars can be delivered to the dealers. At Gate 10, approximately three months after SOP, process development projects are called off.

From Figure 5.4 we can see that the area we are involved in, Packaging Budget & Design, span between a very early stage in the development process, Gate – 2, and SOP at Gate 8. This is due to the fact that the articles needed for producing the cars are useless unless the packagings for them are constructed in a way that secure both their quality and transportability as well as the overall assembly efficiency requirements. These demands on the packagings are explained at a later stage in this paper. Next, we are going to define the different types of packagings that VCC uses, what TB packagings actually are used for and their features.

5.5 The Packagings

5.5.1 Introduction

In order to understand the basics of what we were to investigate, we started out by conducting an interview with our supervisor at Volvo, Björn Mattsson, who is the Project Manager and Process Owner at the Supply Chain Development department. The questions asked were of a quite general nature so that we could clearly understand what Typebound (TB) packagings actually are, and the uses and importance of it. Below is a revised version of the questions asked and the answers received.

1. Which are the different types of packaging devices that VCC uses?

"The packagings could be categorised in two main groups, Standard packagings and Typebound packagings. The Standard packagings are owned and supplied by Volvo Logistics Corporation (VLC), for which we pay a transaction cost every time we use them. Examples of these could be Volvo pallets and Volvo boxes. A TB packaging is a packaging device that is solely used for one specific group of components or articles. This packaging can or should not carry any other articles than what it is designed for. So in other words, it is not a standardised packaging which could suit many different purposes and carry huge varieties of components or articles."

2. What different types of TB packagings are there, and can they be categorised in terms of materials used or design and construction?

"There are many types of TB packagings which can be classified according to its materials. The main ones are steel racks, EPP (expanded polypropylene), vacuum packing and EPS (expanded polystyrene). Of these, steel racks are the most frequently used."

3. Who is responsible for the construction and manufacturing of TB packagings?

"This is dependent upon which platform we are talking about. The general strategy for P2 is that VCC develop and own the TB packagings. Regarding the P1 platform, it was decided that the article suppliers were to develop, after our specification, and own the TB packaging that carry its articles. Starting with P2, which is the platform currently in production, there are basically two different ways to go at present– the first is where a VCC consultant constructs it in-house by drawing it in CATIA according to our specifications displayed in Template 1. This Template is the working document that is used by those involved in the development of a specific TB packaging. However, a car model requires approximately 100 types of TB packagings, and this consultant cannot manage all of them. There is unfortunately a lack of people knowledgeable in Catia internally. This is where the second way comes in. A packaging manufacturer places a quotation for building them after it has received a requirement specification from VCC. It then carries out both the detail construction as well as the manufacturing of it. So there is only a small portion of the packagings that are designed internally at Volvo. In any case, the final manufacturing of it is always placed on an external manufacturer. For P1, we send the specification of the TB packaging to the article supplier, who becomes responsible for both supplying it as well as owning it. The cost of this is added to the piece price per article."

4. Is the design and construction of them based upon some kind of modular system, where basic blueprints and layouts exist?

"Many logisticians and other people are involved in the design and construction of these packagings, and of course there are differing views and ideas of how to deal with this. A standard is required, but this is by no means easy to produce. However, a conceptual idea does exist within the organisation."

5. How long time does it take to develop a TB packaging – from the need to actual usage in production?

"The development of them is positioned at a very early stage of the planning phase, around 1 to 1,5 years prior to production. MP&L has an engineer involved in the pre-studies and at the design stage of the processes in order to

be updated on the latest information. In addition, this individual contributes with ideas regarding packaging solutions and other standpoints on the development. When the projects are formally initiated, resources are pushed in to start developing them."

6. Which are the main kinds of flows that the TB packagings are involved in?

"Almost all components and articles are involved in either sequential flows or batch flows. Sequential flows are, for example, those that arrive to the Trim and Final Assembly plant several times a day. Many of these flows originate from the Supplier Park at Arendal, which is situated just a kilometre or two from Volvo. Batch flows of components are those that, for example, arrive to Volvo 10-12 times a year. These components and articles are sent from suppliers located in all over Europe, Japan and the US. However, it can be said that far higher demands are put on the typebound packagings that are involved in the sequential flows. Due to their delivery frequency and loop rate, the demand on ergonomics, handling capabilities, production line fitting, quality and durability etc. is much higher."

7. At what type of production change needs the TB packagings to be replaced?

"Most typebound packagings are developed for one particular platform or car model, which make them useless when it's abandoned after a few years. Some sequential racks must be able to suit articles for more than one car model (for example V70 and XC90), since they have the same assembly point on the assembly line. So when the articles have the same assembly point for two different car models, they all have to fit into the same rack in the same flow. This is somewhat of a headache – it's not optimal to have, for example, two different types of front bumper articles in the same rack. It's a very complex operation when more than one car model is assembled on the same production line, which wasn't the case before. Currently at Volvo Torslanda (VCT), four models are being built on the same assembly line: S80, V70, XC70 and XC90.
Even "facelifts" (minor changes of the car, such as new lights, panels etc.), which occur every two or three years, create problems. This is because it is not

certain that the new, modified articles fit into the previously used packagings anymore."

8. What happens with the TB packagings when they get obsolete or when a car platform is abandoned?

"We try to the greatest extent to re-use it for the next car model or platform. But the fact is that most of them are smashed up or partially damaged after approximately five years, due to rough handling and transport etc. There are also some work/environmental-related reasons to why some of the racks are being scrapped – many of them are warm galvanized, which means that they are either toxic or very difficult to weld and to handle. If this is the case, they are sent for recycling to Stena Metall."

5.5.2 Packaging Uses and Features

To give some kind of idea of the uses and features of the two different packaging devices, the following general guidelines are defining what parts and components Standard packaging and TB packaging are used for respectively:

5.5.2.1 Standard Packaging

- Fasteners (bolts, nuts clips etc.)
- Steel parts
- Rubber parts
- Interior parts without sensitive surface, i.e. boot interior (no scratch risks)
- Pipes, hoses, wires

The standard packagings are various dimensions of Volvo pallets and plastic/wooden boxes that can carry a huge variety of components or parts that do not require unique packaging solutions or take up huge amounts of space next to the assembly line.

5.5.2.2 TB Packagings

- Painted exterior parts, front and rear lamps, door mouldings
- Parts with sensitive surfaces, i.e. chrome, aluminium, interior parts (scratch risks)
- Parts where lifting tools are used

As indicated in the interview with Björn Mattsson, the TB packagings are used in numerous sequential flows, and are solely used for specific components, i.e., it is a packaging device that is uniquely constructed to contain a certain article that could not be packed into standard packagings.

The TB packagings are predominantly made of steel (steel racks), EPP (Expanded Polypropylene), EPS (Expanded Polystyrene), and vacuum formed packagings. In addition, corrugated boxes, plywood boxes, foam products, and a variety of plastics are also used to some extent. The cost of these packagings vary rather extensively, some of them could cost up to 40.000 SEK per piece. Next are the most common ones described and illustrated.

- Steel racks

The most frequently used TB packagings are steel racks. The simplest ones are mostly used to store bulky articles that are relatively insensitive to shocks and blows. Others contain additional inner packagings to carry more sensitive articles.

- Foam Products

A large variety of foam products are used for many applications: for thermal and acoustic insulation, for sealing, shock absorption, vibration damping, and cushioning for automobile components.

- EPS

The material EPS consist of 98% air, contained in 2% polystyrene cells. EPS protect automobile components against shocks, blows, pressure and vibrations and isolates them from air, moist and thermal conditions.

- EPP

The material EPP offer outstanding temperature resistance and flexibility. Similar to EPS, it protects components against shocks, blows, pressure and vibrations.

- Vacuum Formed Packagings

A print is made from a specific article, which is then cast to produce a form. These vacuum formed packagings are used to store articles that, by this, take up a minimal amount of space in the overall packaging device at the same time as it is protected against shocks and blows.

5.6 Working Procedures and Responsibilities

5.6.1 Template 1

Template 1 is the working document that is jointly used by the different functions within VCC, and possibly also some external actors, when developing a TB packaging. Each article and component has its own working document for the packaging development. It serves as a verification and validation checklist of how its development is proceeding; outlining the preferences and prerequisites of the TB packaging device; its features (weight, height, width, length etc.); design reviews; volumes needed; cycle time calculation sheets; which problems that may occur; concern and corrective action reports; which key people/functions that should be involved in the process; and what demands they have. In short, this working document sums up

all the demands brought forward by the involved functions in order to evaluate and come forward with the most suitable solution. A consensual approach is taken to find the most optimal packaging device, which in the end is a compromise of many interests – production line fitting, cost control, handling issues and ergonomics, efficiency issues, transportability, durability, tooling-needs, and many more aspects. This working document is shown in Appendix 1, which in this particular case deals with emballage 4100, a steel rack with inner vacuum formed boards that should carry inner ceilings to P11, P12 and S60. Below, the people/functions that usually have the most prominent roles in the development of TB packagings in Template 1, are briefly explained:

- Purchasing Logistic Engineer

Is the person that is responsible for packaging devices for a number of components and articles. The responsibility depends a bit upon whether the packaging is VCC-owned (P2) or is to be Supplier-owned (P1). If Supplier-owned, the responsibility is to put forward the various demands and specifications (derived from Template 1) that are placed on the packaging device and on the component supplier itself. If VCC-owned, he initiate meetings with involved parties and has an overall responsibility of the particular packaging.

- Process Owner

This person has a more strategic responsibility in the process. He is in charge of the overall development of the packaging process within the PD- and OtD process, and contributes to and run projects in conjunction with PAG and Ford concerning new concepts for future TB packagings and methods. Analysing SMFs (synchronised material flow), to secure virtual verification of packaging activities, and cost control, are also within his responsibility. In addition, he is to evaluate and conceptualise the transferring of packaging responsibilities (P1) and carry out negotiations regarding the contracts surrounding them.

- KU (Konstruktions-uppdragsgivare)

KU is the person that is responsible for coordinating an array of activities, such as arranging meetings between the various people involved in the process, and keeps everybody updated and informed about the latest developments. So the KU's main function is to have the overarching coordinative responsibility of a specific article, and its packaging, as well as the supervision of costs and time-schedules incorporated in this work.

- Purchasing Quality Engineer

This person is responsible for quality control- and assurance, and is working with securing that the quality of components and articles as well as of suppliers, remain at high levels. Undoubtedly, this function is of major importance to the final end product of this process.

- TB Packaging Supplier/Article Supplier

For obvious reasons, the TB packaging suppliers/article suppliers have to be selected according to their competencies and capabilities. When selected, the supplier has to make inputs in the process regarding operational and manufacturing-related issues. A Target Agreement regarding the article price is carried out, and responsibilities, such as the provision of TB packagings, of the supplier are defined.

- VCC Plant Logistic Engineer

One responsibility is to gather and coordinate the different views and opinions from the production personnel and their managers in the Trim and Final Assembly Plant regarding TB packaging. Contact with the Manufacturing Engineer (explained below) takes place on an almost daily basis. Another responsibility is to receive and coordinate the vast amount of articles that are unloaded at the docks in the plant, as well as controlling transaction costs of standard packaging.

- Manufacturing Engineer

It is the manufacturing engineers' responsibility to develop process-effective assembly solutions, and incorporated in this is the task of putting forward demands and specifications regarding the properties of the TB packaging. For example, it should take up a minimal amount of space in the plant, it should be ergonomically adapted, and it should be efficient and easy for the assembly personnel to quickly unpack the article from the packaging.

- CATIA Design Engineer

The main responsibilities this person has is to construct 3D models in CATIA of TB packagings according to specifications drawn by the team involved in the development, and to examine and make construction standards for them. He also follows the development of new materials used in the packagings, and receives 3D-models from suppliers and put them into VCC's computer system. Evaluation of material solidity and tenacity is also included in the work. An example of how the design is carried out of the previously mentioned emballage 4100 is shown in Appendix 2.

- Facilities Materials & Services Purchasing (FM&SP)

This person/function purchase non-production related materials such as packagings, office stationary and whole facilities. He places the manufacturing task of TB packagings on tender by a Request for Quotation (RFQ) if it is to be VCC owned.

5.7 Development of Typebound Packaging

In this part, we aim to visualise the process of VCC's packaging development, i.e., the procedures of defining the type of packaging that is needed for a specific article or component, and how the packaging devices is to be acquired. The two options at hand are: (i) to use an existing standard packaging (ii) to develop and use a TB packaging device. Additionally, if a TB solution is chosen, VCC either order and purchase them from an external packaging manufacturer (P2), or make the component supplier responsible for attaining them (P1).

This whole process consists of a General Phase combined with any of the alternatives shown below (for each packaging):

- Packaging - General Phase
- Alternative 1: Standard Packaging
- Alternative 2: VCC owned Packaging, part 1 (design)
- Alternative 2: VCC owned Packaging, part 2 (purchase)
- Alternative 3: Supplier owned Packaging

The following activity maps explains how this process works in practice.

5.7.1 Packaging - General Phase

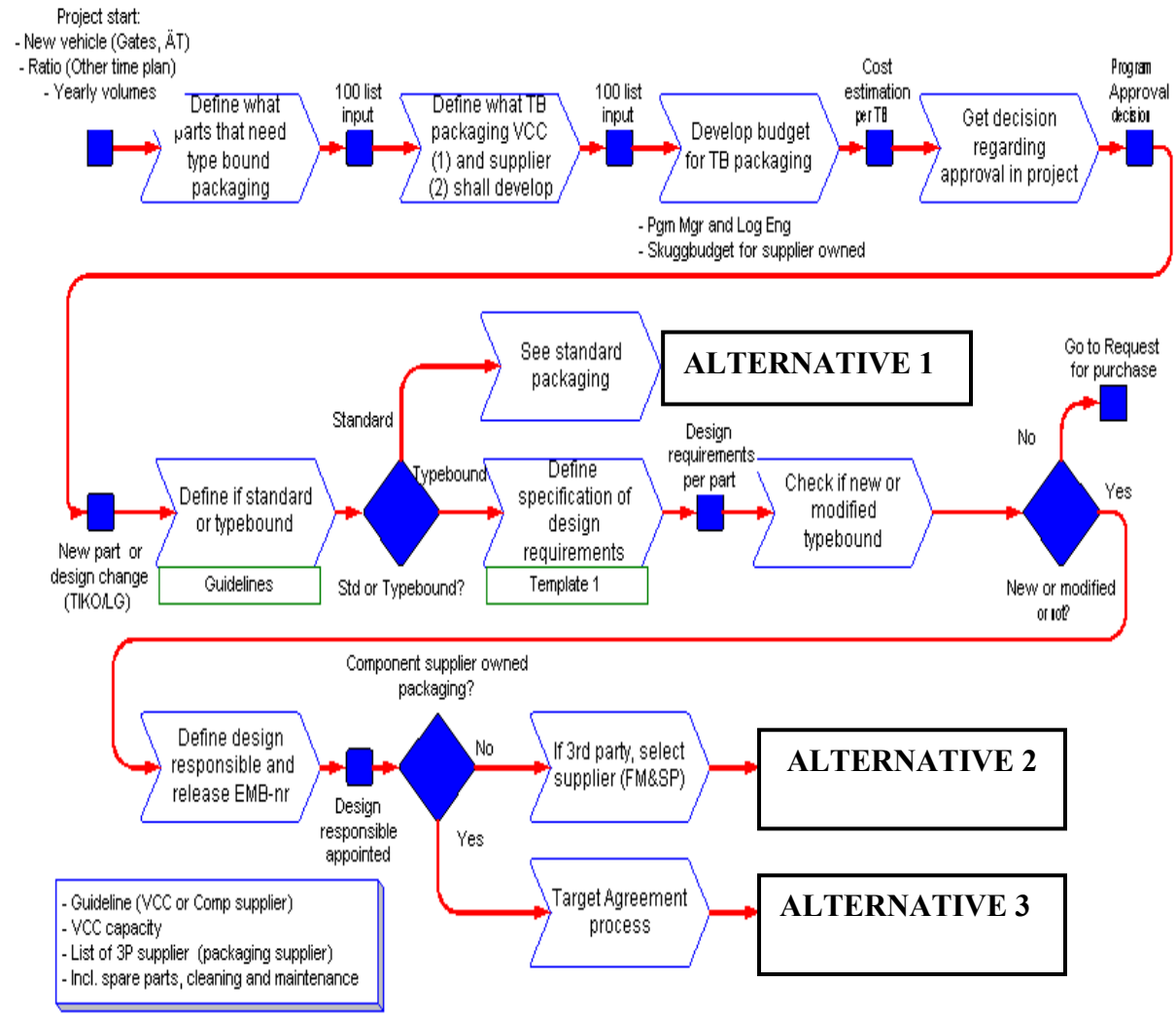


Figure 5.5: Packaging Development – General Phase

The first thing in the development process is to define which articles that need TB packagings and what types of it that needs to be produced. A shadow budget is made which needs to be approved for further development. Along this initial process, a so-called 100-list is checked. This list contains information regarding the most logistically complex articles from a packaging point of view of a specific car model. Then it is defined whether a standard (explained in alternative 1) or TB solution is required for each specific article. If it is TB, a specification of design requirements is needed. This is carried out in Template 1, which was explained earlier. Then it is outlined whether the TB packaging

already exist or if a new one must be developed. If it exists, a purchase request is sent to the provider – if not, it has to be decided whether it should be purchased and owned by the supplier or by VCC (P2 packaging or P1 packaging). If it is for P2, a third party – a packaging manufacturer – is contacted (explained in alternative 2). If they are to be supplier owned (P1), a Target Agreement process is initiated with the component supplier to negotiate solutions and costs etc. (explained in alternative 3).

5.7.2 Alternative 1: Standard Packaging

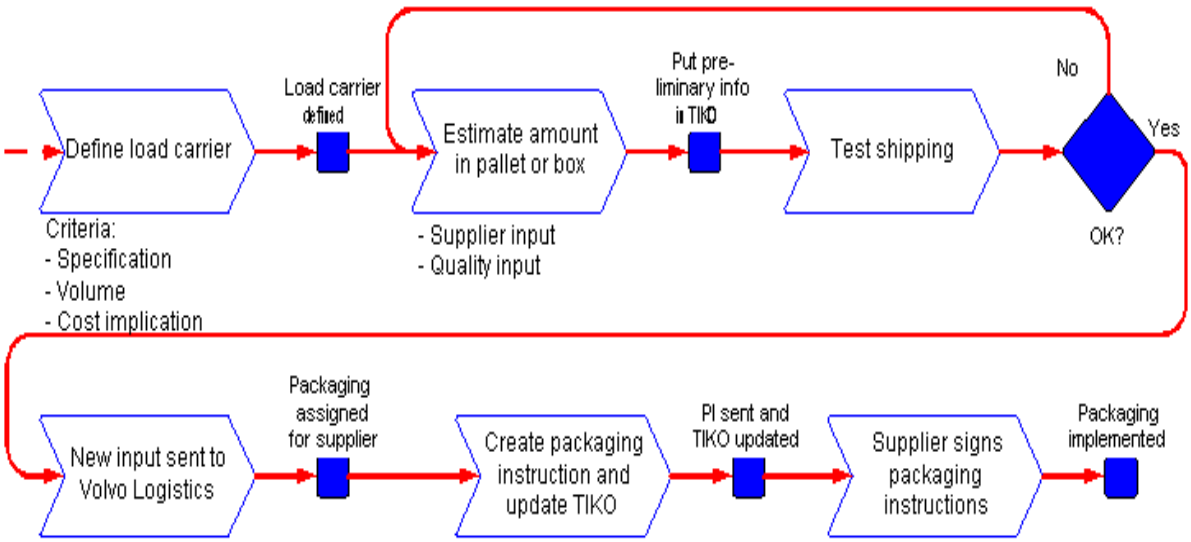


Figure 5.6: Packaging Development – Standard Packaging

For the standardised packaging devices that are to be used for the car model, the processes in the above activity map are carried out. VLC is contacted and used as the supplier since they own and handle the transports of all standard packaging. Again, examples of standard packaging could be Euro pallets, Volvo pallets and various types of Volvo boxes. Then TIKO, which is VCC's computer based purchasing system that contains information regarding component prices, volume data for each article and unit loads, is up-dated. However, this system is soon to be replaced by a new system called eVEREST. Finally, instructions are signed and the packaging is implemented.

5.7.3 Alternative 2: VCC owned Packaging, part 1 (design)

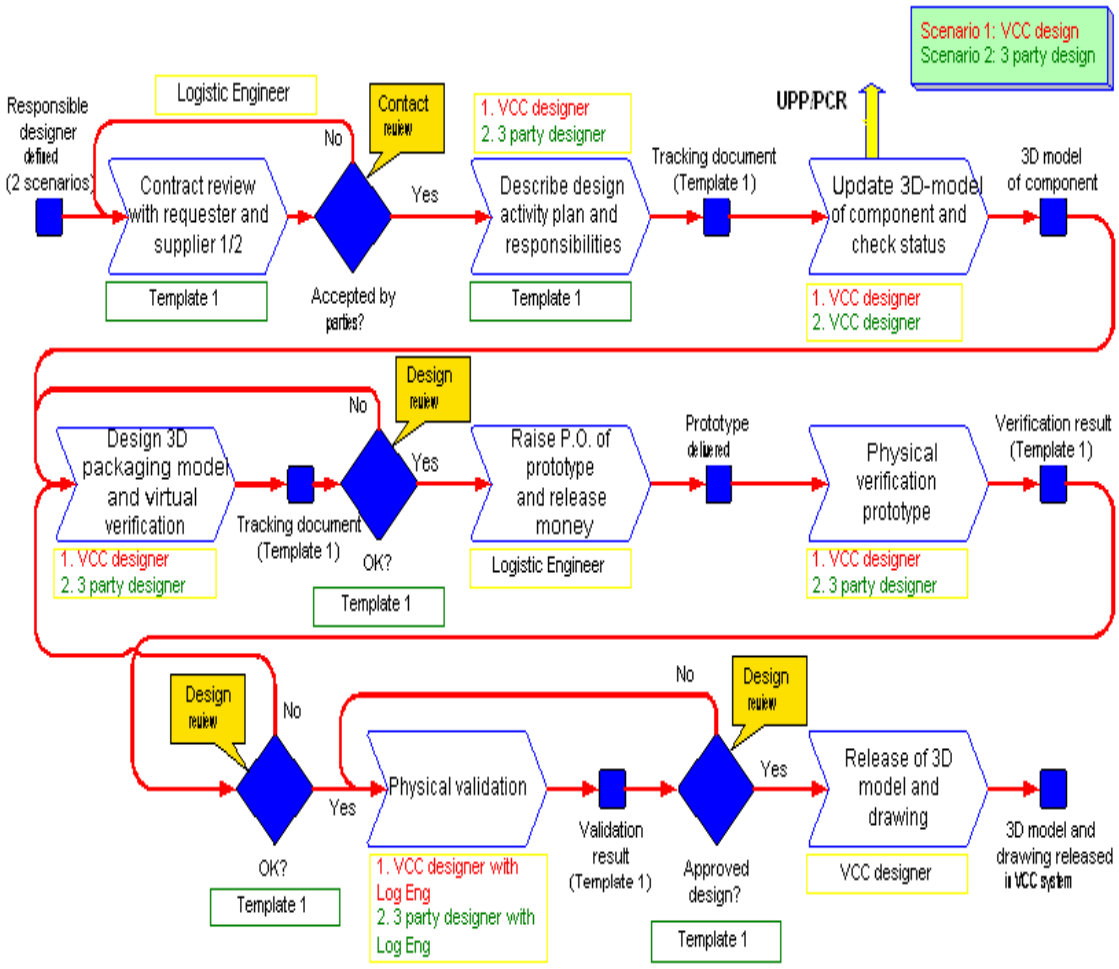


Figure 5.7: Packaging Development – VCC-owned part 1

Having defined what TB packaging to use, and that it should be VCC owned, the process above is initiated. The first thing to establish is whether VCC or the packaging supplier should make the design of the TB packaging (scenario 1 or 2). After that, reviews of contracts are held and should be accepted. Then either the VCC CATIA designer or the packaging manufacturer creates a design of it, and the activity plan along with the responsibilities of the parties involved are determined from Template 1. The 3D-model is updated, and finally designed, and if it is approved, money is released for making prototypes. Then, physical verification and validation is carried out which should be accepted and

approved in the design reviews. When design is approved by VCC, the 3D-model is released into VCC's system.

5.7.3.1 Alternative 2: VCC owned Packaging, part 2 (purchase)

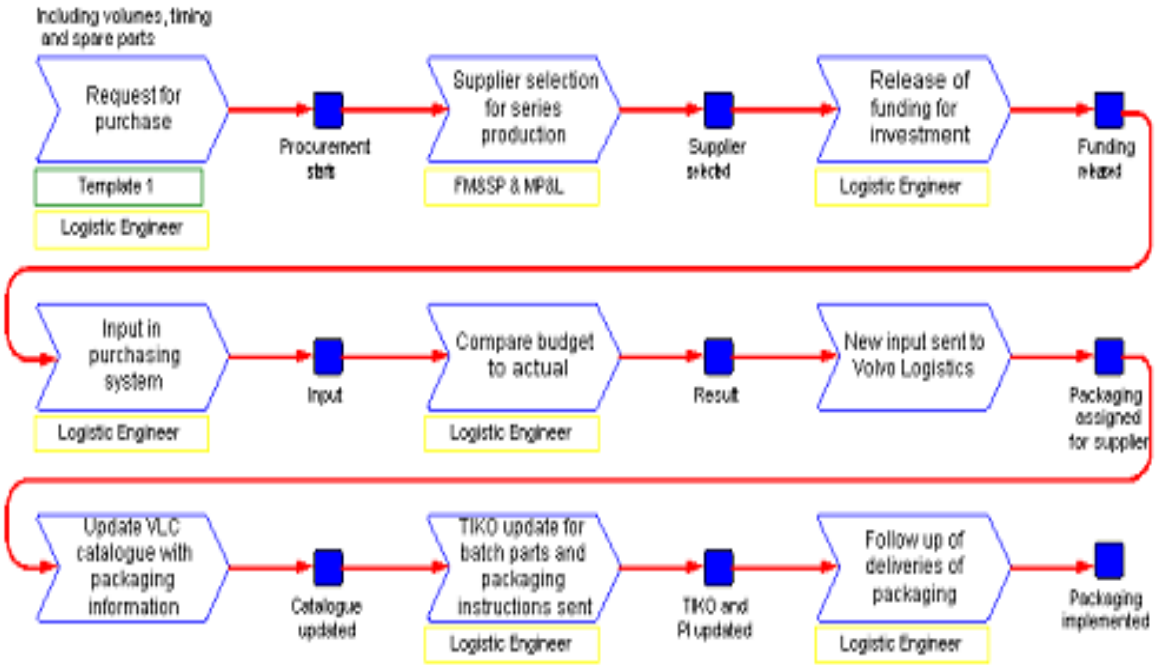


Figure 5.8: Packaging Development – VCC-owned part 2

When a prototype has been tested and approved, and everything else is settled design-wise, the purchasing process of the TB packagings begins. VCC then invite tenders for supplying the packagings needed through FM&SP. The most suitable supplier is then selected for series production and funds for investment is released. Information is submitted and integrated into the purchasing system. VLC, which handles the Emballage Pool and the Emballage Catalogue (an intranet service catalogue that displays all information regarding packaging types), is also updated on the new packagings. TIKO is updated, follow-ups are made and finally, the packaging implementation is finished.

5.7.4 Alternative 3: Supplier owned Packaging

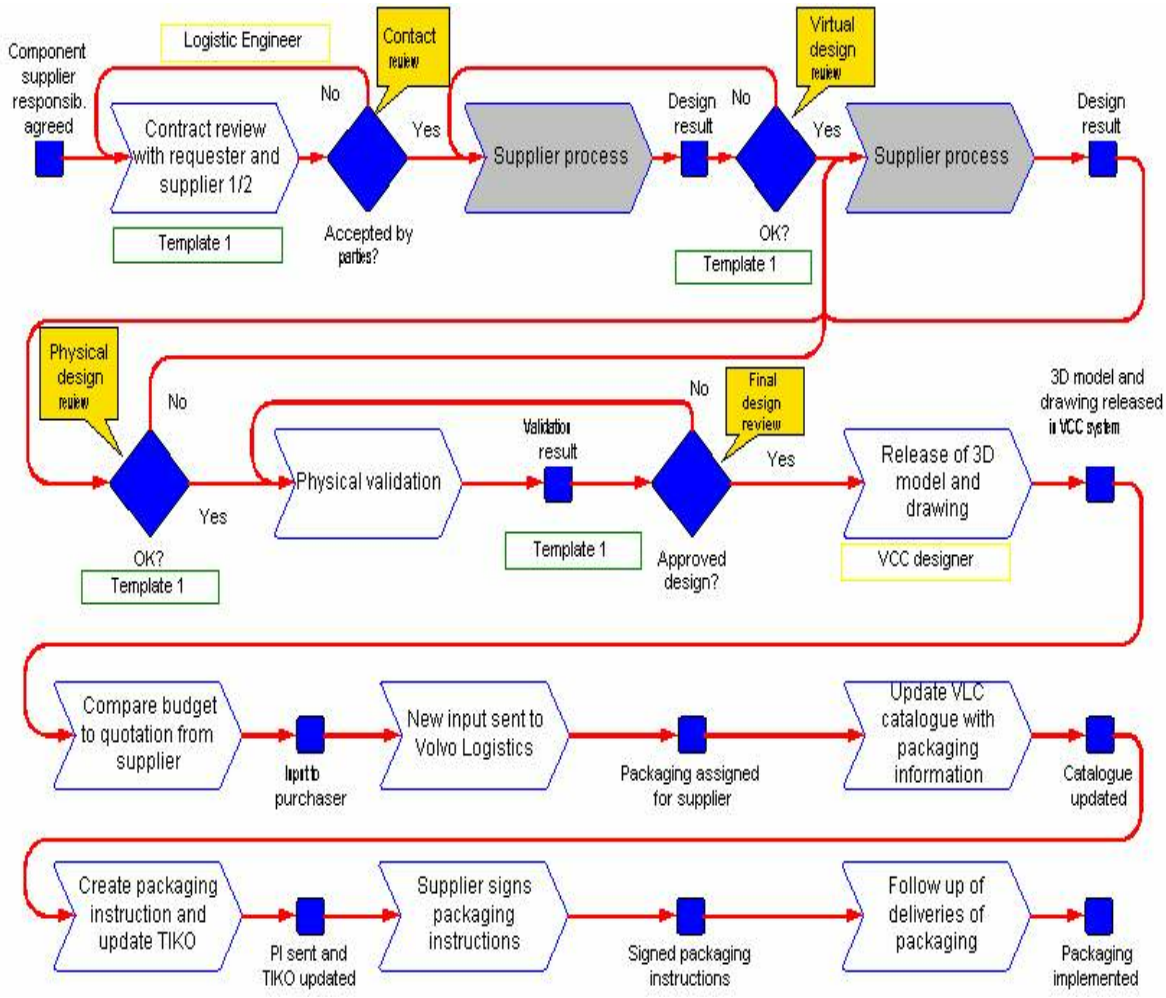


Figure 5.9: Packaging Development – Supplier-owned Packaging

In contrast to P2, the supplier for P1 now provides VCC not only with articles but also with the TB packagings. The cost of the packagings is aggregated into the piece price per article. A contract is being made up to specify each other's responsibilities. These agreements and contractual issues involving the operational procedures are outlined later in the paper. Thereafter, the article supplier works on the design of the packaging (alternately that he outsource this to a packaging supplier if he does not possess the competence), and when the virtual, as well as the physical, reviews get approved, a 3D-model is released. Budget limits are checked and information regarding it is sent forward to VLC for filing it in the Emballage Catalogue. Finally, TIKO is up-dated, packaging instructions are signed, and the system is followed-up and checked.

5.8 Article and Component Flows

As our initial interview informed us, the flows in which VCC's components and articles are involved, are divided into batch-flows and sequence-flows. Batch-flows incorporate articles that are sent in huge volumes to VCC once or twice a month. In general, it can be stated that these articles are not component-specific for a certain car produced, i.e., that they do not have anything with the end-customers' specific requirements to do (rear/front lights, specifically coloured components etc.). These articles are sent from suppliers located all over Europe, Japan and the US. Sequential flows incorporate articles that are sent in far smaller volumes but with much higher frequency, often several times a day to the Trim and Final Assembly Plant. Many of these flows originate from the Supplier Park in Arendal, which is situated close to VCT. For the V70, XC70, S80 and XC90, there are 96 commodities sequenced from a total of 19 suppliers and 90 % of these suppliers are within 5 miles of the plant. As stated earlier, due to the higher delivery frequency and loop rate, much higher demands are put on the TB packagings that are involved in these flows. Stricter demands are placed upon ergonomics, handling capabilities, production line fitting, quality and durability. Figure 5.10 below gives a general illustration of how a sequential flow from Arendal could look like.

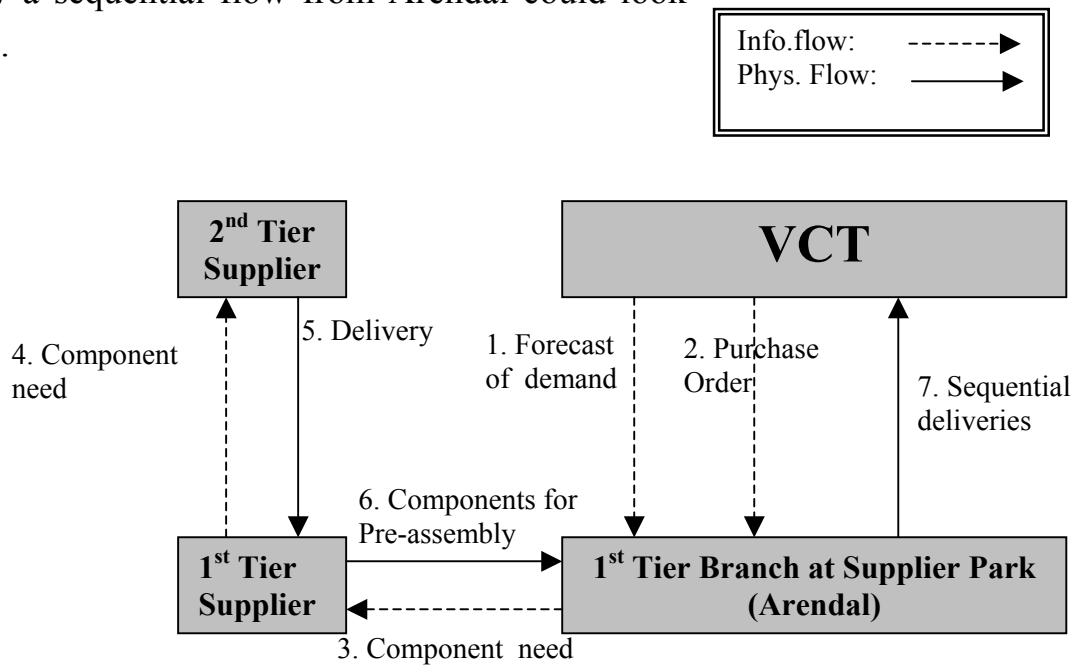


Figure 5.10: Sequential flow between Arendal and VCT

5.8.1 Flow Example – Floor Carpets from Rieter

The flows, however, are much more complex than what is illustrated in the previous figure. The figure shown next illustrates in more detail how this works. It shows the flow of floor carpets from Rieter, one of VCC's suppliers. The corporate headquarters is located in Genk, Belgium, but to be able to deliver the floor carpets in sequential flows directly to VCT, they have established a branch located in the supplier park in Arendal. See Figure 5.11.

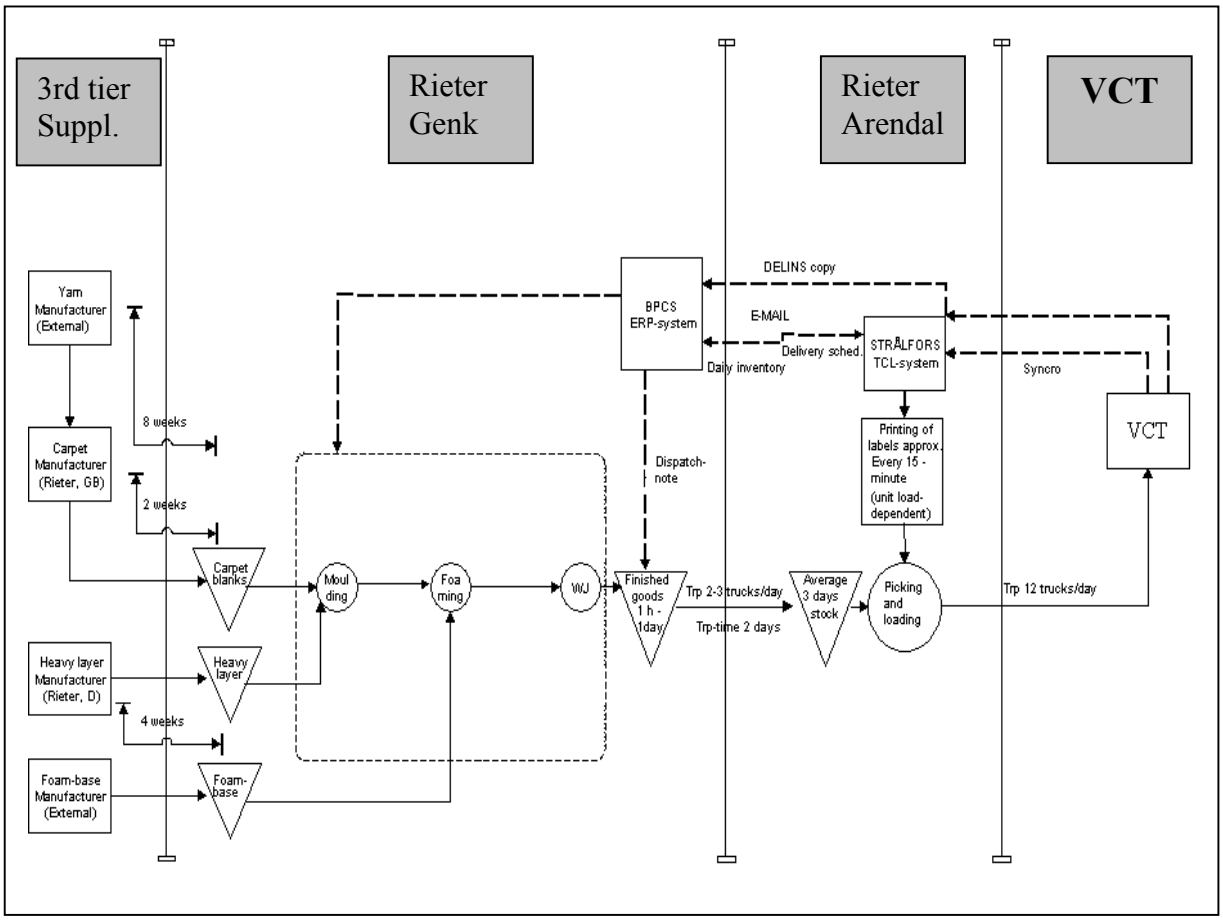


Figure 5.11: Sequential Flow, Rieter

The flow above puts high demands on structural co-ordination of activities. Forecasts of material needs are sent well in advance to Rieter. VCT then places the actual purchase order to Rieter with a 4-hour notice to delivery. Having received the order, Rieter starts preparing the delivery from Arendal to VCT. Information is constantly sent via EDI to the headquarters in Belgium regarding current stock levels and incoming orders. This information is used to produce

production plans, which in turn are used for buying material from 3rd tier suppliers. These supply Rieter with semi-finished materials needed for producing the floor carpets: carpet blanks from Great Britain, heavy layers from Germany, and foam-base from an external supplier. Then on average, 2-3 trucks per day of the finished floor carpets are sent from Rieter in Genk to the branch in Arendal, where it is labelled and packed for final delivery to VCT. In total, 12 trucks per day are unloaded at the plant.

5.9 The Emballage Pool

5.9.1 The System

The Emballage Pool is owned and administered by VLC. VLC is today a separate company as a result of Ford's takeover of VCC from the Volvo Group. However, VLC, formerly named Volvo Transport, continues to handle and coordinate all the transport-assignments ordered by VCC. Volvo Trucks and all the other companies still existing in the Volvo Group also use the Emballage Pool that is a system in which empty standard packagings, as well as TB packagings owned by VCC, are stored after they have been emptied in the Trim and Final Assembly Plant. However, the Emballage Pool does not carry out repairs and maintenance of these TB packagings. The Emballage Pool is a large, flexible system that makes it possible to create flows with a high percentage of filled packaging transport assignments. The aim of the Emballage Pool is to optimise the total logistical cost of materials handling. One of the pools is situated in Arendal, where most of VCT's suppliers are located. By using this system, VCC obtains the following advantages:

- *Storage:* VCC is able to store its empty TB packagings at low costs
- *Proximity:* It is geographically close to VCT and its prime suppliers
- *Economies of scale:* Since many users are included in the system, economy of scale is obtained due to the huge flow volumes when it comes to transport, handling and repairs (standard packagings).

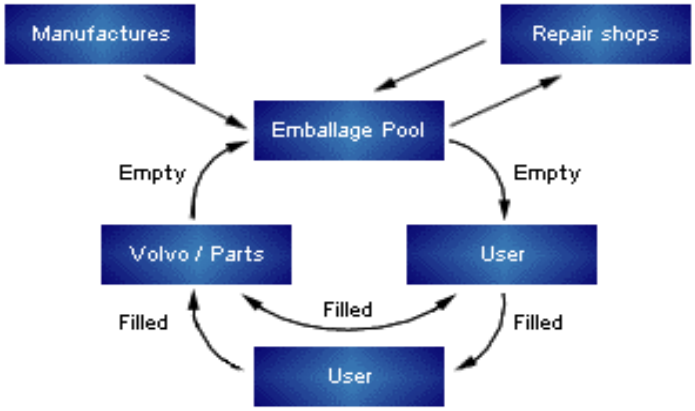


Figure 5.12: The Emballage Pool system.

The Emballage Pool is a global operation and its business concept is to supply the automotive industry with total packaging systems. VCC's packagings are transported not only from suppliers to VCC but also between different suppliers. However, for VCC and its suppliers, it is mostly used when VCC has placed a purchase order to one of its suppliers. Then this article supplier (the user) orders the amount of packagings needed for carrying out the consignment. When they dispatch the consignment to the next link in the chain, they send in a PMR (Packaging Material Delivery Note), which specifies the number and type of packaging units used.
The packaging system can be compared to a banking system. All those taking part in the chain have an account, in which they can see how many units of packagings they have received and how many they have dispatched.

5.9.2 Transaction and Leasing costs

The Emballage Pool, in other words VLC, owns the standard packagings and the lessee only pay when they use it. Regarding this range of packaging, the costs are divided into a transaction cost and a lease cost. The transaction cost, the cost of use, arises when the consignment is sent full of goods between two companies in the chain. This cost consists of purchases, returns, cleaning, repairs, scrapping, quality control etc. The lease cost occurs when VCC has the packaging in the plant. The lease cost is invoiced twice a year after the inventories. Figure 5.13 shows the transaction flow between the different actors in the system.

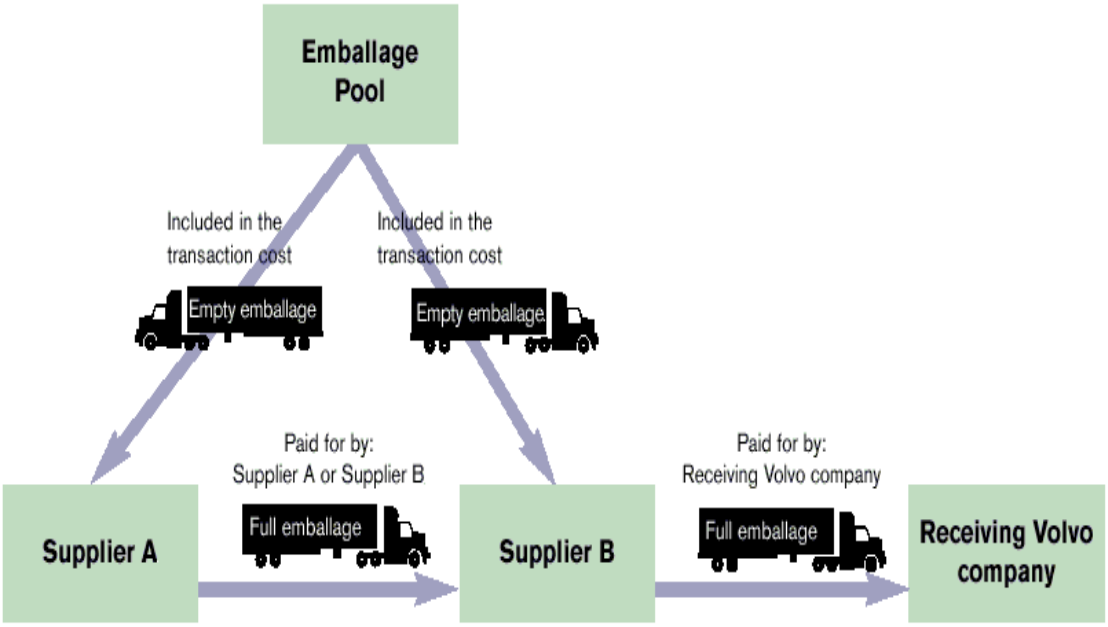


Figure 5.13: Transaction Flow, Emballage Pool

- When goods are sent between a supplier and a Volvo company, the receiving Volvo company pays the transaction cost.

- When goods are sent between Volvo suppliers, the payment is settled between these two companies.

- When goods are sent between Volvo companies, the dispatching Volvo Company pays the transaction cost.

5.10 Current Packaging Strategies

Having defined all the processes, people and functions involved in the development of TB packagings, what uses and features they have, and the flows they are incorporated in, we will in this part provide a summarised view of the two strategies for P1 and P2. The summary involves the working procedures, responsibilities and ownership of the TB packagings for both strategies. This is made from combining all the previous empiric research, which is based on mostly secondary data, with the primary data obtained by interviews made throughout the whole research process.

The development of a TB packaging is a highly complex process that is initiated long before actual SOP. There are many people and functions involved in placing demands upon each particular packaging, which have to be analysed and evaluated so as to come up with the most suitable solution. These demands are issues regarding functionality, handling capabilities, transportability, ergonomics, production line fitting, quality and costs, amongst many other things. The end result is often a compromise of many wishes and interests. In order to coordinate all demands and to control the process of developing a TB packaging, the working document Template 1 is used. As stated earlier, the different stakeholders involved in the development procedure jointly use this working document. Each TB packaging has its separate working document, which serves as a design requirement and approval checklist of how the development proceeds.

5.10.1 Packaging Strategy P2

5.10.1.1 Ownership and Responsibilities

For P2, the TB packagings are fully owned and administered by VCC with a few exceptions, such as flows containing dangerous and explosive goods. This means that issues such as repair and maintenance, design, and specifications of all prerequisites and features of them are controlled and paid for in-house by VCC. However, VCC does not carry out all these tasks themselves. Firstly, an

in-house or an external consultant is employed to carry out the CATIA designs of the packaging. Secondly, companies specialised in packagings manufacture the TB packagings according to specifications, and thirdly, the repairs and maintenance of them is outsourced to external firms.

In essence, VCC develops, owns and have the responsibility of the TB packagings as well as fitting them into the supply chain, while outside firms are hired to carry out all the surrounding sub-activities. The reason for historically having adopted this strategy has been that it has enabled VCC to maintain the total control over all of its processes and support activities, since it was argued that the management of such large volumes is best handled in-house. As previously stated, VLC, which was earlier incorporated in the Volvo Group before Ford acquired VCC, has had the responsibility to coordinate and carry out the transports of the articles (with its TB packagings) as well as being responsible of storage of empty packagings. Although it is a separate company nowadays, they still carry out these tasks for VCC due to the good relations between them and the knowledge of each other's processes and working procedures. Again, VLC owns and administer the Emballage Pool, which is a storing place for empty packagings from which VCC's suppliers order packagings for their shipments to VCC.

5.10.1.2 Procedures

In Figure 5.14, an illustration of how the general procedure of developing and purchasing a TB packaging for P2 is shown.

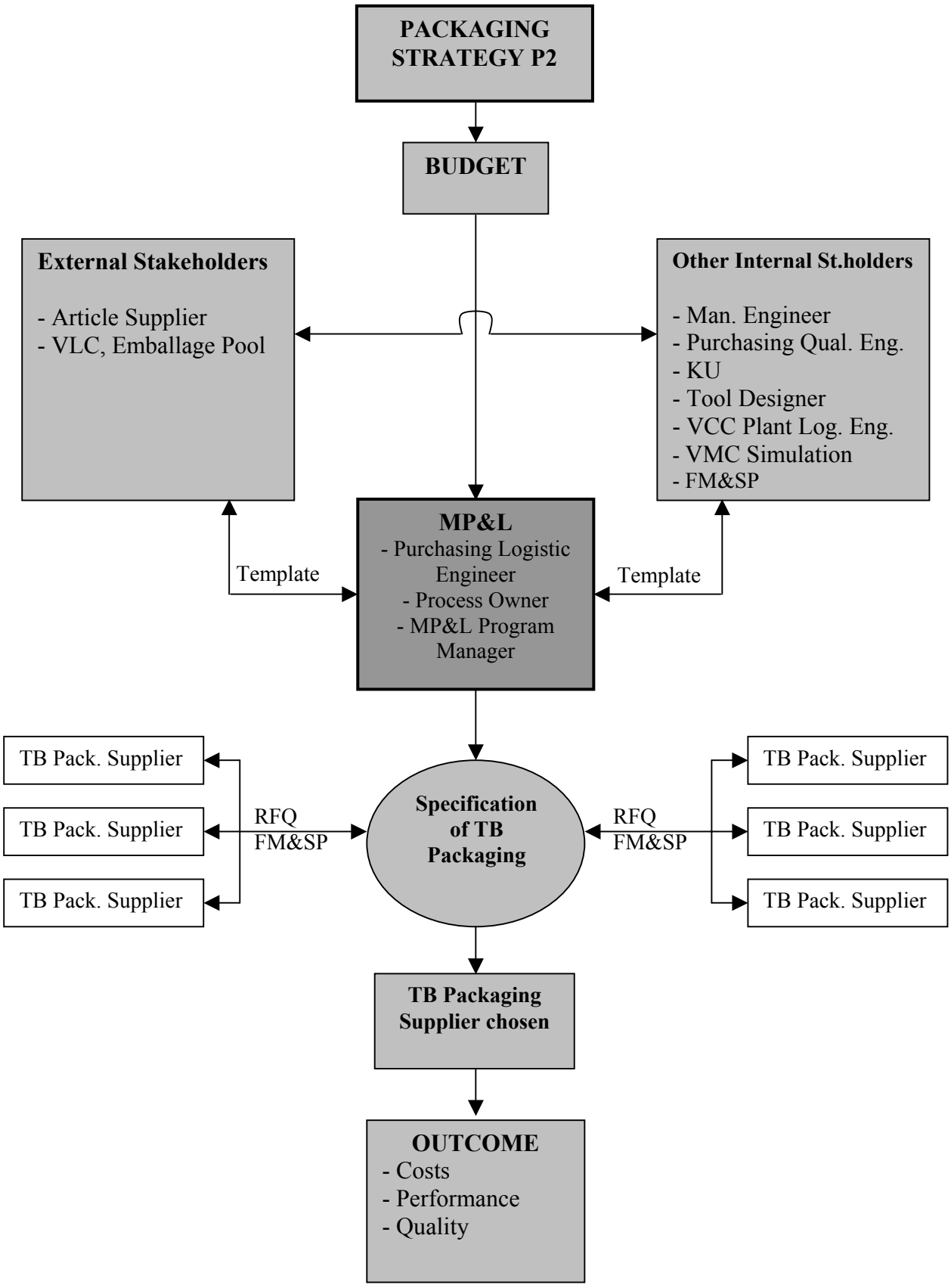


Figure 5.14: Procedure P2

Key people within MP&L produce together with other key people inside and outside the organisation a final specification of the packaging. This is carried out through Template 1, which now contains all the demands and information needed for manufacturing the TB packagings. A Target Agreement with the article supplier is negotiated. Here it is defined what responsibilities each party have against each other and which demands VCC have on the quality of the article, its features and cost. The article supplier provide input regarding the article itself, their manufacturing process and other requirements that have to be considered in the development of the TB packaging. VLC and the Emballage Pool are notified of the new packagings that are going to enter the flow. Through FM&SP, which is the purchasing division of non-production related products, the task of manufacturing the TB packaging is placed on tender by an RFQ to various, and often preferred, suppliers.

5.10.1.3 Costs and Investments

For P2, and for all previous platforms, an initial investment is made to purchase the TB packagings. This investment is included in the Entry Ticket, which is the total development cost for a car model. No running costs exist, except for those costs associated with repairs and maintenance, scrapping and recycling. More about costs and investments are outlined in the next part.

5.10.1.4 Contractual Agreement: VCC-owned TB Packaging

See Appendix 4.

5.10.2 Packaging Strategy P1

Ownership and Responsibilities

For P1, which goes into production in 2004, the TB packagings are meant to be fully owned and administered – with a few exceptions – by each of VCCs' article suppliers respectively. The specifications of packaging prerequisites and features are still controlled and carried out internally at VCC. However, repair and maintenance as well as scrap costs have to be absorbed by the article supplier. Then it is up to the article supplier what to do and how to provide the TB packagings. The article supplier can either outsource the development and manufacturing of it or produce it in-house, this is a process that VCC does not take part in. The CATIA design of all packagings is either carried out by VCC's consultant in-house, or by the supplier in case it has the capabilities to do so. This is however specified in each unique contract between the parties.

In essence, VCC has placed the ownership and responsibilities of the TB packagings on the article supplier, instead of owning and administering them themselves. One major change is that working procedures have now become more formalised and control-oriented, since this huge responsibility now is transferred to external parties. Similar to the P2 strategy, VLC coordinates and carries out the transports of articles and packagings.

5.10.2.1 Procedures

In Figure 5.16, an illustration of how the general procedure of developing and purchasing a TB packaging for P1 is shown.

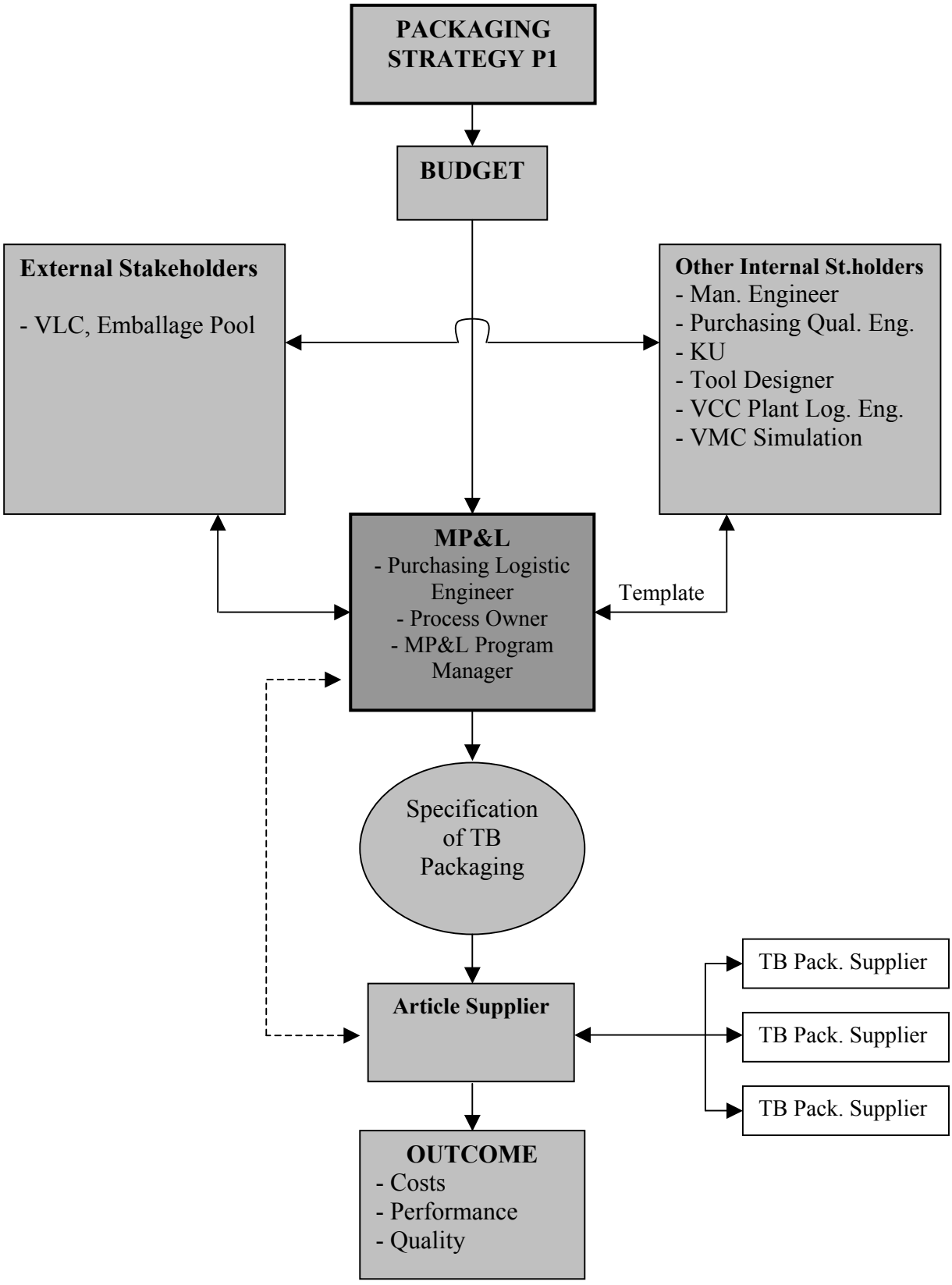


Figure 5.15: Procedure P1

Similar to the strategy for P2, the people within MP&L together with other functions in the organisation produce a final specification of the packaging. The difference is that the article supplier is now not only involved in the input phase regarding the TB packaging specification, but is now also an active party in the development process, since it will now carry the costs related to the responsibility of owning and supplying the TB packagings for their shipments of articles. The article supplier can either design and manufacture the packagings in-house or hire an external TB packaging supplier to manufacture them. A total cost (piece price per article plus the packaging cost) is then presented to VCC.

5.10.2.2 Costs and Investments

Transaction and cost-wise, VCC pay the article price plus the debited cost of the packaging in an aggregated sum for every component ordered. The latter cost is based on estimates done by the article supplier regarding costs of repairs and maintenance, and manufacturing based on the packaging's probable technical lifecycle. By this, VCC get rid of the initial investment in TB packagings and pays running costs instead. More about costs and investments are outlined in the next part.

5.10.2.3 Contractual Agreement: Supplier-owned Packaging

See Appendix 5

5.10.2.4 Exceptions in Ownership

Although the principle for P1 is that the article supplier should develop and own the TB packagings, this is not always the case. In Ghent Belgium, where P1 is to be produced in 2004, the P2 model S60 is also built. Therefore, the following decisions have been taken:

TB packagings for P1 that should remain VCC-owned are:

1. P1and P2 sequence packagings from the same supplier

- Those having the same assembly point in VCG.
- Those with differing assembly points in VCG where P2 packagings can be used.

2. P1and P2 sequence packagings from differing suppliers
   - Those having the same assembly point in VCG
   - Those with differing assembly points in VCG where P2 packagings can be used.

The reason for this is that a number of TB packagings currently used for S60 could be used for P1 as well. Either more of them are built or slight modifications are made to the blueprints of the ones already built for S60 (carry-over). This is done in order for them to carry components for both P1 and S60. These TB Packagings are incorporated in the sequence flows between VCG and its suppliers in the Supplier Park in Belgium.

5.11 Logistics & Packaging Costs

In this part, we will take a look at the costs related to the TB packagings. We will first define what VCC takes into account when they calculate their costs, and from this look at the costs related to TB packagings for P2. Then we will look at some of the estimated costs for P1. Scrutinising a number of firm quotations provided from article suppliers to P1 will show probable differences in packaging cost between these strategies. This information will then be used as a foundation for further analysis of the outsourcing alternatives we will present in the next chapter.

5.11.1 Logistics Cost and Landed Cost

In order to attain a general perception of real logistic cost within VCC, Volvo has defined two major measures, Logistics Cost and Landed Cost. The Logistics Cost is the cost of handling the internal activities, the purchasing cost of the packagings and capital costs. The landed cost considers the Logistic Cost as well as the actual cost of the purchased components.

These costs are then used for decision making regarding:

- The supplier choice process
- In case of change of supplier/shipping site during program activities
- Verification of logistics decisions in program logistics

Table 5.1 shows the components involved in these costs:

	Packaging
+	Transport
+	Internal Handling
+	Receiving at VCC Plant
+	Material Area
+	Capital Tied Up
=	**Logistic Cost**
+	Article Price
=	**Landed Cost**

Table 5.1: Logistic & Landed cost

5.11.2 TB Packaging Costs – P2

The cost components shown are the general factors influencing the total cost for VCC's logistics operations. The cost we aim to investigate is the Logistic Cost for TB packagings, including the repair and maintenance of them. This can, however, only be done for the platform in production, P2, since only rough estimates of certain cost components exist for P1 at present time.

5.11.2.1 Repairs & Maintenance

Costs for repairs and maintenance for VCC-owned TB packagings are estimated to be approximately 2 – 5 % of investment per year. Regarding the packagings we have focused most upon, the sequential packagings, VCC has outsourced this to Plåt & Svets AB that has a branch in the Trim and Final Assembly Plant VCT.

5.11.2.2 TB Packaging Administration

This includes the transports from suppliers to plant, loading and unloading, internal handling and the general administration of them.

The costs (in SEK) for repairs & maintenance, TB packaging administration and one-way packagings are shown in Table 5.2 below (note: capital cost not included):

	Produced Cars VCT	One-way pack. VCT	Packaging Admin. VCT	Repair & Maint. VCT	Total Pack. Costs VCT
week 01-04	8834	72210	975154	345147	1392512
week 05-08	12557	0	1147525	409123	1556649
week 09-12	12929	15767	1020113	484758	1520637
week 13-17	14566	50230	1268064	410115	1728409
week 18-21	8144	0	780196	334790	1114986
week 22-25	10891	0	1138890	355388	1494278
week 26-30	4274	0	259287	322306	581594
week 31-34	6280	34292	229029	324093	587415
week 35-39	15453	0	1119016	359632	1478648
Total (to w 39)	93928	172499	7937274	3345352	11455128
Budgeted/y	**150802**	**563563**	**16719049**	**4884216**	**22166829**

Table 5.2: Logistics cost, TB packagings P2

As the above table points out, the logistics cost of TB packagings for the four cars in P2 totals almost 22.2 mSEK. This corresponds to a logistics cost of 147 SEK per car (forecasted).

5.11.2.3 Capital Costs

The figures used internally at VCC are:

Interest rate: 7%
Depreciation: 5 years
Depreciation charge: 24%

The TB packaging investments made for every car model in P2 are estimated as follows: V70 60mSEK, XC70 10mSEK, S80 60mSEK and XC90 70mSEK. This means that the total investment in P2 has been around 200 mSEK. The total logistics cost in TB packagings per year would then be:

Total investment P2:	200
Depr. Charge:	24%
Total cap. cost/Y:	48
+ Pack. costs/Y:	22,2
Total Logistic cost/Y:	**70,2 mSEK**
Total Logistic cost/car	466 SEK

Table 5.3: Total Logistic cost P2

The assumptions made in these calculations are that VCC still amortise on the investments made in TB packagings for all P2 car models in production at VCT (S80, V70, XC70 and XC90). When it comes to the XC90, which has not been in production for a year, we have included this anyway since the packagings for this model is estimated to cost 70 mSEK and that the production volume still remains at 150.802 cars.

Although these cost figures may not be as accurate as they potentially could be, they serve as a guide of how high the costs in this area really are.

5.11.3 TB Packaging Costs – P1

As stated earlier, the cost figures for TB packagings for P1 are not yet known in full, since very few complete firm quotations has been handed over to VCC. However, a business case has been done at VCC regarding a few firm quotations received. This has been compared with the cost of VCC-owned packagings for P2 that are almost identical to these particular packagings. For obvious reasons, we cannot present the names of these suppliers. The results are presented in cases where the supplier's quotation is shown first, and then followed by an estimated cost for the same amount of packagings if they were VCC-owned. The results are shown next.

5.11.3.1 Case 1 - Supplier-owned Packaging

Below is a calculation of costs related to a required amount of TB packagings that is provided by Supplier X for door glasses. The calculation is based upon the figures provided in the quotation shown in Appendix 3. The following assumptions and estimates are made; Production volume/year = 250.000, 1 € = 9.10 SEK.

Figures from Supplier:

Depreciation charge = 37%, 5 years
Repair & Maintenance = 1.09 SEK/Car
Rack Cost = 0.73 SEK/Car
Total Cost = 1.82 SEK/Car

ARTICLE	SUPPLIER-OWNED
Door glass	Supplier X
Depreciation charge (5 years)	37%
Interest rate	(25%)
TB Pack. Required	88
Cost/TB Pack.	6370
Investment	560 560
Repair & Maint. /year	272 500
Cost/year	207 407
Total Cost/Year	**479 907**
Total Cost of Investment	**2 399 535**

Table 5.4: Packaging costs case 1, supplier

5.11.3.2 Case 1 - VCC-owned Packaging

Below is an estimated cost calculation of a scenario when VCC would have carried the ownership and development in-house of the same TB packaging as the former cost example related to. The calculation is based upon figures from VCC and from an earlier produced identical packaging used for P28. The following assumptions and estimates are made; Production volume/year = 250.000, Repair & Maintenance = 5% of investment/Year.
The results are as follows:

Figures from VCC

Depreciation charge = 24%, 5 years
Internal Interest Rate = 7%/Year

ARTICLE	VCC-OWNED
Door glass	
Depreciation charge (5 years)	24%
Interest rate	7%
TB Pack. Required	88
Cost/TB Pack.	4000
Investment	352 000
Repair & Maint. /year	17 600
Cost/year	84480
Total Cost / year	**102080**
Total Cost of Investment	**510 400**

Table 5.5: Packaging costs case 1, VCC

Repair & Maintenance = 0.07 SEK/Car
Rack Cost = 0.33 SEK/Car
Total Cost = 0.41 SEK/Car

5.11.3.3 Case 2 - Supplier-owned Packaging

Below is a calculation of costs related to a required amount of TB packagings that is provided by Supplier Y. The calculation is based upon the figures provided in the incomplete quotation from the company. The following assumptions and estimates are made; Production volume/year = 150.000, 1 € = 9.10 SEK.

Figures from Supplier

Interest Rate = 7.5%/Year
Total Cost/Year = 327 600 SEK
Total Cost/Car = 2.18 SEK

ARTICLE	SUPPLIER-OWNED
Door module	Supplier Y
Depreciation charge (5 years)	(24.7%)
Interest rate	7.5%
TB Pack. Required	68
Cost/TB Pack.	Not specified
Investment	Not specified
Repair & Maint. /year	Not specified
Cost/year	Not specified
Total Cost/Year	**327 600**
Total Cost of Investment	**1 638 000**

Table 5.6: Packaging costs case 2, supplier

5.11.3.4 Case 2 - VCC-owned Packaging

Below is an estimated cost calculation of a scenario when VCC would have carried the ownership and development in-house of the same TB packaging as the former cost example related to. The calculation is based upon figures from VCC and from a similar rack produced by a TB packaging supplier. The following assumptions and estimates are made; Production volume/year = 150.000, Repair & Maintenance = 5% of investment/Year.

Figures from VCC

Depreciation charge = 24%, 5 years
Internal Interest Rate = 7%/Year

ARTICLE	VCC-OWNED
Door module	
Depreciation charge (5 years)	24%
Interest rate	7%
TB Pack. Required	68
Cost/TB Pack.	10 000
Investment	680 000
Repair & Maint. /year	34 000
Cost/year	163 200
Total Cost / year	**197 200**
Total Cost of Investment	**986 000**

Table 5.7: Packaging costs case 2, VCC

Repair & Maintenance = 0.23 SEK/Car
Rack Cost = 1.09 SEK/Car
Total Cost = 1.32 SEK/Car

5.11.3.5 Case 3 - Supplier-owned Packaging

Below is a calculation of costs related to a required amount of TB packagings that is provided by an article Supplier Z. The calculation is based upon the figures provided in an incomplete quotation from the company. The following assumptions and estimates are made; Production volume/year = 150.000, 1 € = 9.10 SEK.

Figures from Supplier

Depreciation 37%, 5 Years
Total Cost/Year = 546 000 SEK
Total Cost/Car = 3.64 SEK

ARTICLE	SUPPLIER-OWNED
Q-glas	Supplier Z
Depreciation charge (5 years)	37%
Interest rate	(25%)
TB Pack. Required	50
Cost/TB Pack.	not specified
Investment	not specified
Repair & Maint. /year	not specified
Cost/year	not specified
Total Cost/Year	**546 000**
Total Cost of Investment	**2 730 000**

Table 5.8: Packaging costs case 3, supplier

5.11.3.6 Case 3 - VCC-owned Packaging

Below is an estimated cost calculation of a scenario when VCC would have carried the ownership and development in-house of the same TB packaging as the former cost example related to. The calculation is based upon figures from VCC and from a similar rack earlier produced in-house. The following assumptions and estimates are made: Production volume/year = 150.000, Repair & Maintenance = 5% of investment/Year.

Figures from VCC

Depreciation charge = 24%, 5 years
Internal Interest Rate = 7%/Year

ARTICLE	VCC-OWNED
Q-glass	
Depreciation charge (5 years)	24%
Interest rate	7%
TB Pack. Required	50
Cost/TB Pack.	21 000
Investment	1 050 000
Repair & Maint. /year	52 500
Cost/year	252 000
Total Cost / Year	**304 500**
Total Cost of Investment	**1 522 500**

Table 5.9: Packaging costs case 3, VCC

Repair & Maintenance = 0.35 SEK/Car
Rack Cost = 1.68 SEK/Car
Total Cost = 2.03 SEK/Car

5.11.4 Total Cost Comparison: Cases

	Supplier Owned	*VCC Owned*	*Difference*	*Difference in Percent*
Case 1 – Door Glasses				
Total Cost/Year	479 907	102 080	377 827	+ **370%**
Total Cost of Investment	2 399 535	510 400	1 889 135	
Case 2 – Door Modules				
Total Cost/Year	327 600	197 200	130 400	+ **66%**
Total Cost of Investment	1 638 000	986 000	652 000	
Case 3 – Q-glasses				
Total Cost/Year	546 000	304500	241 500	+ **79%**
Total Cost of Investment	2 730 000	1 522 500	1 207 500	

Table 5.10: Total Cost Comparison: Cases

These differences are parts of the underlying factors why VCC have asked us to evaluate and analyse alternatives where instead external service providers will carry the ownership, development and other responsibilities of TB packagings. Further on, the differences and other facts surrounding the two current strategies will be discussed and analysed in the Analysis part of the research.

5.12 TB Packaging Trend

In manufacturing in general, and the car industry in particular, outsourcing has been highly evident for the last 10 years. This has meant that more and more sub-activities are being contracted out to either other external companies or to their prime suppliers. This was clearly shown when it was decided that Lear Corporation, a prime supplier of seatings to VCC, should take over VCT's sub-assembly of instrument panels. This sub-assembly has been carried out separately from the production line in the Trim and Final Assembly Plant and then being internally transported to the final point of assembly.

5.12.1 Impact on TB packagings

This re-arrangement will also have an impact upon the TB packagings carrying the instrument panels to the assembly line. Figure 5.18 below illustrates this change.

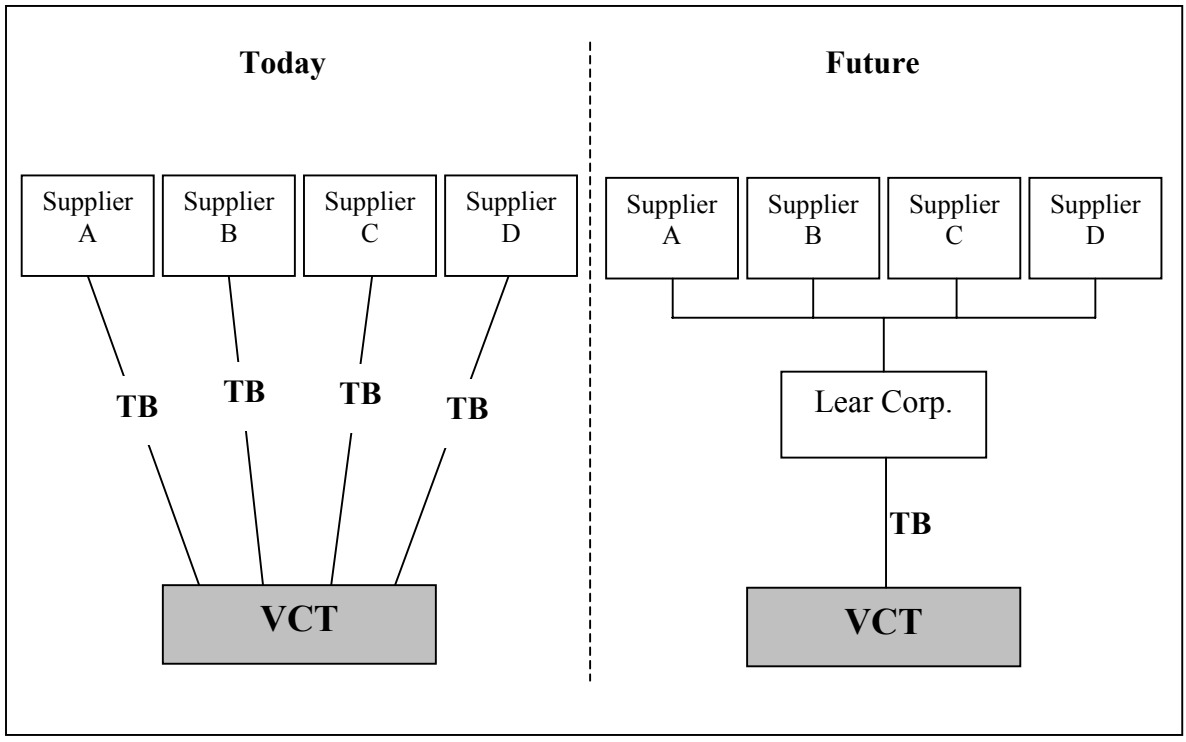


Figure 5.16: Reduction in use of TB packagings

The figure shows that today, numerous different TB packagings are needed for bringing the various components from a number of companies to VCT. In the close future, only one will be needed since Lear will become responsible for supplying the finished instrument panel. The TB packagings today are smaller, cheaper and numerous while they in the future will become larger, more expensive, more complex but much fewer. By having one TB packaging type for the whole instrument panel, efficiency gains are made. They take up less space in the plant, handling becomes easier and space could now be utilised for other more value-adding purposes.

The trend at VCC today is just like the one described above. The TB packagings are getting bigger, more complex and more expensive. This is therefore, an issue to consider when making decisions regarding what the best development and ownership solution for this would be.

5.13 Logistics Mission - MP&L

MP&L has presented a business plan in which strategic issues regarding logistics are outlined. The business plan ranges between 2002 and 2007 where several economical spheres are highlighted. Concerning the provision of TB packagings, two fields of strategy are emphasised, typebound packaging standardisation and PAG synergies. As discussed in the previous part, more and more sub-activities are being contracted out to either external companies or to prime suppliers. The TB packagings are thus getting bigger, more complex and more expensive. Typebound Packaging Standardisation is seen as a measure in order to deal with this development. Some areas of standardisation are rack bottom, bottom structure, foldable posts and the measures of the packagings. The other major field of importance that has to be considered in our research is the strive for PAG membership synergy effects through a higher degree of commonality. This particular aspect will be discussed in the next part.

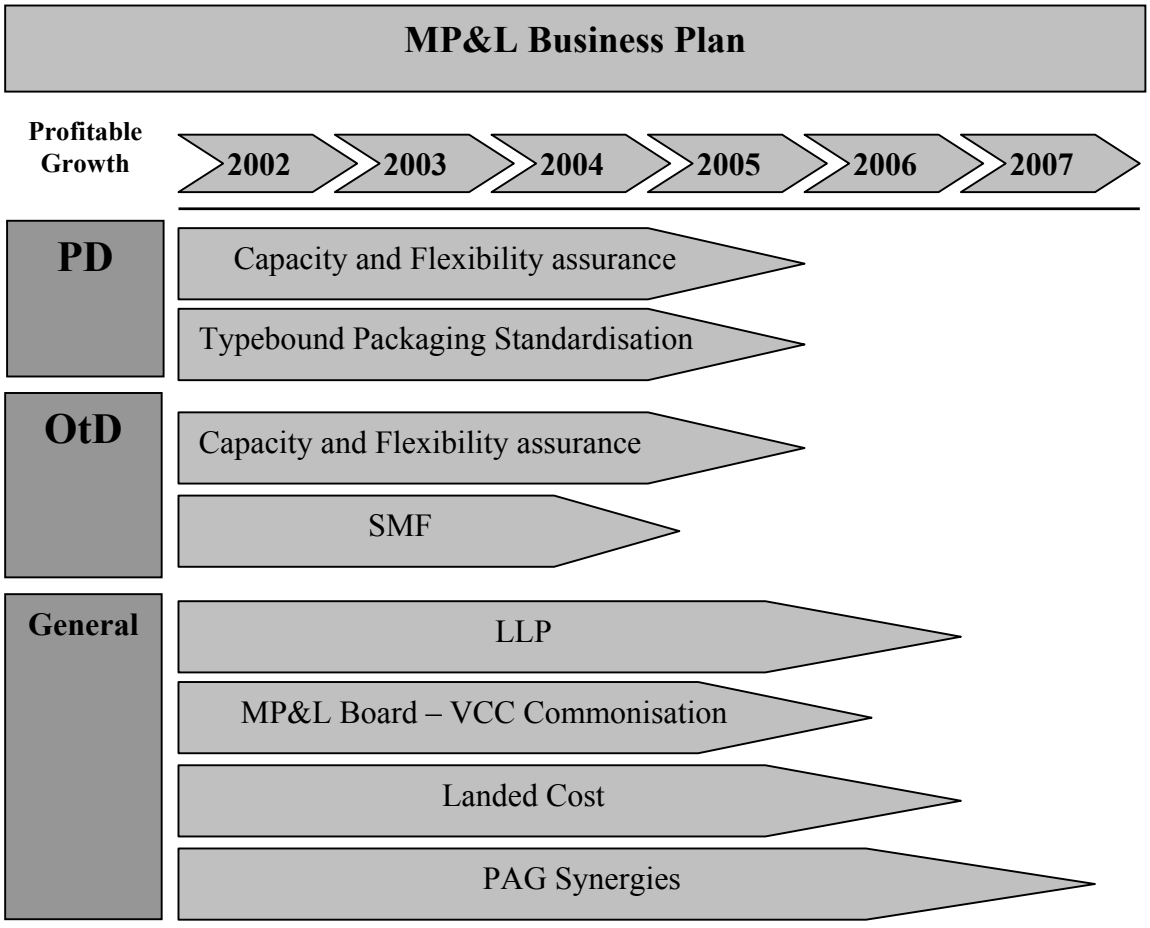


Figure 5:17 MP&L Business Plan

5.14 The Pan Brand Group

The Pan Brand Group is an organisation that was formed in order to promote and achieve a co-operation between all car brands that are incorporated in the Ford Motor Company, Europe. The aim is to attain a common commodity and supplier strategy, while maintaining the uniqueness of the brands. The components that are of interest for this commonality strategy are those not considered value adding to the brand itself. These are components that the customer does not see, feel or hear. Many of the five brands in the group already have a high degree of common suppliers, which makes the integration a bit more manageable.

The competition in the car industry today is vast and all manufacturers are trying to improve value, extract synergies and drive commonality. Some of the manufacturers working together in order to obtain these advantages are shown below:

- GM / Fiat
- Renault / Nissan
- Daimler / Chrysler
- Peugeot / Toyota

Within Saab Automobile, that is part of the multinational company General Motors, only 30% of the components are considered to create value for the specific brand. The strive within GM is concentrated towards component commonality, i.e., that components and platforms are the same to the highest extent possible for all the members of the GM family. What is considered to create differentiation for the brand is the engine, driving characteristics and design. In other words what the buyer immediately can see and experience. The manufacturer that has taken the commonality strategy furthest is VW. This group - consisting of Skoda, Seat, VW and Audi - has a commonality rate of approximately 75%.

The Ford Motor Company buys raw material in Europe for approximately $1.2 billion a year combined for all of the brands in the group. On an individual

basis, some commodities at each respective brand represents low turnover procured from multinational suppliers. Given this, there is a need to create economies of scale to maximize the total leverage and drive improvement of quality and logistics. The leverage is not only financial in nature but also a strengthening of resources and cooperation in the use of the raw materials from an engineering standpoint.

An additional driver for a Pan Brand Organisation is the current market structure of the Ford Motor Company supply base. The total buy is highly consolidated (90% of the total buy is with 20% of the suppliers). The market is also encountering increased merger and acquisition activity that is driving the supplier consolidation further.

The strength with a Pan Brand Organisation

A major strength of the Pan Brand Organisation is the increased purchasing power gained by the leverage of the total volumes across all the European brands. The benefit is not only the combined leverage but also a common face to the supplier, thus allowing for aligned and consistent communication. A Pan Brand Organisation is also believed to facilitate the coordination of Pan Brand and global negotiations. This will contribute to the building of stronger relationships with the suppliers. In addition, the organisation will also be able to drive cost and quality optimisation through the commonisation of specifications across brands where possible, and the reduction of the supply base.

5.14.1 Commonality within FMC

For the up-coming VCC platform P1, some of the parts are commonality parts with Ford and Mazda, these parts are named C1. When VCC launches the P1 platform, it will be the first manufacturer to work with commonality parts within FMC since the platforms of the other producers are scheduled into production at a later stage. This commonality strategy will be taken further in the future starting with the platform Y286, where the commonality parts are labelled EUCD. This platform will go into production 2005. Table 5.11 shows

the car manufacturers and the models that are intended to form the commonality base.

Ford Europe	Volvo	Land Rover	Jaguar
Fiesta	S80	Freelander	XJ/XK8
Focus	V70	Discovery	S-Type
Mondeo	C70	Range Rover	X-Type
	S60	Defender	X100
	V70		
	S40		
	V40		

Table 5.11: Major Commonality Participants

Commonality and Typebound packagings

The potential of savings in the typebound packaging development due to the commonality strategy could be vast. Large amounts of resources and capital can be saved since the same packaging can theoretically be used by all manufacturers within the group. This would probably be most applicable for the packagings used in batch flows, since these originate from all over Europe, including Sweden. But also for those foreign sequential suppliers that have branches in Arendal, great potential exist. There is however a problem. The production processes of the manufacturers are so different that a packaging designed for one plant cannot always be used at another. This has been evident for the C1 commonality parts where the article producer has got to handle three different types of packaging since its customers, Ford, VCC and Mazda are in need of specially adapted solutions. It will be a major task in the future to streamline and achieve commonality of the various production processes of the manufacturers.

6 Presentation of Alternatives To Current Practice

Having defined all procedures involved in the development of TB packagings along with how these are structured for P2 and P1, we will here present two outsourcing alternatives that are related to externalising the development, ownership and other responsibilities of them. In other words, two alternatives that would involve external service providers. In this part we will highlight and discuss a range of matters that has to be considered when entering these kinds of outsourcing ventures. Firstly, a discussion of what functions that can be outsourced is made. Thereafter, a brief presentation of the proposals is made along with basic criterions for their viability. Secondly, a number of general capabilities that a third party must possess in order for VCC to engage in a relationship are outlined. In addition, we will explain the advantages VCC may obtain from having a variable cost instead of having to make investments in fixed assets, i.e., the TB packagings. The problem that the TB packagings are regarded as dedicated assets, along with the implications of this, is also discussed. Finally, we will present a framework consisting of a number of evaluation criterions by which the overall viability of the outsourcing venture will be analysed around in Part 7, the final Analysis.

6.1 What activities can be outsourced?

Having defined and mapped all activities and processes involved in the development of TB packagings, a discussion of what actually can be outsourced is central. In our opinion, the activities that can be outsourced to an external service provider can be divided into four major areas. These are shown and discussed below:

- Ownership and Control
- Construction
- Specification
- Repairs & Maintenance

6.1.1 Ownership and Control

As mentioned before, the outsourcing of the ownership was one of the main reasons why VCC wanted this research done. The aim has been to convert the fixed cost associated with the investment in TB packagings into variable cost. The transfer of ownership has been seen as a way to reach this and at the same time reduce the asset base. The TB packagings are to be leased from the external service provider at a running cost. When it comes to the control, we mean an extended responsibility in making sure that the packagings are available at the right place at the right time and in the right volume.

6.1.2 Construction

A consultant has so far handled the in-house construction in CATIA. He is hired in periods covering most of the time in the development phase of a car project. This function is however vital to VCC since a knowledgeable person in this area is needed. Tasks that do not involve the actual construction is the receiving and conversion of construction models from suppliers, and putting them into VCC's system. Nevertheless, this activity can also be seen as being subject to outsourcing since the insourcing company could provide some of these tasks.

6.1.3 Specification (Template)

The specification of requirements and prerequisites in the template is a procedure involving a number of stakeholders. The Logistics Engineers at MP&L are carrying the responsibility of this activity and act as co-ordinators. Although we believe that the specification process cannot be fully outsourced, parts of it are seen as being eligible for outsourcing. An individual from the external service provider could support this function by managing the collection of views and opinions from the various instances involved within VCC. Then, this individual would act as a bridge between VCC and the external provider. This, however, puts high demands on integration and structural co-ordination of activities.

6.1.4 Repairs & Maintenance

This service is already placed upon external suppliers. However, coordinative gains could be made if this activity is held at the provider. Therefore, we have also included this point when outlining what can be outsourced to the provider in the alternatives.

6.2 External Service Provider Alternatives

The main difference between the two scenarios is the number of actors involved respectively in each. The first involves outsourcing to one part only, while the second involves outsourcing to a number of parties. The two are:

1. Outsourcing to a single partner – VLC
2. Outsourcing to a few preferred TB packaging manufacturers

These along with some basic criterions for choosing them are briefly described.

6.2.1 Outsourcing to a single partner – VLC

By this proposed alternative, it is assumed that VLC will take over the ownership, parts of the control responsibility and the repairs and maintenance of all TB packagings. The reasons for outsourcing these particular activities in this case are further discussed in the Analysis. In exchange, VCC will pay a running cost on a monthly basis. The formation of some kind of partnership is sought after.

Basic Criterions for Viability

- Variable costs, no initial investment
- VLC already handles the Standard packagings with a similar transaction system
- VLC coordinate all of VCC's transports today (suppliers – VCC)
- Knowledge of each others' routines and working practices

- VLC handles the Emballage Pool in which TB packagings already are incorporated in
- Only one party to negotiate with from VCC's side
- VLC would provide VCC with a "package-solution", i.e., it would handle inbound as well as outbound distribution, the storing of empties (Emballage Pool), repairs and maintenance, ownership and responsibility over parts of the control involved in the process.

6.2.2 Outsourcing to few preferred TB Manufacturers

By adopting this proposed alternative, VCC would place the ownership, CAD/CATIA construction and responsibilities of some of the activities related to the specification of the TB packagings, onto a few of its preferred TB packaging manufacturers. The reasons for outsourcing these particular activities are further discussed in the Analysis. This will be carried out through letting suppliers in their particular niche – steel racks, EPP, EPS, vacuum formed plastics etc. – to have all the business from VCC in its niche. This means that either one or two manufacturers in each niche are used and that this would reduce the number of parties negotiating with. Similar as the previous alternative, running costs are to be paid for the usage of the TB packagings. This alternative also implies a formation of some kind of partnership.

Basic Criterions for Viability

- Variable costs, no initial investment
- Construction competence exist at the manufacturer
- Few partners to negotiate with
- No middlemen in the supply chain
- Expert knowledge in packaging solutions
- Possibility of scale advantages

6.3 Required Capabilities – External Service Providers

In addition to the basic criterions for the alternative solutions mentioned, there are a number of other factors that VCC has to take into consideration when engaging into a logistics relationship and placing the development, ownership and responsibilities onto a third party. When choosing an actor to co-operate with on a long-term basis, VCC has to make sure that the external service provider can satisfy the demands placed upon them. Irrespective of which of the alternatives that could be of most interest, there are a number of some general common areas in the alternatives that have to function faultlessly. In our view, to fulfil VCC's demands the basic, but utterly important, capabilities of the providers in each alternative are shown in Figure 6.1.

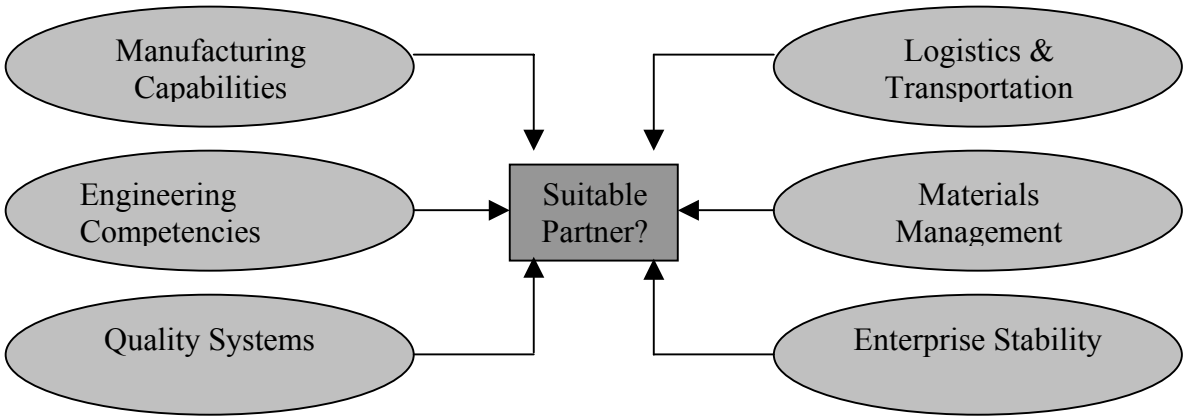


Figure 6.1: Supplier Capabilities

Manufacturing Capabilities

This comprises the provider's standards of manufacturing engineering and support functions. This capability is, of course, of vital importance in the alternative where the packaging manufacturers take the ownership and responsibilities of the TB packagings.

Engineering Competencies

The competencies in construction (CATIA), support, development and testing of TB packagings are important in order to ensure that efficient working procedures are used and that as much as possible could be placed on the partner in order to rationalize these functions at VCC. The TB packaging manufacturers possess these competencies but VLC does not currently have the construction competence – meaning that this has to either be built up/bought or be kept in-house at VCC.

Quality Systems

Quality assurance is actually one of the most important capabilities that the external service provider must live up to. Therefore, effective organisational control mechanisms and quality practises are vital to ensure that the flows – or in the worst case the production – are not interrupted in any way. Both VLC and TB packaging manufacturers are considered to have these systems in place.

Logistics and Transportation

The provider's access to emballage pools and an efficient transport network is vital in order for VCC to ensure that lead-times are minimised and that everything runs smoothly. Loading and unloading practises, as well as the whole value chain structure, must be optimised, and that expert knowledge within logistics operations as a whole exists. VLC is, of course, an expert within this field since they already handle all of VCC's transports. When it comes to the TB packaging manufacturers, the network for this exists and is already used extensively.

Materials Management

Production management and sourcing practices has to be of very high standards, so as to ensure that losses, wastage and errors could be held at a minimum, and that best-buy practices are used. Production management and

sourcing practices are considered to be of high standards at TB packaging manufacturers, while VLC most probably would outsource the production.

Enterprise Stability

Naturally, VCC does not want to engage in a relationship with actors that are not financially buoyant. Financial controls and objectives, a clear vision, mission and strategy as well as sound management, are vital aspects when choosing a partner. VLC is a stable company that VCC has been in contact with for decades, while on the TB manufacturer's side, this could be more uncertain and have to be checked up more closely.

6.4 The Conversion of Fixed Investments into Variable Costs

It is rather classical that companies want to exchange their fixed costs into variable costs. However, the reasons for doing this could be many. For a small company, major investments could result in insufficient cash flow, while for larger companies variable costs may be preferred for reducing its fixed asset base. In any respect, the conversion of fixed investments into variable costs would for VCC's part result in the following:

6.4.1.1 Lower total investment cost/car model (lower Entry Ticket)

The total Entry Ticket for a car model varies rather much, but lies approximately around 1,5 to 2 billion SEK. The aim is to reduce this as much as possible. By not having the TB packagings VCC-owned, the need to raise capital for them diminishes. A lower outflow of capital result in better cash flow and lower opportunity costs. The task of getting the investment approved from top-management is also eliminated.

6.4.1.2 Reduction of fixed assets

The amount of capital tied up is, of course, always wished to be kept at a minimum, since it needs to be converted into profit rather quickly. Another

very important aspect is that better financial ratios, notably Return on Assets, are achieved.

6.4.1.3 Elimination of sunk costs

Regardless of depreciation charge, these unique assets do not have any sales value at the end of its technical life. So, by not owning the TB packagings, VCC transfer these costs to the external service provider.

6.4.2 Dedicated Assets – The Problem

As indicated in the theoretical frame of reference, a leased asset that is regarded as being dedicated has to be accounted for in the balance sheet even though the lessee does not formally own it. The problem with the TB packagings is that in a situation where these are leased and used by VCC, the packagings are regarded as being dedicated. As mentioned in the empirical research, a TB packaging is an asset that is solely used for one specific group of components or articles. Furthermore, they are also used by VCC only, and are utilised during its whole economic life. So, instead of being an operating lease, this is classified as a finance lease, see Figure 6.2 below.

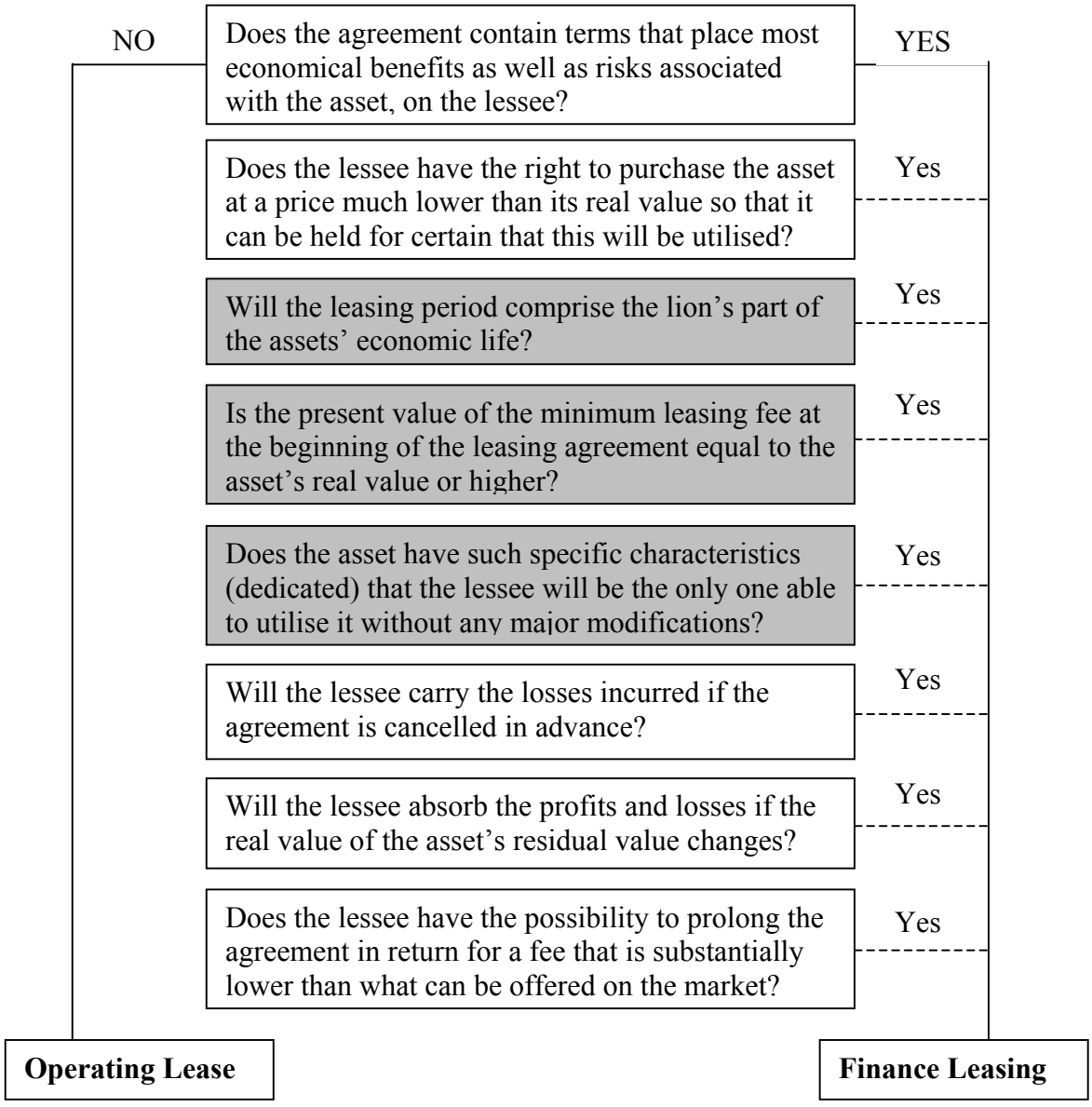


Figure 6.2: Classification of TB Packaging Leasing

When VCC decided to adopt the strategy to place the ownership and responsibilities upon its article suppliers, this rule was not accounted for or reflected over. Therefore, one of the strongest drivers for adopting the P1 strategy became heavily undermined. The only way in which the lease can be regarded as an operating lease, is to share the usage of TB packagings with one or more other actors.

This has, of course, a profound impact upon the outsourcing alternatives as well. The argument is whether it is worthwhile to outsource the packagings if they have to be accounted for as fixed assets anyway. However, there may be other more valuable factors to consider when committing to outsourcing – these are outlined next.

6.5 Evaluation Criterions For Outsourcing the TB Packagings

Here we will provide our criterions which we believe have to be fulfilled for making the outsourcing a success. This since the venture must produce some kind of value-adding gains to VCC.

When considering outsourcing the TB packagings, there must be some strong and viable reason for doing so. The first thing to glance at is what kind of strategic importance this activity actually has. From Figure 4.4 in the theoretical frame of reference (activity categories) we can see that the activities surrounding TB packagings most likely fit the description of a "support activity", meaning that this is an activity needed for operative issues to work, i.e., the manufacturing of the cars. Nevertheless, the importance of this support activity, and its contribution to the success of efficient manufacturing, is regarded as being rather high. In Figure 6.3, the assumed categorisation of MP&L's activities is shown.

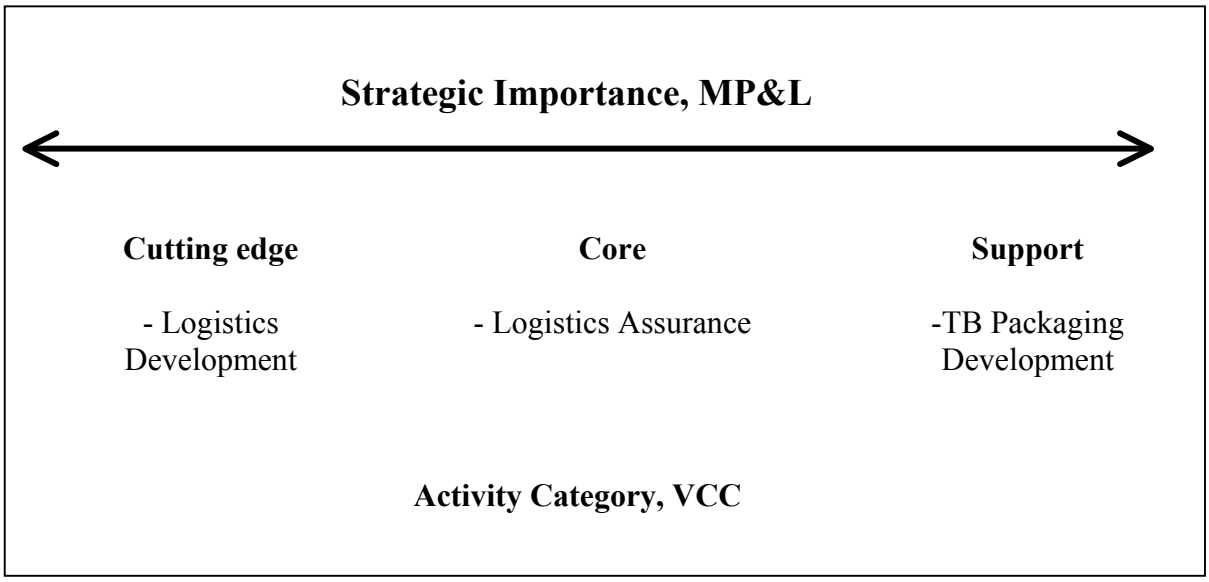


Figure 6.3: Activity Categories, MP&L

Although it may be difficult to define which areas that are of critical importance, and therefore must be kept in-house, the figure above illustrates our view regarding the development of TB packagings, as well as all the other aspects surrounding it. So, by outsourcing activities and functions related to packaging development, will managers and their associates be able to focus more upon core activities? This remains to be answered. Another important thing is to estimate the total outcome in terms of costs related to the outsourcing. Many companies believe that outsourcing, which we will take a look at when analysing the strategies used and the third party arrangements proposed, can cut costs. In addition, to realise the full potential of outsourcing, VCC has to ensure that there is a strategic fit between VCC and the external service provider, and that this provider has the requisite expertise that VCC seek.

From a Value Chain perspective, VCC has already outsourced a great deal of its inbound and outbound operations. All transports in and out from the Final Trim and Assembly Plant are handled and co-ordinated by VLC, and its Emballage Pool provides the standard packagings. So the only physical inbound and outbound activities carried out by VCC are the flows of materials and components inside the actual plant.

In order to give some indicative answers to everything said so far, we have come up with a framework that will be used as a comparison foundation between current practices and the alternative solutions we are to analyse. The comparison will be made in relation to P2, since this is the only strategy in existence and that the results of it is known. The evaluation criterions we will base the comparisons upon are shown in Figure 6.4.

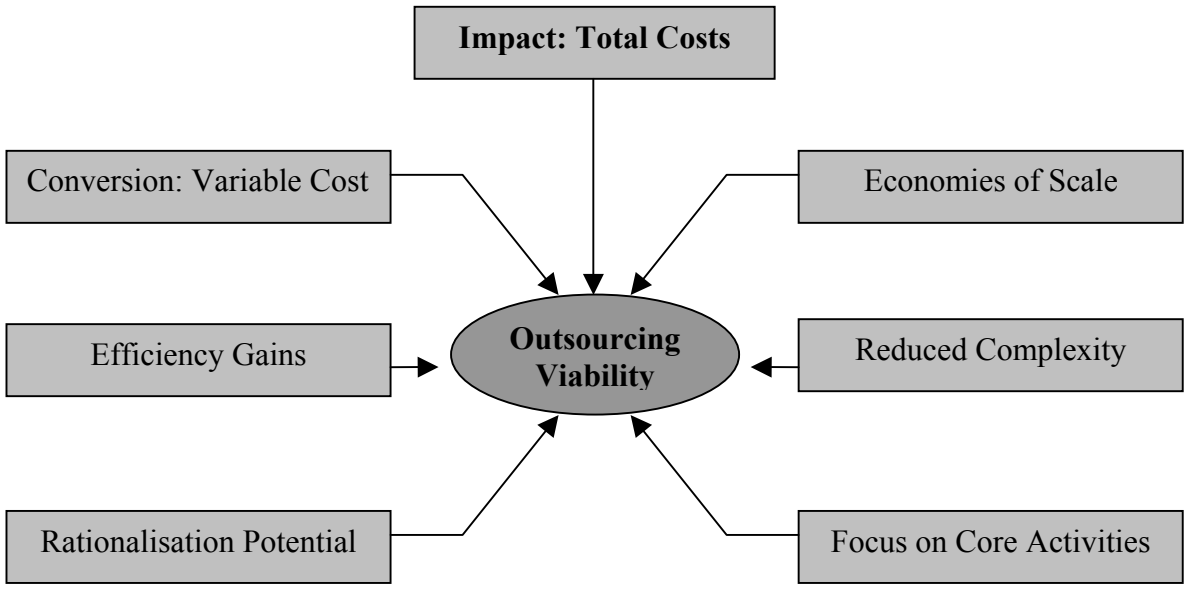


Figure 6.4: Criterions for Outsourcing Viability

7 Analysis

So far we have described the whole process involving the development of TB packagings, presented the alternatives, and highlighted a range of issues that need to be taken into account regarding the outsourcing of VCC's activities and functions. In addition, a framework of evaluation criterions has been presented which will be used at the end of this part. We start out by making an analysis of the P2 strategy by evaluating the advantages and disadvantages of it followed by a discussion. This strategy will act as a base for the final comparisons made in the end of the Analysis. The analysis of the P1 strategy will be carried out similarly and the views around it from a number of article suppliers' are presented and discussed. Thereafter, an analysis outline for the alternative solutions describes how the evaluation of them is structured. This comprises which activities that are eligible for outsourcing in every alternative, the interest and response from representatives of the providers, implementation and structure, advantages and disadvantages, criterions for viability and a total cost discussion. As mentioned above, this evaluation will then be used to make a final comparison of the alternatives against P2. Thereafter, the overall strategic fit of outsourcing the TB packagings will be analysed with focus placed on commonality issues and future integration with Ford and PAG. The Analysis is heavily based upon all the interviews carried out (Appendix 7-10).

7.1 Analysis: VCC-owned Packagings P2

The following is the analysis of the strategy currently in place at VCC. As already mentioned, this will be the one that we compare the P1 strategy and the alternative solutions with in the end of the Analysis. Firstly, we start out by presenting the advantages and disadvantages of this strategy followed by a discussion.

7.1.1 Advantages

Consolidation of knowledge and activities: Having all activities – development and construction – consolidated in one place eases communication between all stakeholders in the process of developing TB packagings. This is seen as promoting flexibility in the information channels, meaning that a great deal of informal information is quickly shared within the Purchasing division. In addition, consolidation of knowledge reduces the bureaucracy in making formal and detailed specifications of requirements, since many processes and activities are known to those involved. In other words, the knowledge and competencies needed for developing a TB packaging are not fragmented.

Flexibility: As mentioned above, communication flows are often more informal and faster internally and misunderstandings are avoided. So when VCC-owned, it is faster and more efficient to make quick and late changes to the packagings if needed.

Control of costs and processes: When handling everything in-house, and dealing with the TB manufacturers themselves, VCC both preserves the total control and management of the process as well as over the costs. In the end, when all TB packagings are constructed and ordered from the packaging manufacturer, VCC will know exactly what the costs for them will be.

No middleman in supply chain: Since VCC is dealing directly with the TB manufacturer, any extra margins are not introduced in the chain. Therefore, the cost of these TB packagings would most likely be closer to its actual material and manufacturing cost than by any other alternative.

Ease of carry-over: When owning the packagings, VCC could modify them according to their wishes without encountering any problems. VCC-owned packagings could be re-used and modified at a much higher degree than if they were owned by anyone else. In situations where the packagings are Supplier-owned and that another replaces this supplier, rather big problems could emerge. By owning the packagings themselves, VCC would eliminate this risk.

Minimal risk of sub-optimisation: By owning the packagings, the risk that they would be constructed and optimised according to other actors' benefit, is eliminated. Sub-optimisation can arise when for example an article supplier should provide the packagings. They would possibly try to fit the packaging according to their production processes and handling activities, instead of streamlining it to VCC's processes.

Close relationship with preferred suppliers: VCC employs a number of preferred suppliers to manufacture their packagings today. These suppliers are well aware of VCC's processes and know the demands that are placed upon them. However, although VCC use to employ a number of preferred suppliers, there are still many occasions where others than these have to be hired due to capacity restraints etc.

Market insight: By placing the manufacturing of the packagings for tender, the market prices for them are always known. If loosing the grip of market prices, VCC would not know what they are actually paying for, and what the prices should be. By knowing the market prices, VCC can assert its bargaining power in a much more efficient way, and make sure that the competition in the packaging manufacturing industry is not weakened. Additionally, by having this insight, the possibility to scavenge for more competitive manufacturers in other markets, such as Eastern Europe and Asia, becomes more feasible.

7.1.2 Disadvantages

Initial Investment: By having the ownership, VCC has to make rather hefty investments in the TB packagings – around 55-70 million SEK per car model that is to be produced. By letting someone else own the packagings, better cash flow can be grasped and opportunity costs are avoided. The work of getting everything approved for final release of funds is also eliminated if outsourced.

Many negotiating partners: By placing the manufacturing task on tender, one ends up with a variety of suppliers to negotiate and sign contracts with. Well in place, contacts are made with an array of suppliers instead of just having a few

to communicate with. In other words, this strategy implies a greater amount of administrative tasks and a wider, thus more complex, network of stakeholders.

Limited focus on core activities: The question is whether VCC should be dealing with packaging development at all. If one assumes that logistics assurance (capacity and material planning, quality control, continuous improvement programmes and flow optimisation) is the core activity of MP&L and its sub-units, it is argued that packaging issues shouldn't be dealt with at all. Briefly stated, there is too much focus on packagings, and the ins and outs of them, instead of spending more effort on logistics assurance.

7.1.3 Discussion

It is clear that VCC benefit from owning the TB packagings in a number of ways. The consolidation of activities is one of the strengths mentioned, and in comparison to other car manufacturers (according to one of the interviews carried out), VCC are particularly good at developing packagings in-house since they have always done this themselves in the past. In other words they possess a competence that does not exist at other manufacturers. By having all the control over its packaging processes, the costs are known. Since there are no middlemen in the chain and that they have market insight, the advantage of attaining low prices for the TB packagings are held. A flexible working procedure with short information channels also promotes the effectiveness in, for example, modifying the packagings and to adjust rapidly to late changes. To deal with preferred suppliers is, of course, also contributing to the overall efficiency, since VCC and these suppliers know each other's processes rather well.

There are however, some concerns and disadvantages with this strategy as well. The most obvious one being to make the investment in these TB packagings. This is the number one argument from VCC's point of view for outsourcing this. As described earlier, a better cash flow is achieved and VCC would not have to have as much tied capital as it would when owning the packagings themselves. This is due to the long period of time from the final release of

funds to actual use of the packaging. Time is money when it comes to the management of working capital, and if the investment is eliminated VCC could reduce the cost of interest rates, and have additional "free" money available to support additional sales growth or more profit generating investments. Another disadvantage of VCC-owned packagings is the number of contacts and negotiations that have to be made with these suppliers. By having only a few, or just one, this would not be as time consuming, and the possibility to build up a higher degree of mutual trust and relationships grows.

Again, the question is raised whether such a large extent of the packaging development that today is carried out within VCC, should be handled in-house at all. As discovered in some of the interviews, the view exists that this should not be part of the Purchasing organisation – or perhaps not at VCC at all for that matter. Support activities, such as those related to TB packagings that are not core activities are always seen as eligible candidates for outsourcing. It was also the authors' initial belief that this activity would be better off outsourced, in order to release resources to more vital activities. However, to outsource something, one has to get something in return in order to motivate it, i.e., that some kind of value has to be created.

7.2 Analysis – Supplier-owned Packagings P1

As already mentioned, one reason for letting the Article suppliers take care of the TB packagings were that a variable cost could be obtained and that a major share of investments from VCC's side were eliminated. From our findings made through the interviews, and through the empirical study, we found out that there were a number of disadvantages as well as advantages with this strategy. These are explained below.

7.2.1 Advantages and Disadvantages of Strategy

7.2.1.1 Advantages

Closer to component: From VCC's point of view, it was argued that the closer the development of the TB packaging was to the article, the better. By being closer to the article, the risks of making errors to the packagings are minimised. Quick adjustments and check-ups could be made without wasting precious time.

Reduced complexity: The strategy implies that VCC would get a complete solution – to get the articles and its packagings from the same supplier.

Focus on core competence: Instead of dealing with the design of packagings, VCC could focus more of its resources upon logistics assurance, which lies closer to the core competence of the Purchasing division.

Less administrative tasks: The purchasing process of the packagings is placed at the article supplier, meaning that VCC negotiate with one party instead of two for every component class needing TB packagings.

7.2.1.2 Disadvantages

Insufficient know-how of packagings: Packaging development is not a core competence at many of the article suppliers, and they lack the efficient processes needed for constructing and manufacturing the TB packagings. This in turn has resulted that they have outsourced this task to an external packaging manufacturer, leading to additional margins in the chain.

No incentive for cost-consciousness: Most article suppliers see the provision of TB packagings merely as an additional service to its core competence, which is to manufacture components. This fact, together with the fact that they will retrieve all costs related to the provision of the TB packaging, results in this lack of cost-consciousness. The mistake made from VCC's side that target costs were not specified also lowered the cost-consciousness of suppliers (discussed later).

Limited efficiency gains: Due to the fact that they lack competence in developing the TB packagings, and that this is a process that is highly complex

and involve strict specifications from VCC, VCC have had to support them in this procedure. Therefore, the amount of man-hours involved in this has not enabled VCC to utilise its resources in a more efficient way, which was expected. So instead of releasing resources, a great deal of the work has shifted to become more control-oriented. Unfortunately, this has reduced the believed advantage of being able to focus more upon core activities.

Safeguarding: In the agreements between VCC and its suppliers, it was in most cases decided that the article suppliers were to take the responsibility for repairs and maintenance of the TB packagings. Since they have limited knowledge in the packaging area, plus the fact that neither the volume nor the cost of this is known in advance, a high premium has been taken out for this in order not to risk their investment. This was clearly shown in the case comparisons in the empiric research.

7.2.2 Discussion

The major advantages of this strategy are that the investment in TB packagings is eliminated, and that the article supplier is closer to the article that should be carried in the packaging. As the result from our questions to the suppliers indicated, they know better where the weak and sensitive spots on the articles are. By then having the responsibility to develop the packagings for them, damages from shocks, blows, humidity, vibrations and thermal conditions, could be minimised during transports and handling. Linked to this is the advantage of getting a complete solution – by acquiring the packagings along with the articles from the same supplier reduce the complexity involved in terms of the number of contacts, negotiations, contracts and other administrative tasks.

There is however a downside to these advantages. The fact that most article suppliers do not manufacture these packagings themselves, but hire an external provider to carry this out, show that they do not have any expert knowledge in this area. This also introduces an additional margin in the chain. They may know better about their article's sensitivity, but they do not know how to

optimally adapt the packaging to everyone's processes. Thus, to ultimately receive an optimal packaging solution from VCC's perspective thereby becomes very difficult, or at least very time consuming. (A revised aggregated version of the interviews carried out with the Article Suppliers is shown in Appendix 10)

It was also found that the workload of the involved people at VCC did not in fact reduce – it just shifted from being part of the development process to supervision and control measures instead. Therefore, the increased efficiency VCC expected from this strategy did not arise.

As the cost comparisons in the empiric research showed, increased total cost for TB packagings would most probably be the result of this strategy. It is rather evident that the high costs involved are a reflection of what the suppliers perceive as a high-risk task to cater for. In other words, the suppliers are caught in a situation where a great deal of uncertainty exists and where they not necessarily want to be (although the opposite was argued for in the interviews). In addition, the high costs are also a result of the mistake on the part of VCC of not putting a target cost on the supplied packaging. As one respondent explained it, "we basically gave them free hands to search our pockets". This meant that the article supplier could choose whatever packaging supplier they wanted without needing to take costs into consideration. In essence, the high costs that were the result of this change in strategy can be summed up as follows:

- Uncertainty and lack of knowledge
- Sourcing inefficiencies
- Excessive margins and premiums
- No Target Cost

7.3 External Service Provider Alternatives

As mentioned initially in this part, an outline for analysing the alternatives would be provided so as to structure the evaluation of them. First of all, we will briefly outline what functions that are to be outsourced for the alternative. Then the interest and response from those involved is presented. How this then should be managed is discussed in the "Implementation and Structure" part. Alternative-specific advantages and disadvantages will thereafter be evaluated, and the scenario will then be analysed in line with the framework we have constructed for outlining the viability of the outsourcing venture. Finally, a total cost discussion is carried out. The outline is shown below.

7.4 Analysis Outline

1. Activities eligible for outsourcing

- Ownership and Control
- Construction
- Repair and Maintenance
- Specification

2. Interest and Response from Provider

3. Implementation and Structure

- Organisation and working procedures
- Partnership issues
- Integration of activities

4. Advantages and Disadvantages of Alternative

5. Analysis according to criterions for outsourcing viability

- Conversion: fixed to variable costs
- Efficiency gains
- Rationalisation Potential
- Focus on core activities
- Economies of Scale
- Complexity

6. Total Cost Discussion

7.5 Outsourcing to a Single Party – Emballage Poolen, VLC

7.5.1 Proposed Activities Eligible for Outsourcing

7.5.1.1 Ownership and Control

This alternative implies that the TB packagings should be fully owned by VLC. Here, we have also included that the control of TB packagings should be held by VLC. By control we mean stocktaking, the responsibility for ensuring that enough packagings exist in its flow to avoid scarcity, and inventory management in general. This is a major change since their earlier responsibility was just to distribute existing packagings from the Emballage Pool. A variable instead of a fixed cost is obtained.

7.5.1.2 Construction

The task of constructing in CATIA is in this case not seen as an activity eligible for outsourcing. VLC does currently not possess this expertise in-house, which means that this function either has to be built up or bought from an external supplier.

7.5.1.3 Specification - Template

One cannot outsource the actual specification of the TB packagings, but parts of the coordinative tasks carried out by the logistics engineer and KU involving the packagings can be contracted out. However, it is not believed that this task should be carried out by VLC since they do not possess any specialist knowledge in this area. In other words, this should continue to be carried out in-house at VCC.

7.5.1.4 Repairs and Maintenance

Since VLC already has the capability to repair and maintain the standard packagings it owns, it is believed that they can also take this responsibility for the TB packagings. This would be an optimal solution since the damaged

packagings have to return quickly into the flow again in order not to cause scarcity. Most of the TB packagings end up in the Pool for every loop they take, and the fact that VLC is situated in VCC's Industrial Park makes this suitable as well.

7.5.2 Interest and Response from VLC

Today, the Emballage Pool is responsible for distributing what is available in it to its customers, i.e., it does not "hunt" for the TB packagings. This is one of the tasks proposed to be placed upon VLC. At present, VCC is responsible for ensuring that there is enough TB packagings in the flow and that they return to the Emballage Pool.

On the question whether this scenario would be of any interest to VLC, the people we talked to replied that a deeper collaboration and integration with VCC is always interesting, since they already have a good relationship today. But, there are many issues that have to be addressed if one is to realise a partnership like this. At present, it was found that there is often a scarcity of TB packagings in the Pool. One of the reasons behind this is that when VCC calculate the required amount of TB packagings needed, they try to avoid having any surplus due to the high costs of these packagings. Sometimes they are also stored longer in the plant than expected, which is another factor to consider. There is a strong need for a great amount of control in the process since a scarcity situation involving TB packagings can be immensely costly. It is exactly this control of the TB packagings that is extremely difficult to set a price upon, they stated. This would imply that enhanced systems and routines for controlling these packagings have to be developed further.

An important aspect to decide and agree upon is what volumes that are to be in the system. If VLC are to be responsible for ensuring that the TB packagings always should be available upon VCC's request, they have to get timely and accurate information of the volumes needed well in advance. The fact is that they stated that this does not work faultlessly today.

On the question whether the repairs and maintenance of the packagings could be taken over by VLC, they could not see why this would not be possible. Everything depends upon the specifications of the agreement regarding prices, quality demands and frequencies. The infrastructure for it exists, and there would be benefits in letting one party carry this out. In addition, it was stated, VLC have to be aware of what kind of additional expertise they would need if the repairs and maintenance of these rather specialised packagings should be carried out by them.

The need for building long-term relationships with manufacturers of TB packagings have to be evaluated as well so as to be able to rationalise processes and to obtain possible scale advantages. (The interviews carried out at VLC are shown in Appendix 8)

7.5.3 Implementation and Structure

There are several issues that have to be taken into consideration when implementing and organising such a big change, as this alternative would entail. When choosing a partner that should supply VCC with all its TB packagings, VCC have to make sure that it lives up to the capabilities mentioned in part 6; Manufacturing capabilities, Engineering competencies, Quality Systems, Logistics and Transportation, Materials Management and Enterprise stability. These capabilities are the foundations for even considering an outsourcing venture like this. In order for a relationship of this kind to work and be mutually advantageous, a long-term strategy and dedication is essential. To be able to get the best result out of it, VCC has to commit itself to long-term contracts with long-term players since this will impact both VCC and its partner extensively. This means that a formation of some kind of close collaboration and partnership has to be created. In order for the relationship to be a success, joint start-up teams must draw up well-defined requirements and measures. Information between VCC and the partner has to be standardised and as much transparency as possible is vital to obtain the best possible outcome of it. So in essence, the following aspects must be held and set up in order to

establish a good foundation for the partnership between VCC and its collaborator:

- Top management support from both companies
- Joint start-up teams
- Joint design of the partnership
- Well-defined responsibilities and working procedures
- Focus on information sharing and communication
- Common systems to be used

If these aspects are considered and jointly discussed around, the partnership between VCC and its partner would have a good starting point for minimising inefficient operations and future conflicts.

The ownership and control should be the responsibility of VLC which would grant the conversion of fixed into variable cost for VCC. VLC is today administering the in-bound and out-bound transports of TB packagings from the Pool. As stated in the previous part, scarcity situations of TB packagings occur from time to time. Various component suppliers are ordering packagings from VLC, which they cannot provide. This alternative implies that VLC is to take the responsibility of this task, to ensure and guarantee the availability of TB packagings in the system. A structural change like this would increase the stress on information systems. Information regarding forecasted volumes and variations must constantly be up-dated and sent to VLC in order for them to manage this task.

It is not believed that VLC should carry out the construction in CATIA since they currently have no expertise in this area. This function would have to be built up or bought from external suppliers. The problem is that the demand of this service from VCC is fluctuating which means that if a VLC in-house capability is built up, more customers of this particular service have to be acquired in order for it to be justifiable in terms of costs. However, the possibility of creating this service within VLC exists but as stated in one of the interviews, the most probable scenario would be to hire external expertise in the beginning of such a venture. It is seen as rather natural in this case to keep the construction task within VCC. This since the outsourcing of it would only

introduce an intermediary in the chain providing no additional value, thus leading to a higher total cost.

The specification task is rather complex and involves many stakeholders. VLC are not experts in TB packagings, meaning that they cannot provide any additional value to the process. Hence, it is not seen to be a candidate for outsourcing since it would not in our belief lead to improved quality, and that this probably would result in a higher total cost.

Regarding the repairs and maintenance of the TB packagings, it has been found through the research that many actors are rather unwilling to take the responsibility of it due to the uncertainty of costs involved. However, VLC stated in the interview that they saw no problem in carrying this responsibility. This is seen as a very good solution since most of the TB packagings passes through the pool administered by VLC. Efficiency gains are made through consolidating this activity at one place, and by the fact that the packagings wouldn't leave the flow in the same way as it would in other alternatives. VLC does not currently possess the exact competence to perform these activities, but it is not seen as a major problem to build this function up. There is however a certain amount of TB packagings that never goes into the Pool. These are the ones involved in direct flows between VCC and the component supplier. Nevertheless, this can easily be arranged through the agreements made between VCC and VLC.

When outsourcing all of the functions mentioned to one partner, VLC, it would be most flexible to strive for horizontal forms of communication and decision-making since there would be many people involved and that these people are employed in only two organisations. By only having to communicate with one party, VCC would have it easier to structure tasks in an efficient way, contrary to what could be done when dealing with an array of parties.

If a long-term successful relationship is to be obtained with VLC, the "walls" that exist in every company when it comes to re-construction, need to be broken down. A way in which this could be accomplished is by forming - as suggested in the theoretical frame of reference - some kind of lateral co-

ordination in the relationship. This is made through the emergence of communication across vertical lines of authority. Managers and employees in both companies should be able to solve problems at their own level by contacting each other in order to increase decision-making capacity, flexibility and to tie the functions together. In order to increase this co-ordination, informal co-ordination, formal groups and integrating roles should be promoted and set up. Informal co-ordination is the spontaneous communication that would involve the day-to-day operational contacts needed between the people at VCC and VLC. Formal inter-organisational teams – working in project groups – would consist of employees at different levels from both VCC and VLC. These would have the tasks of solving operating problems and to carry out improvements to the system. The integrators at VCC and VLC, by suggestion the process-owners, should have the overarching responsibility to organise activities and co-ordinate the work of these teams. This is illustrated in Figure 7.1.

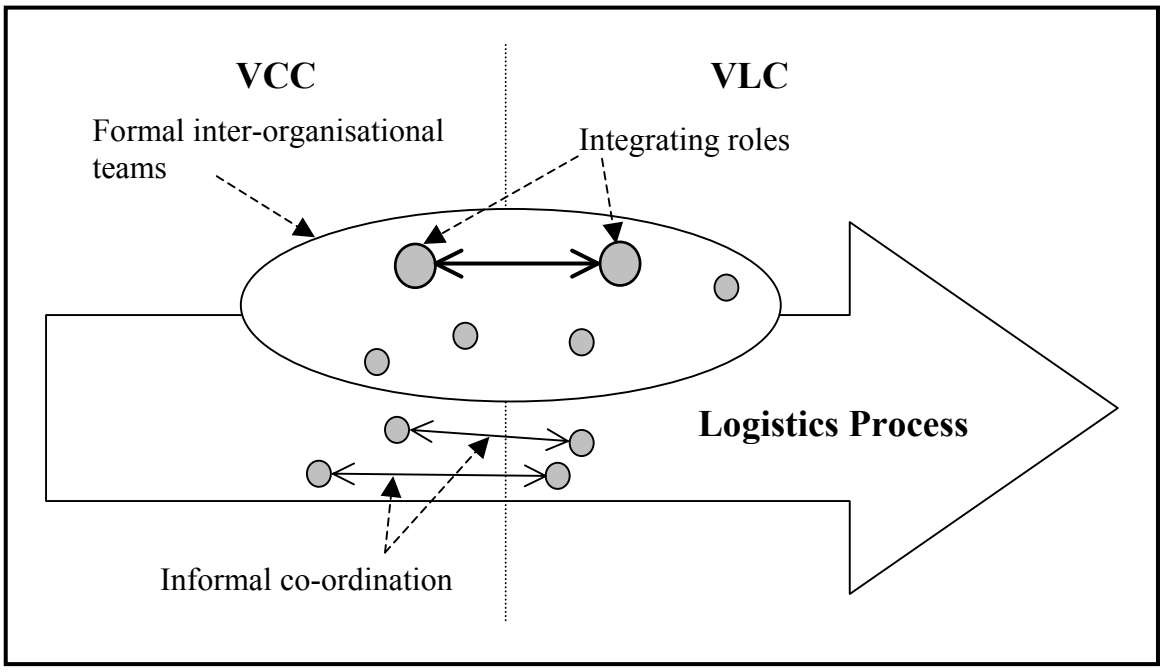


Figure 7.1: Lateral Co-ordination VCC-VLC

7.5.3.1 Organisational Impact on VCC

This alternative involves an outsourcing of ownership, control and repair and maintenance. The outsourcing of ownership has a very small organisational impact on VCC. However, the outsourced control functions have a more profound impact upon VCC's organisation. The information flows between VCC and VLC must be highly structured in order for this to be a success. Now greater demands would be placed on the functions involved with the administration of PMR's. In addition, stricter control over where the packagings are located has to be carried out from VLC's side. This naturally has to be carried out with a greater deal of coordination between the Plant Logistics Engineers at VCC and the responsible function at VLC (informal co-ordination). Along with this, stricter rules and demands upon the component suppliers regarding labelling, receiving and dispatching, have to be implemented. In other words, total control from VLC's side has to be attained in order for them to supply the packagings without encountering scarcities and other problems such as losses etc. This is not seen as reducing the workload at VCC to a large extent. However, it is seen as increasing the stability of the flows, thus reducing the risk of scarcity situations that exist today. Concerning repairs and maintenance, no real changes in processes have to be taken within VCC since this activity already is outsourced to external firms. The construction in CATIA and the whole specification process will still be carried out in-house. On the whole, it is not believed that the organisational impact upon VCC will be very extensive.

7.5.4 Advantages and Disadvantages of Alternative

7.5.4.1 Advantages

No initial Investment made: VCC will by this alternative pay variable costs instead of having to make a lump investment, leading to a lower Entry ticket, improved cash flow and reduction of tied up capital. The rather time consuming process of getting the financing approved and to raise capital is eliminated.

Total Packaging Solution: By outsourcing the ownership, control and repair and maintenance to VLC, a more or less total packaging solution is obtained. VLC would control and administer almost all of VCC's packaging related activities, thus creating potential coordinative gains.

One Part to Negotiate/sign contracts with: In relation to P2, this alternative would imply that only one party is carrying out activities that earlier have been carried out by several actors. This is seen as reducing the complexity in negotiations since an overall picture is more easily obtained when dealing with one partner only.

Infrastructure: VLC already have a well-functioning infrastructure to manage most of the control over the TB packagings. This infrastructure comprises distribution systems, ERP systems, routines, knowledge and physical facilities. Regarding repairs and maintenance, they have a function already in place that deals with this for their standard packagings. The system is understood to be very efficient, with inspectors working on the field monitoring processes and the need for repairs and maintenance. Nevertheless, there are a number of areas that still would need to be re-structured and improved in order to meet VCC's demands.

Knowledge of VCC's processes: VLC and VCC were once part of the same company. When the Ford group acquired VCC, the company continued to work on a close basis with VLC. This of course means that knowledge of each other's processes and routines exist. This is seen as increasing the stability of the collaboration, thus minimising the risk of conflicts. In addition, by knowing each other's processes also simplify and shorten the lines of communication.

Combined usage of TB packagings and standard packagings: Through our interviews, it has been found that there is a possibility of using standard packagings to a greater extent for TB demanding articles. This is supposed to be made through for example putting inner packagings into the standard packagings. If this area is to be investigated and analysed further, VLC would of course be the most suited partner to collaborate with.

7.5.4.2 Disadvantages

Middleman created: If this alternative were to be implemented, VLC would practically act as a middleman although they own the TB packagings. By not directly deal with the packaging manufacturer, an additional link in the chain is introduced, meaning that an additional margin also has to be catered for from VCC's side.

Risk of loosing competence: If placing more of the control and the purchasing of the TB packaging upon VLC, competence in these areas may be lost. VCC would loose its widespread communication network previously held with its preferred suppliers and others. Therefore, the competence of actually purchasing and negotiating around TB packagings is lost. Additionally, it may prove hard to establish this network all over again if once lost.

Reduction of market overview: By letting VLC make all the purchases in this field, VCC may loose the grip of market prices, quality and service levels. In the long run, this may result in increasing prices if VLC's sourcing capability isn't adequate. In addition, it was found out during the interviews that VLC isn't very subjected to competition in this area - there is only one other competitor providing total logistics and pool management solutions similar to what VLC does.

Dependence on one partner: Having to rely on only one party that takes over a large part of the control involved over the TB packagings, imply a certain amount of risk. Unexpected events such as accidents, bankruptcies and conflicts would hit hard on VCC and its ability to finally produce the cars as planned. In addition, VCC's share of VLC's total business is stated to be around 40%. It was found that many at VCC believe that VLC already has too much of their operations, that this is not diversified enough. Since VCC is now also separate from the Volvo Group, new actors than just VLC has to be more extensively considered when choosing a partner in this area since VCC now has become more of a global actor through Ford's ownership.

7.5.5 Analysis according to Criterions for Outsourcing Viability

7.5.5.1 Conversion: fixed to variable cost

This criterion is fulfilled by this alternative, but the problem is how this would look like. VCC wants to pay for volumes used while the most probable scenario would be that VLC would like to charge periodical prices based upon their investment, capital costs and depreciation charges. However, regardless of payment system adopted, a minimum total charge would most probably be specified in the contract to secure VLC's investment since no insourcer would want to carry the economic risk involved.

7.5.5.2 Efficiency gains

Efficiency gains could be obtained through a more extensive combined usage of TB packagings and standard packagings. By this, the cheaper standard packagings can be used on a larger scale that facilitates lower costs. In addition, if the repairs and maintenance is carried out at the Emballage Pool, it would mean that the packagings do not leave the flow as it would in the other alternatives since most TB packagings end up there for every loop they spin. If one does not need to take the packagings out of the flow, higher efficiency could be obtained. Through the infrastructure and network that VLC possesses, coordinative gains could be made.

7.5.5.3 Rationalisation Potential

By rationalisation potential we do not mean making people redundant, what we mean is to cut and streamline processes in a way so that abundant activities are eliminated. Dealing with a single partner, less administration and bureaucracy would probably be needed. Having a close relationship with VLC and the fact that all operative functions are aggregated, the potential for working out rationalisation steps is seen as being rather high. The possibility of implementing continuous improvement programs regarding practices and processes at both parties should be investigated.

7.5.5.4 Focus on core activities

By just outsourcing parts of the control function, repairs and maintenance and the ownership of the TB packagings, and not any of the time consuming activities, it is not believed that much of VCC's resources are going to be relieved. In other words, that a limited increased focus can be shifted to more core activities.

7.5.5.5 Economies of Scale

If this alternative were to be implemented, VLC would in turn outsource the manufacturing of the packagings to a set of preferred suppliers. However, it is not believed that VLC would be able to grasp any higher degree of scale economy than VCC could do. In terms of sourcing efficiencies it is therefore doubtful that any gains in this area could be made.

7.5.5.6 Complexity

By letting VLC take over more of the control of the operative issues along with the repairs and maintenance, and that these now are consolidated at one partner, the overall complexity is assumed to decrease rather substantially.

7.5.6 Total Cost Discussion – Outsourcing to VLC

Economic aspects of outsourcing is of major importance since a company is, in most cases, not willing to pay more for the outsourced services than the actual cost for carrying it out internally. However, as stated in the theoretical frame of reference, companies often don't know how much a function is actually costing them. It can therefore be hard to estimate whether the operating costs of having the function outsourced is too high in relation to the services provided. It is of course also important to have in mind that the insourcer will demand not only cost coverage, but also some profit. Thus extra margins are introduced into the chain of activities.

The cost effect of entering this outsourcing relationship is extremely hard to approximate. On one hand we have some positive aspects that are believed to reduce costs, such as efficiency gains and rationalisation potentials. On the other hand there are some heavy aspects that lead to an increase in costs. These are issues such as the creation of a middleman and opportunistic behaviour due to high dependency. Additionally, the workload of the involved people at VCC is not believed to be reduced, meaning that any significant cost-cutting measures cannot be made in this area.

In addition, the actual building of a relationship is costly. If the outsourcing venture is to be successful, time and money needs to be spent on relationship building activities. Follow-up and feedback procedures must be implemented and work properly. This highlights the need for perhaps investing in new information systems and other resources. Software interfacing needs may have to be sorted out as well. So it is not only the operational activities performed by VLC that have to be covered, the required investment into the partnership will also be costly.

To sum up the cost discussion, it is believed that the total costs of letting VLC take the ownership and responsibilities of repairs and maintenance along with the increased control measures, will increase compared to the costs for P2.

7.6 Outsourcing to Preferred TB manufacturers

7.6.1 Activities Eligible for outsourcing

7.6.1.1 Ownership and Control

This alternative implies that the TB packagings should be fully owned by a number of preferred suppliers in their respective niche. In other words that perhaps one or two manufacturers manufacture and own all VCC's steel racks, one manufacturer manufacture and own all EPP packagings, and so on. Again, the main idea with this is to get a variable instead of a fixed cost. When it comes to the control of the packagings, it isn't believed that the manufacturer would be able to handle this in an optimal way since this isn't one of their core activities. In addition, they are probably not willing to take this responsibility either.

7.6.1.2 Construction

Since the manufacturers of packagings already have this competence in-house, the task of constructing it in CAD/CATIA seems natural to outsource as well. The result of this is that the VCC consultant is made redundant. This however creates a problem, since someone at VCC must receive virtual constructions and put it into VCC's system for simulation at VMC.

7.6.1.3 Specification - Template

As stated in the previous alternative, parts of the coordinative tasks carried out by the Logistics Engineers and KUs involving the packagings can be contracted out. In this alternative we have chosen to engage the external service provider to take a prominent role in the specification process. This is done through having one of the manufacturer's experts in packagings involved, providing valuable input from a manufacturing perspective. This individual will take part in this process at the very beginning of the car project, and his task will be to supplement the Logistics Engineers at VCC.

7.6.1.4 Repairs & Maintenance

As the damaged packagings have to return back quickly into the flow again, the repairs and maintenance must be carried out at a place relatively close to it. It is therefore believed that the companies currently carrying this out for P2 – Engar and Stål & Svets AB, which has a branch in the Trim and Final Assembly Plant – best handle this, since the manufacturers chosen could be scattered over vast geographical areas.

7.6.2 Interest and Response from TB Packaging Manufacturer

In order to find out what the thoughts about this alternative would be from the manufacturers' point of view, we carried out an interview with Patrick Hugenholtz, Managing Director at Conteyor. Conteyor, which is situated in the Netherlands, is a large supplier of packagings for plastic based components, and it supplies VCC predominantly with steel racks at present. Its biggest customers are large car manufacturers like GM, Ford, PAG, BMW and PSA.

When asking him if this kind of relationship was of interest, the answer was promptly yes. He also even speculated around the set-up of a Joint Venture in this area. He explained to us that Conteyor is a specialist, i.e., that they are not actually seeking the one-stop-shop approach since this would then be a "generalist activity". Conteyor has been involved in programmes like this before but on a much smaller scale than this would imply. But apparently, he saw this as a very interesting idea, worth investigating.

There were a number of aspects that Hugenholtz pointed out as being of major importance if a scenario like this would be realised. Early programme involvement was seen as the single most critical aspect when engaging into a partnership like this. And when asked if Conteyor would be capable of taking this responsibility, he came up with a rather important point – namely that the actual production of the racks is not the bottleneck. Instead, the design and the approval of it from its customers on time was the biggest problem. So if, as suggested in our alternative, Conteyor got involved at a very early stage in the

development process, this problem could be overcome. In addition, he stated, early involvement means better scheduling that leads to lower costs. Having found this out, two major issues had been clarified – interest for this scenario exist and the capacity for manufacturing the packagings were not seen as an obstacle. Furthermore, this particular company has experience from this concept from past procedures.

Another issue that was seen as being very important was that the supplier and VCC would need to have a common CAD/CATIA platform. This since the component will only be available virtually and that someone must not only be able to read the files, but also make comprehensive packaging designs with them. We again confronted him with the idea that Conteyor took the responsibility of the whole construction task, since this was what we suggested in our alternative. Again, he saw this as a workable solution. However, he stated, it must be made clear how the supplier could cover these costs. Otherwise it would be difficult to find motivated suppliers that will share the latest innovations with VCC. In addition, the ownership and responsibility for the final design of the packaging needs to be defined. In the case that VCC switch supplier, and that it is found out that the design from its previous supplier works out very well, conflicts could emerge. Hugenholtz stated that in many cases nobody talks about this, but it should be especially considered in a venture like this. (The interviews carried out with Conteyor are shown in Appendix 9)

7.6.3 Implementation and Structure

A strong partnership between VCC and the manufacturer is vital since VCC now becomes rather heavily reliant upon this partner. If something for any reason does not work out as planned, there could be huge consequences for VCC. Escalating costs, flow disturbances and interrupted assembly could possibly turn out to be the result if things are not made right from the beginning. If for example the assembly line is stopped, the production loss is estimated to cost VCC around 12,000 SEK per minute.

This highlights the need of having the partner involved in the process at a very early stage, preferably from the very beginning of the project, as stated by Hugenholtz. This is one of the most important prerequisites for getting everything right in the beginning.

By letting a packaging expert from the manufacturer take a more central role, and more responsibility in producing the specifications for the packagings his own company will provide, an early involvement in the process is achieved. He will have a prominent role, where he acts in conjunction with the Logistics Engineer in making the contacts that have to be made with people spread across the organisation. This individual will also handle all the contacts and communication between VCC and his employer, the manufacturer of the packagings. The making of the packaging specification will practically work the same as before, with the exception that the packaging expert now gets a more integrated role in its development and that he take over some of the work previously carried out by the Logistics Engineer and also possibly from the KU.

The manufacturer of the TB packaging is best suited for carrying out the construction of it in CAD/CATIA. The reason for this is that this competence already exists within the company, meaning that it would not be necessary to have this competence at VCC any more. The only obstacle to overcome is the receiving of the 3D models at VCC and the placing of them into VCC's system. However, since the construction task now lies with the manufacturer, any of VCC's other CATIA experts can probably take care of this. After all, they should not make any modifications of it they will only receive it. In any respect, in order for this to function properly, VCC's CAD/CATIA platform must be compatible with the one used by the manufacturer.

As stated earlier, nobody actually wants to take the responsibility of repairs and maintenance of the TB packagings. Due to the uncertainty of costs related to it, and the fact that a smooth solution is required in order for the packagings to return to their flows, it is believed that VCC could best take care of this. It is therefore suggested that VCC continues to let Engar and Plåt & Svets AB take care of this activity. This would probably be the most suitable solution since

the system for it already exists and that escalating and uncertain costs could be avoided.

7.6.3.1 Organisational Impact on VCC

As stated in the theoretical frame of reference, outsourcing of activities creates opportunities for positive synergy by bringing the core competencies of two companies together. But these decisions have not met their full potential due to two major reasons. Firstly, outsourcing decisions have been looked on as tactical decisions with key emphasis on cutting cost. Secondly, outsourcing contracts are often viewed as a mean for getting rid of a function rather than looking at it as a potential co-operative relationship. It is important to have in mind that the most successful outsourcing companies have strong relationships with their suppliers, hold high-level strategic reviews, and have an effective process for continual improvement.

This is the reason why it is believed that the creation of a partnership with the manufacturer is crucial to reach mutual benefits and common advantages. The closer contact between VCC and its partners that this alternative would imply, demands a good structure of the partnership and effective communication so as to create the prerequisites for successful implementation. Similar to the previous alternative, joint start-up teams must draw up well-defined requirements and measures and information between VCC and the partner has to be standardised and as much transparency as possible is vital to obtain the best possible outcome of it. Again, the key elements needed to reach this are the following:

- Top management support from VCC and the manufacturer
- Joint start-up teams
- Joint design of the partnership
- Well-defined responsibilities and working procedures
- Structured information sharing and communication
- Common systems and platforms to be used

By adopting this alternative, a greater extent of responsibility is placed upon the packaging manufacturer and its employees. The biggest organisational

impact from this alternative would be that the construction of TB packagings no longer is needed at VCC, and that parts of the workload involved in the specification process is shifted onto the TB manufacturer. By outsourcing the construction task to the manufacturer, and having an individual from that company that takes a prominent role in the development process, VCC's own resources are liberated and could be placed on more core activities such as logistics assurance.

7.6.4 Advantages and Disadvantages of alternative

7.6.4.1 Advantages

No initial Investment made: As with the previous alternative, the investment is eliminated.

No Middleman/subsidiary: No additional actors are positioned between VCC and the manufacturer, which would be the case in the previous alternative. This of course means that no extra margins are introduced in the supply chain.

Fewer Partners to negotiate/sign contracts with: In relation to P2, this alternative would imply that a lower number of packaging manufacturers would be responsible for supplying the TB packagings.

Economies of Scale: Since the chosen manufacturer supplies other companies with packagings as well, sourcing efficiencies could be made which would have a positive impact upon the price charged. A higher degree of packaging standardisation could also be obtained through the use of a few suppliers.

Access to Specialist knowledge: The first aspect of this is that VCC would deal directly with people knowledgeable of TB packagings instead of what is done for P1. The other aspect is that experienced specialists in packaging materials carry out the CAD/CATIA construction.

Early Involvement: The early involvement from the manufacturers in the specification process would lead to better scheduling of manufacturing tasks, thus lowering costs and reduce errors.

Deep Collaboration: A relationship like this would most probably be an incentive for the manufacturer to focus more upon the provision of quality assured products. Even though this type of relationship would stretch over a long period of time, the manufacturer still has to make sure that efficiency matters and rationalisation potentials are analysed. This in order for the manufacturer to remain being a credible partner, and that it will be entrusted with renewed contracts.

Enhanced focus on Core Activities: Since the construction task and a large part of the specification process are now placed on the manufacturer, resources at MP&L will be released. This in turn means that those resources could be more extensively used for logistics assurance instead of packaging design.

7.6.4.2 Disadvantages

Low diversification of suppliers: Employing only a small amount of packaging suppliers implies a certain amount of risk. In addition, relying on a few partners creates a high dependence upon these. This dependence could lead to power abuse from the packaging supplier and reduced bargaining power for VCC.

Loss of competence: When outsourcing an activity, the competence in the area previously held in-house may be lost. It can be difficult to re-build this competence in case the outsourcing is proven not to be very value adding. In this case, VCC would loose the CATIA construction competence. This is however held by a consultant, whom in the end is not part of VCC's working force. Furthermore, this alternative implies that the competence of actually purchasing and negotiating around TB packagings is lost. The contact network held today with other manufacturers can also be lost – and if once lost, it will be difficult and time consuming to re-build it again.

Reduction of market overview: When entering a partnership of this kind with a certain supplier, one is committed to only deal with this partner during the pre-specified period. This could lead to the outsourcer loosing grip of market prices and service levels. However, this could be counteracted through rather simple measures such as market surveys and continuous quotation requests.

Reduced process overview and control: The fact that outsourcing of an activity is even considered, indicates that a company no longer wishes to deal with it. In other words, the responsibility and control of a task is placed on another provider. However, this can be seen as a disadvantage since the outsourcer in some cases could totally loose the control of the outsourced activity. In case of trouble scenarios, this could turn out to be a huge disadvantage.

7.6.5 Analysis according to Criterions for Outsourcing Viability

7.6.5.1 Conversion: fixed to variable costs

This criterion is fulfilled by this alternative

7.6.5.2 Efficiency gains

Efficiency gains could be obtained through early involvement of the TB packaging supplier. As Patrick Hugenholtz stated in one of the interviews, an early involvement in the process would lead to better planning and thus lower costs. By having a specialist from the packaging supplier involved in the specification process, operational efficiency could be improved since decisions regarding design and construction could be made at an earlier stage. In addition, the fact that the specialist handles the communication on behalf of the manufacturer, and that he also provide feedback from VCC to the manufacturer, makes the information sharing more effective. Decreased formalisation is achieved and misunderstandings are minimised.

7.6.5.3 Rationalisation Potential

Dealing with a limited number of suppliers, less administrative tasks such as the RFQ process (tendering), fewer contracts, and less quotation evaluations need to be performed. By adopting a close relationship with a few packaging suppliers, rationalisation steps could be worked out and specified. As with the previous alternative, the possibility of implementing continuous improvement programs regarding practices and processes of both parties should be investigated.

7.6.5.4 Focus on core activities

By liberating resources involved in the specification process, these can be used for activities closer to the core functions of the MP&L division, namely logistics assurance. This includes capacity and material planning, quality control and flow optimisation.

7.6.5.5 Economies of Scale

The TB packaging manufacturers could obtain sourcing efficiencies and scale advantages through larger volumes and bulk purchasing. By concentrating the total purchase of one category of TB packagings to a single supplier, economy of scale is achieved. In addition, these TB manufacturers often have other big customers in the car industry, which could lead to further improvement and scale advantages through a higher degree of standardisation.

7.6.5.6 Complexity

It is believed that the set-up of this type of relationship could be rather complex initially. However, when all activities and responsibilities are specified and implemented, and when everything is up and running, the complexity of the process would be reduced from VCC's point of view. Responsibilities and tasks that were earlier carried out in-house are now carried out by the manufacturer.

7.6.6 Total Cost Discussion – TB Manufacturer-owned

Although costs cannot actually be cut in many situations through outsourcing, there could be rather significant cost savings if it is carried out correctly and selectively. Due to advantages of economies of scale that insourcing companies can grasp through servicing many companies, they can provide a service or manufacture products at lower costs. This while the outsourcer can reduce its tied up capital in assets.

The total cost of entering this type of partnership is also very difficult to estimate. Positive aspects that may lead to cost reductions are efficiency gains, rationalisation potential and scale advantages at the TB packaging manufacturer. The fact that this alternative would lead to an exclusion of middlemen in the chain, also reduce costs compared to the previous alternative. On the other hand, issues such as power abuse from the supplier due to the high degree of dependence, and reduction of bargaining power and excessive margins, may cause a rise in prices. In addition, since the manufacturer must profit from its fixed asset base by variable payments, the risks implied in this will be hedged for in the leasing costs. It will most likely be rather expensive to have the specialist involved in the development process at VCC. However, the additional value that this individual could provide may by far compensate the costs. Nonetheless, whether the total effect would be either positive or negative is extremely hard to estimate. Outsourcing the CATIA function would lead to lower cost for VCC since this role is made abundant. Yet, the manufacturer would naturally demand cost coverage and margins for providing this service as well.

Summed up, it is in any respect believed that the total cost for this alternative would be higher than for the P2 strategy. This is mainly due to the higher risk taken by the manufacturer in actually owning the packagings along with its demands on return on investment. Nevertheless, the alternative brings forward some positive aspects that one cannot value in monetary terms.

7.7 Summary – Outsourcing Viability

A summary of the outsourcing criterions identified from the P1 strategy and the proposed alternatives in relation to the P2 strategy, is shown below in Table 7.1. Note that these are just *indications* of what we believe would be the effects from every strategy. Arrows pointing upwards stand for an increase for the particular criterion and vice versa. A flat arrow indicates no or very limited impact.

	Supplier-Owned Packagings (P1)	**Outsourced to a Single Partner, VLC**	**Outsourced to Manufacturers of TB Packagings**
Conversion: Fixed to Variable Costs	YES	YES	YES
Efficiency Gains	→	↗	↗
Rationalisation Potential	↗	↗	↗
Focus on Core Activities	↗	↗	↗
Economies of Scale	→	→	↗
Complexity	↘	↘	↘
Total Costs	↗	↗	↗

Table 7.1: Comparison of Strategies to Outsourcing Criterions

7.8 Long-term Strategic Fit – Alternative Solutions

A basic criterion for relationships of this kind is long-term agreements between the parties. Both actors have to change and structure processes in a way which would make short-term solutions unfeasible. Concerning the proposed and analysed partnerships, one major issue has to be addressed. The competition in the car industry is severe and all manufacturers are trying to improve value, extract synergies and drive commonality. As stated in the empirical research, FMC Europe is striving for a higher degree of commonality within the group. The aim is to attain a common commodity and supplier strategy, while maintaining the uniqueness of the brands. A common commodity strategy, i.e. the joint purchasing of components from the same supplier, would also mean that a common packaging strategy could be worked out. As it could be seen in MP&L's Business Plan up to 2007, standardisation of TB packagings and PAG packaging synergies is strived for. Therefore it is believed that commonality, standardisation and PAG synergies are three critical factors that will have an impact upon what packaging strategy to choose for future car projects.

It is believed by the authors that the greatest potential of making huge savings related to TB packagings lie in this area. Large amounts of resources and capital could be saved if all manufacturers within FMC Europe could use the same packagings, and that these would have been developed and owned by the same company carrying full responsibility. There is however a problem with this. The production processes of the various manufacturers are so different that a packaging designed for one plant cannot easily be used at another. For example, the dimensions of internal storage depots, shelf spacing, automatised warehousing and handling equipment etc. are rather unique for every plant. Even VCC's production facilities, VCT, VCU and VCG, differ from one another, meaning that assembly line fitting would pose a problem as well. This has been evident for the C1 commonality parts where the article supplier will have to handle three different types of packagings since its customers, Ford, VCC and Mazda needs specially adapted solutions. It will therefore be a major task in the future to streamline the various production processes at the manufacturers in the Pan Brand Group.

7.8.1 Impact on Packaging Strategies

When turning to the viability of the alternatives and having the mentioned issues in mind, a number of questions arise. The first one naturally being if outsourcing of activities and functions would be a good solution once the work with the issues surrounding commonality, standardisation and PAG synergies are taken into account. Having analysed the advantages and disadvantages for each strategy, we will provide a general discussion of what we believe to be the main issues of every packaging strategy in relation to the strive for commonality. In other words, the viability of each strategy on a long-term basis along with the complexity involved, will be outlined.

7.8.1.1 Single Provider - VLC

In a long-term commonality perspective, VLC is not seen as an optimal partner since they are not involved in any processes – the company is merely an intermediary, meaning that they are not providing any physical value related to the product itself (apart from distribution). At present they have limited skills and knowledge about the specifications made at VCC, and no construction competence exists. In essence, an array of questions has to be analysed and answered before considering this alternative on a long-term basis. How many of the group's packagings should be owned and controlled by VLC? Furthermore, the ownership would require a massive amount of investment, which VLC itself wouldn't be able to muster in the case that it would own other manufacturers' packagings as well. And how should VLC build up the extensive network needed with all the other car manufacturers within the group? Since individual solutions involving the TB packagings will still be required for some time, the communication between all stakeholders is of critical importance. It is not argued that VLC couldn't build this network up, but it is believed that they are disadvantaged due to their position – they are not involved in any of the fundamental processes related to this area; car-, article-, or TB packaging manufacturing. In order to grasp scale advantages, one party must carry the main responsibility in the development of TB packagings for all actors, resulting in a higher degree of standardisation. This would be difficult for VLC to carry out since they have to build up a communication network

with all car manufacturers, see Figure 7.2. In addition, they currently do not possess the knowledge in this area. The most probable scenario would be that one of the car manufacturers took the collective responsibility for every type of packaging. By this, VLC would just act as an intermediary granting limited value to the process as a whole. Nonetheless, it is not said that VLC couldn't be the external service provider for VCC's unique TB packagings.

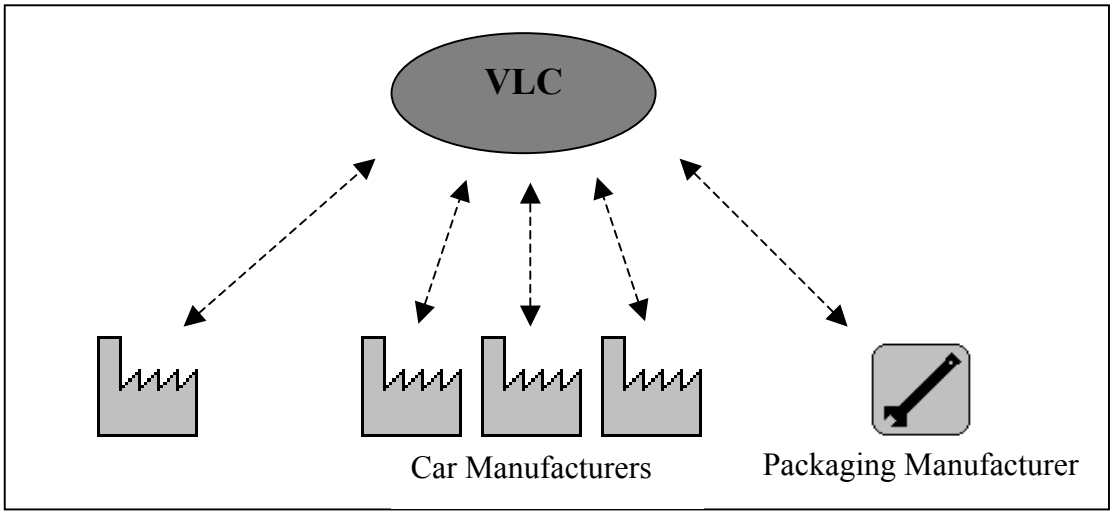


Figure 7.2: Communication Channels VLC

7.8.1.2 TB Packaging Manufacturer

No matter how the owner structure and responsibility would look like in the future for packagings carrying commonality parts, a packaging manufacturer would still be the one manufacturing them. They possess the construction competence, the expertise in packagings and the process in which they are to be manufactured and delivered. It is believed that a packaging manufacturer would be a good partner to work with since these competencies exist and that capacity issues often wouldn't be any problem. In a total perspective, however, this could turn out to be extremely complex since we are now talking about volumes that are far greater than of that needed by a single car manufacturer. In the proposed alternative relating to this, an expert from the packaging manufacturer would get a prominent role in the specification process at VCC. This is seen as a workable solution on a smaller scale. However, the huge coordinative tasks required from the packaging supplier on this scale would

probably be too complicated for this to function efficiently. In addition, a project of this size would require vast resources and whether the packaging supplier would be willing to engage in such a venture is questionable. In comparison to VLC, this solution would entail one less actor to share information with/collect information from (Figure 7.3). Although there are some advantages of this alternative, we believe that it would be difficult to implement on this scale.

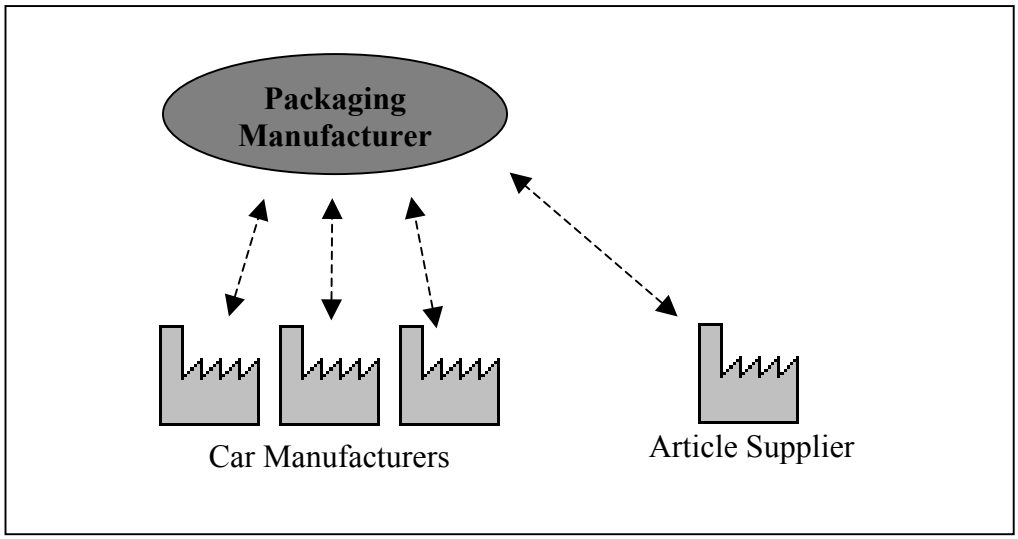


Figure 7.3: Communication Channels Packaging Manufacturer

7.8.1.3 Article Supplier

The increasing degree of commonality implies that the same article supplier would supply all members of the group with the same component. A good solution would therefore be that the same supplier also provided all the packagings needed for this specific component. By this, extensive scale economy could be attained by the supplier due to the massive volume, thus reducing the overall cost faced by all members of the group. The amount of information that would be shared is similar to the previous alternative – but it would be more structured and simpler since the article supplier is closer to the component and only need to pass the specification on to the packaging manufacturer (see Figure 7.4). However, the article supplier is facing a demanding task of developing these packagings. Since all car manufacturers processes are more or less unique, different solutions have to be found. Initially, this can turn out to be rather complex and costly. As stated previously,

the P1 project, where some commonality exists (C1 components), brought increased complexity for the article supplier since it had to develop three different kinds of packagings. On the whole, though, this strategy is seen as being well adapted for common commodity purchasing in the future. The aim of this alternative would of course be to let the commonality suppliers develop the packagings themselves to the greatest possible extent.

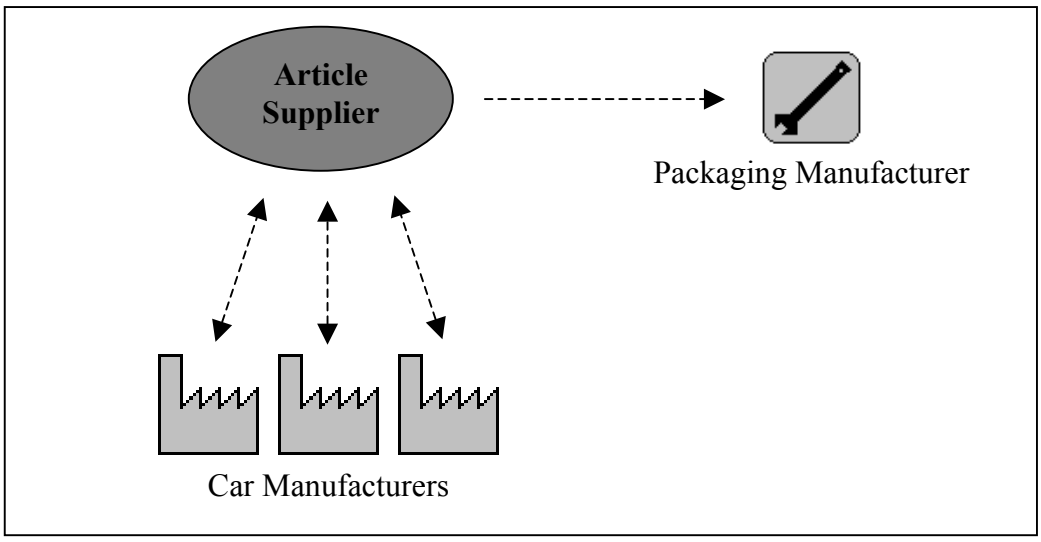


Figure 7.4: Communication Channels Article Supplier

7.8.1.4 Car Manufacturer

Another alternative to the aforementioned practice is of course to let the car manufacturers take the ownership and development responsibilities of the TB packagings themselves. If every car manufacturer were to develop its own TB packagings, scale advantages may be hard to obtain. One way to overcome this could be to split the responsibility of packagings between the members of the group. One manufacturer could take full responsibility for all manufacturers' interior parts and another could take it for exterior parts and so on. This has been reflected around by some of the people interviewed. The car manufacturers possess the knowledge of the processes involved, and the component is developed in conjunction with the other manufacturers and the article supplier. This alternative would thereby imply a number of advantages compared to the other alternatives. The procedure of this alternative is illustrated in Figure 7.5.

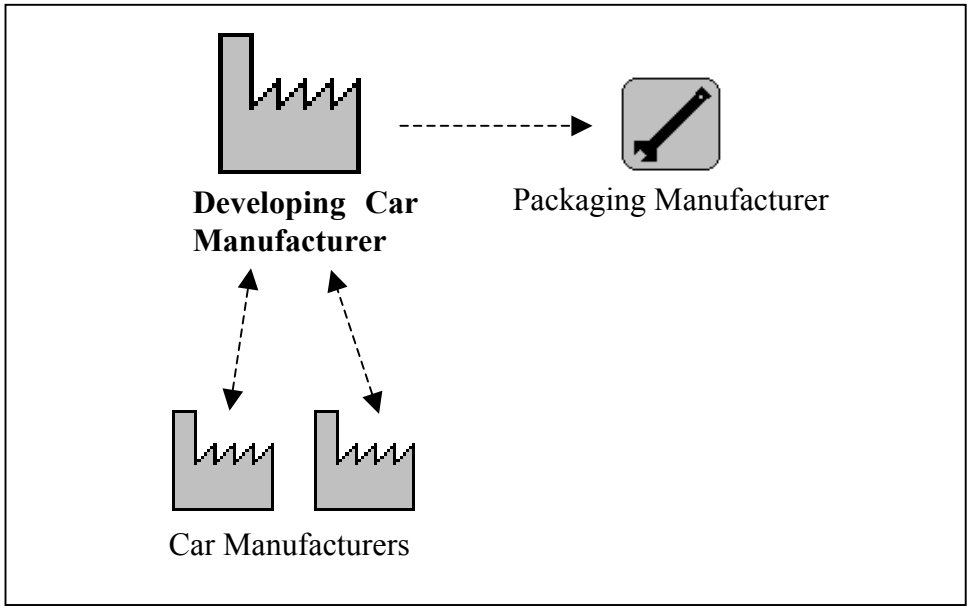


Figure 7.5: Communication Channels Car Manufacturer

7.8.2 Discussion – Future Strategic Fit

This last part was about how the strategies possibly could look like in future – some 5-10 years ahead – in a commonality perspective. This is however dependent upon what degree of commonality that is discussed. What we analysed before this was how the existing strategies worked and resulted in, and how the proposed alternatives that possibly could replace these would work. The reason for highlighting future strategic fit is that we believe that it is important to see what strategy that would be the most suitable on a long-term basis. Another important aspect was also to see which strategy that would be the most suitable to adopt *until* the final decision is taken regarding how the structure of future packaging development will look like.

The question regarding the dedicated status of the TB packagings these future proceedings would imply should be looked upon. Although the legal position of FMC's ownership of the members in the commonality group is unknown, the fact that several companies now utilise the same packagings could mean that the packagings are no longer regarded as dedicated assets. If now regarded as an operational lease, VCC wouldn't need to include them in its balance sheet, thus getting rid of an unwanted effect. However, whether this would be the case or not has to be investigated further.

8 Conclusion & Recommendation

Having analysed the current strategies and the alternative solutions involving the outsourcing of various functions, it can be seen that there are pros and cons no matter what direction VCC choose to take. Any of the strategies has its strengths and weaknesses, and the future course of action wholly depends upon what VCC believe to be the best option for their company – and what long-term strategy they decide to take in this field. It is also important to have in mind that the analysed alternatives related to the outsourcing of functions and activities are just proposals brought forward by the authors. For example, the suggested functions outsourced in any of the alternatives could be set up in a different way than what we have proposed. Nevertheless, one of the reasons why Supply Chain Development wanted this research to be done was to see what possibilities there were, and what the probable impacts of them would be.

Being outsiders, it is difficult to fully argue that a particular path to follow would be the best suited strategy to adopt in any situation. It is in our belief that all four strategies are viable, depending upon which standpoint one think to be most important for the company as a whole. But as with everything else, advantages almost always comes at a price. By developing the TB packagings in-house, consolidation of knowledge and full control at low cost is attained at the expense of being involved in a development which cannot be regarded as a core activity. Article Supplier-owned and developed packagings imply believed less complexity and closeness to the article at the expense of escalating costs of uncertainty and limited know-how. However, as mentioned earlier, if VCC would have placed a Target Cost to the article supplier this expense might have been significantly lower. And finally, by adopting any of the external service provider alternatives, transferred responsibilities, more focus on core activities and variable costs is attained at the expense of higher total costs and loss of certain internal competencies, process overview and control.

It is believed that if one is to enter an outsourcing venture, as many as possible of the sub-tasks related to the entire activity should be included. However, there has to be more than just one criterion that has to be fulfilled, unless

everything remains the same (quality, service levels etc.) at a lower total cost of an outsourcing. It is therefore supposed that outsourcing for bookkeeping technicalities shouldn't be the driver behind the decision to outsource a function. To achieve variable costs from letting somebody else invest in assets and then lease it from them is a viable option if a company would suffer from cash flow problems by making the investment itself. However, VCC is not in this position, and the fact that the TB packagings only represent around 1-3 % of a car project's total Entry Ticket visualises the investment's small proportion of the total development cost.

Concerning the analysed alternatives, it is not believed that the enhanced focus that could be placed on more core activities would be justified in relation to the probable increased cost. The cost of obtaining full control of activities is seen as indefinable, but lack of control can result in fatal consequences that indirectly will have a negative impact on costs. Scarcities, quality problems and losses are examples of this. If developed and owned by VCC, the risk of control deficiencies by other actors is eliminated. It is also hard to estimate the value that the external specialist from the TB manufacturer would provide. It was outlined that this would increase operational efficiency, better communication and early involvement, thus lowering costs. To what extent this would provide these positive effects along with the release of VCC's resources, is however uncertain.

Reduction of the overall complexity is also an important aspect to consider in an outsourcing decision. Both alternative solutions are assumed to lead to decreased complexity from VCC's point of view through pushing responsibilities downwards the channel. This is regarded as a major advantage of the proposals. Although the complexity is reduced in the VLC alternative, the question is whether the formation of a partnership is not just a matter of adding a player and letting VCC pay VLC's profit. If all activities can be performed in-house to the same cost or lower, and that limited additional value is granted, it is likely that an outsourcing is not a good solution.

Even if the alternatives would turn out to be cheaper than the in-house solution, the competence in developing TB packagings that could prove to be highly

valuable in the future in this field will weaken. This would be apparent if VCC wants to cancel the partnership with the external service provider. Furthermore, it has been found out in the interviews that long-term relationships are not generally sought after. On its height, they should only last for 1-2 years – then they should be re-negotiated. This poses a problem since the alternatives presented are based on long-term agreements in order for them to be viable. Thereby, uncertainty is created whether it would be feasible to invest and engage in such a relationship from both sides. In turn, uncertainty leads to lack of dedication and hedging of risks.

The aspects surrounding the long-term strategic fit are also vital to consider before committing to any outsourcing solution. We believe that the two proposals given are not in line with what is to come in the future with regard to commonality issues. Practical procedures and the work of getting streamlined processes could be hampered if VCC commits to any of the proposals on a long-term basis. It is in our belief that the two ways that in the end would be viable in a commonality perspective are either Article Supplier-developed and owned or car manufacturer-developed and owned.

To conclude this research, it is believed that VCC shouldn't commit itself to an outsourcing at this time. The underlying reason for this is that rather limited value is gained in relation to the alleged higher total costs. It is felt that the advantages of the P2 strategy outweigh the ones for P1 and the alternative solutions – both in the short term and in the long term until clearer steps are outlined regarding future commonality decisions. However, the alternatives bring about a number of advantages that could be achieved without having to outsource anything. VCC could strive for getting the TB manufacturers involved at an earlier stage in the development process, granting mutual benefits. Another issue is to let VLC handle and administer the flow-control (i.e. availability and stocktaking) of TB packagings, although they wouldn't own them.

In total, it is believed that VCC should maintain the development and ownership of TB packagings in-house. They should however continue to

request for quotations from the article suppliers. If an outside actor can provide a packaging at a lower cost, it should of course get the task to supply it.

However, the overarching strategy recommended by the authors at this time would be that VCC should continue to own and develop the TB packagings in-house.

9 Proposals for Further Research

The enormity and complexity of this subject has prevented us from diving deep into any particular area discussed in the research. Our study has therefore become indicative in nature since we only have been able to merely scratch on the very surface of the topic.

Below are some of the aspects that we believe have to be analysed further in order to in more detail come up with more precise results and conclusions:

- Actual costs for outsourcing TB packagings (can only be achieved through quotations)
- Impact of commonality upon future packaging development (strategy not yet defined at VCC)
- Technical aspects surrounding the implementation and day-to-day operational issues with regard to the alternatives
- Actual cost for developing and being responsible for TB packagings in-house at VCC (cost components are not precisely known – man-hours etc.)
- What the legal status of the TB packagings would be if utilised by all members in the PAG/commonality group (if the lease would be regarded as operational, i.e. the packagings wouldn't be considered as dedicated assets)

10 APPENDICES

Appendix 1

Template

VOLVO
Volvo Car Corporation

Packaging number: 4100
Component supplier number: 11137
Owner of packaging: VCC
Commonality: P2/P1

Specification of design requirements

1. General Information

VCC contact: 53320 Helena Asp tel 3255062
Packaging supplier contact: Rebo Plastic: Wolfgang Schwab, Plåt&Svets: Bo Wendel
Component supplier contact: Patric De Smaele
Load carrier (e.g. L-pallet, Rack2000):
Type of packaging: rack
VCC Manufacturing plant: VCG
Sequence or batch: sequence
Maximum weekly capacity (acc. to program):

2. Part. Specification

Part name	Part number	Drawing/model number
Headliner P1 / P2	8641464 (P1)	drawing number 09063665
Number of variants	**Unique left and right hand part?**	**Overall component dimensions**
	No	Weight: 10 kg Length: 2455 mm Width: 1380 mm Height: 100 mm

3. Timing

Design reviews	Virtual Design Review	Physical design review	Design approval
Week			
Virtual series	VS 3.1	VS 3.2	
Week	216	301	

Series	S 3.1	S 3.2	PTO 1	TO 1	TO	SOP
Week C-mtrl	247	305	315 / 324	325	332 / 340	338 / 347
Cars	29	29	81 / 37	49	106 / 113	

4. Sign Off Checklist status

SIGN OFF STATUS:	Signed approval of spec:	Signed approval of VDR:	Signed approval of PDR:	Signed approval of final design:	PACKAGING STATUS: Status of design (see explanation)	Planned week	Actual Week	Comments:
Purchasing Logistic Engineer	OK	NA			100	W325		
Process owner MP&L	OK				90	W304		
MP&L Program Manager	OK				80	W303		
KU	OK				70	W247-		
Purchasing Quality Engineer	OK				60	W227	W227	
"Beredare"	OK				50	W227	W227	
Tool designer (If applicable)					40	W227	W227	
Packaging supplier					30	W218	W218	
Vehicle Purchaser					20	W216	W216	
FM&SP Purchaser					15			
VMC-simulation					10		W205	
Component supplier	OK				7			
VCC Plant logistic engineer	OK				5			
Others (if applicable)					0	W135	W135	

5. Delivery Plan

						Sum	Calculated	Diff
Delivery week **	W247							
Planned quantity ***	2					0	0	0
Actually arrived						0	0	0

** package at article supplier, delivery at least one week ahead
*** new package to purchase/manufacture

Demand List

Demands on packaging:	Provider of demands:	Demands:
Strategic directions:	53350	
Packaging standards:	53350	
Time demands:	MP&L Program Manager	
Product demands:	KU	
	Purchasing Quality Engineer	
Process demands	Manufacturing Engineer	Same sequence with P2
Tool demands:	Tool designer	
Transport to VCC demands	Purchasing Logistic Engineer	Shorter rack for better trailer load
Packaging supplier demands	Packaging supplier	Parts laying backside up in rack
Commercial demands	Vehicle Purchaser	
Commercial demands	FM&SP Purchaser	
Virtual manufacturing demands	VMC-simulation	
<u>Loading at supplier plant:</u>	Component supplier	
Loading method:		
Number of operators:		
Handing aid details:		
Rack orientation for loading:		
Component orientation:		
In plant movement:		
Maximum packaging dimensions:		
Transport method (trailer size):		
Unloading at VCC plant		
Other		
<u>Unloading method:</u>	VCC Plant logistic engineer	
Number of operators:		
Handing aid details:		
Rack orientation for unloading:		
Component orientation:		
In plant movement:		
Maximum packaging dimensions:		
Internal transport method:		

Packaging Volumes

VOLVO
Volvo Car Corporation - Logistics

CALCULATION SHEET
CYCLE TIMES SPECIFIC PACKAGING

Material description / part numbers :	Headliner P11 / P12 / S60		
Packaging description / number :			EMB 4100
VCC Logistic Engineer / Dept / Tel :	Helena Asp	53320	55062
Issue / date of issue	Issue	**01**	020819

see amount racks below

	VCG [days]	VTV [days]	ANOVA [days]	KSO [days]
Production volume [cars/day]	1188	0	0	0
Unit load [parts / specific emballage]	5	1	1	1
Empty emballage at supplier	0,00	0,00	0,00	0,00
Emballage in suppliers production	0,00	0,00	0,00	0,00
Filled emballage at supplier	0,00	0,00	0,00	0,00
Transport to the VCC plant	0,00	0,00	0,00	0,00
Emballage in stock at VCC	0,00	0,00	0,00	0,00
Emballage along the line in VCC	0,00	0,00	0,00	0,00
Transport to the emballage pool	0,00	0,00	0,00	0,00
Stock in the emballage pool	0,00	0,00	0,00	0,00
Transport to supplier	0,00	0,00	0,00	0,00
Repair	0,00	0,00	0,00	0,00
TOTAL [days]	0,00	0,00	0,00	0,00
TOTAL [number of emballage units]	0	0	0	0
TOTAL [number of emballage units]				0

Appendix 2

Catia design of interior ceiling

We have previously used template 4100 (interior ceiling) in the mapping of the organisational activities and interactions that takes place in the development of typebound packaging. This part aims to present and describe the various pieces of this specific typebound packaging and the construction of it in CATIA.

As stated before, the TB packaging 4100 is meant to carry three different types of interior ceilings in order to serve as a common rack for the cars in production. The cars that it is meant for are P11, P12 and the S60. These are models that vary in length where P12, the sports wagon, is the longest.

1.

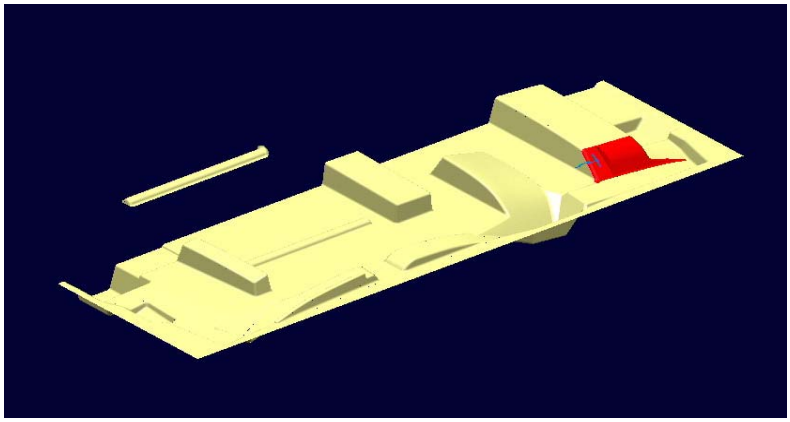
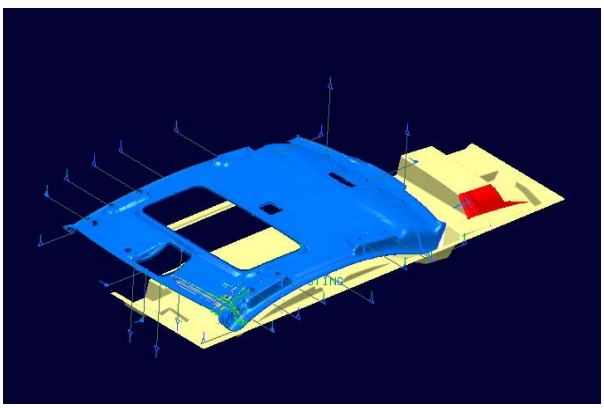
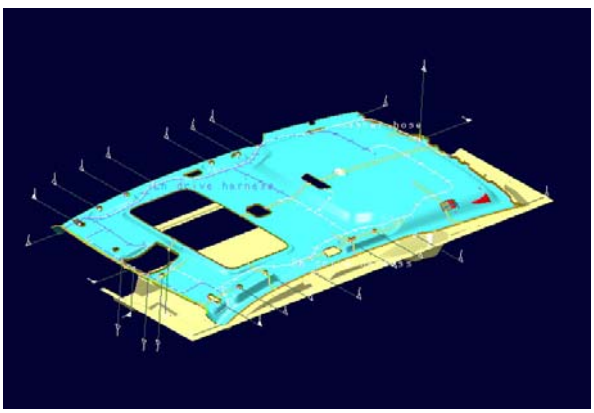


Image 1 shows the vacuum formed board itself that is meant to carry the different types of interior ceilings. When constructing in CATIA, the designer only constructs half the packaging. Features unique on the non-drawn side are added while the rest remains the same.

2.





The pictures show how the interior ceilings from the P11 and P12 are fitted into the common vacuum formed board.

3.

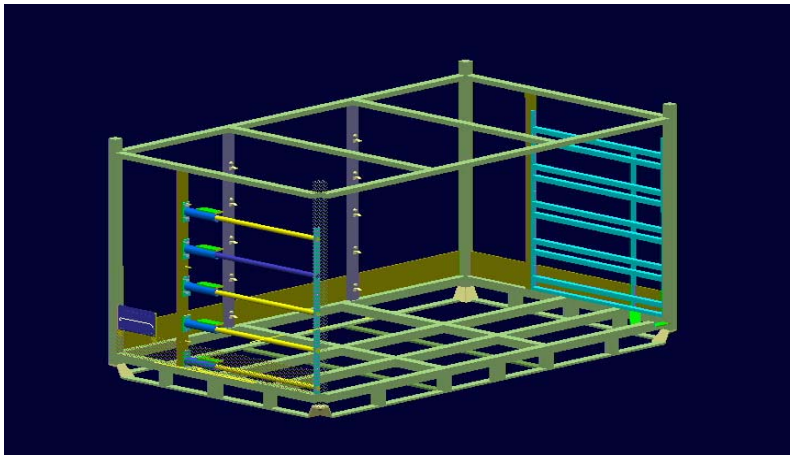


Image 3 shows the steel-rack that is meant to carry the vacuum formed board with its interior ceilings. It is constructed with extensible drawers so that the operators at the assembly line easily can lift off the interior ceilings.

4.

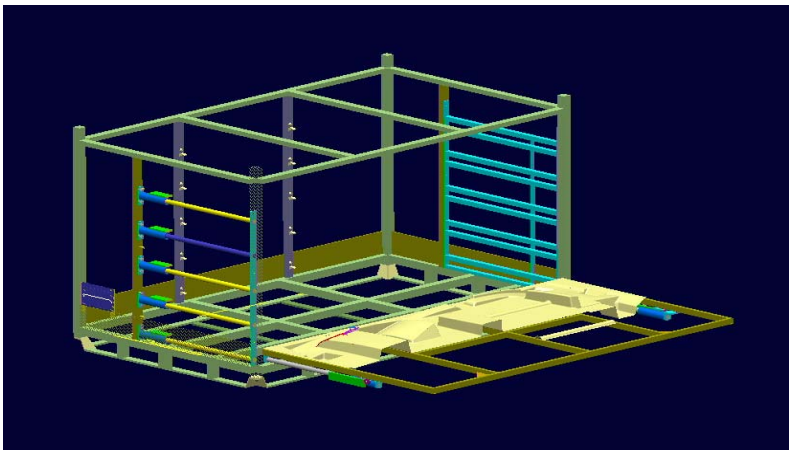


Image 4 shows the complete virtual TB packaging solution for interior ceilings.

Appendix 3

Supplier X Quotation

Base					
P1	150000 cars/Y				
P2	100000 cars/Y				
				Sequence cost P1/P2	
COST CALCULATION		Manpower	Annual cost (euro)	Carset cost 2002 (euro)	Assumption 2004 (euro)
1) Manpower per shift	picking	3			
	forklift	1,5			
	tot. per shift	4,5			
	tot. 3 shifts	13,5	664389	2,66	
2) Forklift costs			70380	0,28	
3) Labelling, overheads				0,38	
4) Scrap risk*				0,16	
5) Visual quality check	(0,04/Pce)			0,16	
6) Sequence racks**				0,08	
7) Sundry, maintenance				0,12	
8) Overheads Supplier X				0,38	
			Tot. Carset	4,22	4,51
			pce	1,05 pce	1,13
Development/prototype rack	10150	To be paid up front via Purchase Order			
***4) Scrap risk**					
0,75% of take rate 85%T/15%L		0,16			
****6) Sequence racks**					
No. of racks	88				
pce price/rack		700	61600		
Accessories racks		170,45	15000		
Total cost			**76600**		
Depreciation 5 Years		37%			
Cost amortising pce		0,08			

Appendix 4

Contractual Arrangements and Agreements

VCC-owned TB Packaging (P2)

-Scope:
The purpose of the agreement is to regulate the usage of Typebound packaging owned by VCC and is issued by MP&L, and it covers both empty and filled packaging. Packaging may only be used for storing of products ready for delivery to a VCC plant and on delivery of production material to a VLC authorized user, see Authorisation.

-Authorisation:
Packaging may only be used for deliveries to companies which receive a packaging account (emballage account number) issued by VLC. Usage of the Volvo packaging is allowed by both the consignor user (dispatcher) and the consignee user (receiver) on the condition of having signed this agreement.

-Debiting:
The user receives, after ordering, empty packaging cost-free. The amount of packaging in the flows is an agreement between the users and the responsible VCC MP&L Logistic Engineer.

-Ordering of Packaging:
When ordering packaging according to a monthly plan, this order plan shall reach VLC at the latest two weeks before the monthly order plan comes into force. Separate orders or changes in the monthly order plan shall be reported in writing to VLC at the latest before the delivery week. All the orders shall be in writing and are to be sent to VLC via fax. If the orders do not reach VLC according to the above times, VLC reserves the right to demand compensation from the user for the additional costs which may arise. The ordering of packaging, however, remains the user's responsibility. To this extent, the user can always request a monthly order plan from VLC in case the user did not receive it by fax. In connection with the ordering procedure, the current amount of empty packaging is to be reported to VLC together with the order.

-Damaged Packaging:
VLC and VCC make sure that the packaging in readiness is in good condition. Should the packaging contrary to expectation be damaged or in any other way be unusable it is the user's responsibility to make sure that it does not come into usage and also that the incident is immediately reported to VCC MP&L. The packaging shall then be sent in return to one of the terminals/repairers assigned by VCC. The cost of the freight home of the damaged

packaging is borne by VCC on the condition that the user has complained to VCC.

-Redundant Packaging:
If the user makes the packaging redundant, that is to say has a surplus, it is the user's responsibility to sort and pack the packaging according to the sorting and packaging instructions which have been issued by VCC. VCC is to be contacted in order to receive sorting and packing instructions. If the packaging is not sorted and packed according to the instructions VLC reserves the right to take out an additional sorting charge. The packaging shall be returned to one of the VLC assigned places. The cost of the return is to be borne by the redundant user.

-Storage of Packaging:
The user is responsible for the packaging being stored in such a way that it is not destroyed, damaged, stolen and protected from rain, wind etc. When there is damage or loss of packaging VCC have the right to invoice the user for the value of the packaging. It is therefore the duty of the user to insure the packaging.

-Packing Material Delivery/Receipt Notes (PMRs):
When dispatching packaging, all users must send an accompanying PMR to VLC either by fax or by any other VLC approved means and this on the same day of dispatch.

-Stocktaking:
A total stock taking of all packaging shall be carried out a few times a year at dates stipulated by VLC. In addition VLC can demand separate stocktaking. Every user is obliged to participate in the stocktaking according to the instructions given by VLC. If a shortage arises between the physical stock provided by the user and the Volvo Accounting system the user will be debited for the shortfall/missing packaging materials according to the current price list.

-Transfer of Packaging:
All Typebound packaging belongs to VCC and therefore cannot be acquired or be transferred.

-Damages:
VCC and VLC are not in any way responsible for direct or indirect costs which are incurred by the user due to the use or lack of packaging.

-Duration of Agreement:
The Agreement comes into force on date of signing and subsequently applies until further notice. It can be terminated in writing by both parties with immediate effect.

Appendix 5

Contractual Arrangements and Agreements

Supplier-owned Packaging (P1)

This user agreement is somewhat more complex and detailed than for VCC-owned TB packagings, since an external company now possesses the ownership and responsibility of them. The specifications are split into four groups, these being:

1. General Requirements
2. Rack Specifications
3. Specific Requirements for Returnable inner TB Packaging (known as spacers)
4. Specific Requirements for Non-returnable inner TB Packaging (known as one-way packaging)

1. General Requirements:

-Job split:
The logistics engineer at VCC, together with the supplier, agrees upon the packaging concept and prerequisites.

-Preferred usage:
There should be minimal use of VLC standard spacers between parts or between typebound spacers, and minimal use of waste (one-way) packaging, where not affecting quality.

-Responsibility (1)
The supplier is responsible for quality assuring the parts in the packaging during normal handling. The supplier must ensure optimised cost in the total logistic flows, considering parameters such as quality, ergonomics, environmental aspects, availability, utility, and dimensions.

-Responsibility (2): running production (Cleaning and Daily inspections)
Making sure that the packaging does not affect the quality of the parts is always the supplier's responsibility. This responsibility is included in the price of manufactured parts. For sequence packaging, on top of the periodic cleaning, the supplier must clean the packaging on a daily base, or more frequently, depending on the sensitivity of the part. This to ensure the quality of the parts during transport. This responsibility is included in the part price.

Periodic maintenance/modifications and damaged special packaging - the supplier is responsible for the function of the special packaging and also for initiating maintenance, modifications and repair. This responsibility is included in the price of manufactured parts. The supplier is responsible to setup a routine together with the VCC Logistic Engineer and a maintenance supplier, how the packaging is to be taken out of the flow if damaged. The supplier is responsible to setup a routine together with the VCC Logistic Engineer and a cleaning supplier, how often the packaging is to be cleaned and how the packaging needs to be taken out of the flow.

-Responsibility (3): Administration
The supplier undertakes administration and stocktaking of type-bound packaging. The supplier must always have a contact responsible for special packaging issues.

-Responsibility (4): Quality

Damage/defects, on the manufactured parts caused by the special packaging are always assigned to the supplier.

-Responsibility (5): Capacity increases
When production volumes increase it is the supplier's responsibility to ensure the availability of the correct amount of special packaging, in agreement with VCC Logistic Engineer. Additional purchases of special packaging during running production must be approved by VCC.

-Responsibility (6): Design changes on type-bound packaging
The supplier is responsible for adapting the special packaging to new product designs. When changes are made, the supplier must update all type-bound packaging to fit the new design of the parts. 3D models of the packaging must be done and sent to VCC for approval before any work are allowed to be carried out on the packaging.

-Economics:
All costs of special packaging must be specified and included in the part price of manufactured parts. Investments and running production costs and administration shall be included in the part price. The packaging cost should be separate specified in the quotation.

-Storage:
The supplier is responsible for storage of empty special packaging.

-Quality requirements (1): Typebound Packaging

Packagings are to be tested in the project phase according to the VCC gate demands. There should be a minimum of 2 prototype racks available at the first pre-series built in the final VCC plant, unless otherwise agreed.

-Quality requirements (2): Flow simulations
In order to be able to determine how many sequence racks should be used in running production, a flow simulation must be made. It should also be ensured that enough racks are provided (based upon the amount of rejects in running production).

2. Rack Specifications

-Timing and responsibilities:

See Appendix 6

-Rack prerequisites:

General

- Volvo Emballage Number and Serial Number painted according to VCC standard drawing on all four sides.
- All individual places in the racks must be numbered.
- No loose parts in racks are allowed.
- The rack should be easy to clean
- No silicon-based products are allowed.
- Steel plate 200 mm height (thickness 8mm) on sides where the racks can be manipulated by forklift.
- If rack is divided into pockets, all pockets should be individually replaceable (pockets not welded together). The pockets must be easy to take out of the rack by removing a side plate or top plate of the rack and sliding out the pockets.
- The supplier must together with VCC Logistic Engineer draw up a spare part list for all sequence racks.
- A stock of spare parts should be available at a local repair company from Gate 7 of the project.
- Racks must be easy to maintain
- The open side of the rack should always be placed to the rear of the trailer during transport.
- For non-sequential racks: Racks must be foldable for minimum empty packaging volume.

Bottom of rack

- The bottom of the rack has to be designed according to the VCC standard bottom for racks (drawing provided by Purchasing Logistic Engineer at VCC).
- A drawing must be made for all type-bound packaging in CATIA and must be constantly updated with all the changes.
- It must be possible to transport the rack in both directions on roller tables.
- Forklift pockets should be closed if it is forbidden from a concept or process point of view to take the rack from that side for factory-related reasons.

Dimensions

- Due to trailer dimensions, ergonomics and safety, packaging cannot be larger than the dimensions below:
  - Length < 2400 mm
  - Height < 1450 mm
  - Width < 1200 mm/ 2400 mm
  - Weight of empty racks < 500 kg

Deviations from these dimensions must first be discussed and agreed upon with VCC Logistic Engineer.

Labelling

- Maximum one Standard A5 Odette label holder per rack.
- Placement of label holder to be investigated and agreed with VCC MP&L Logistic Engineer.

3. Specific Requirements for Returnable Inner TB Packaging (spacers)

-Timing and responsibilities:

See Appendix 6

-Returnable inner packaging prerequisites:

- Dimensions must be compatible with VLC standard packaging, see VCC Standard drawings.

- On each returnable inner packaging the packaging number must be mentioned in a very visible way.
- Parts must be easy for the operator to take out.
- Spacer must be easy to take out of the packaging (for example a standard pallet); a cut-out or handles for the operator's hand must be made if necessary.
- Spacer must be easy to handle by the operator (size, stiffness)
- The “vacuum” effect when taking out spacers must be eliminated by punching holes in the spacers.
- Empty spacer must stack into each other to minimize the volume of empty packaging. There must be a clear indication on the spacer for the operator (for example dot, arrow etc.) how to stack the spacers into each other.
- It must be clearly visible when the pallet is full of empty packaging according to the packing instruction so that the amount of empty packaging is always correct.
- The material used must be durable and resist rough handling without being damaged.
- There must be a minimal maintenance cost.

4. Specific requirements for Non-returnable Inner TB Packaging (one-way packaging)

- These packagings are to be avoided, only to be used when returnable packaging is not a feasible solution.
- Cost for one-way packaging shall be included in part price
- Chosen material must be recyclable and marked according to international standards (i.e. plastics etc.)
- Supplier is responsible for the development of the one-way packaging.
- Timing according to VCC gate demands.

Appendix 6

Timing and Responsibilities

Main responsibility and main schedule of key areas are agreed as follows:

Action	Responsible	Outcome	Gate	Document
Design prerequisites	VCC	Specification of packaging according to Process.	G1	Packaging spec. "Template"
Preliminary 3 D model completed	Supplier	Distributed to responsible Logistic Engineer at VCC	G2	CATIA File
Preliminary 3 D model approved	VCC	Approval sent to Supplier by responsible Logistic Engineer at VCC	G2	Approval
3D model completed	Supplier	Distributed to responsible Logistic Engineer at VCC	G3	CATIA File
3D model tested in simulation	VCC	Approval sent to Supplier by responsible Logistic Engineer at VCC	G3	Approval
3D model approved	VCC / Supplier		G4	Final 3D approval
Delivery schedule	Supplier	Distributed to responsible Logistic Engineer at VCC	G4	Time plan and quantity

Physical prototype completed	Supplier		G4	Material specifi-cations
Pre-series 3	Supplier	Prototype packaging available for production parts	G5	Test protocol
Physical prototype approved	VCC / Supplier		G5	
Full speed test external and internal transport test	Supplier	Enough packaging available for production parts	G6	
Pre-series PTO	Supplier	Enough packaging available for production parts. Final design.	G6	Packaging instruction
Pre-series TO	Supplier	Enough packaging available for production parts. Final design. Maintenance and cleaning agreement ready.	G7	
Production start	Supplier	Enough packaging available for production parts Final design	G8	
Final delivery	Supplier	All packaging available for production parts.	G8	

Appendix 7

Interviews: VCC

Interview – Leif Agby, Logistics Accountant VCC

1. Could you describe your responsibilities within the company?

At a constant basis, the value of all the typebound packages we have in the flow is somewhere between 200 and 300 million SEK. My main function is to distribute these packages to the lowest cost possible. I handle issues such as in what routings they are to be sent and how and when they are to be sent further in the flow. This function is vital since VCC annually spends approximately 40 million SEK solely in distribution and administration of the typebound packagings. I also have an overall responsibility, which is to evaluate and select suppliers and at the same time allocate the work processes among them.

2. How does VCC set the budget for a typebound package?

The way I do this today is by checking the actual numbers of the current situation, I then relate them to next years production numbers, and in that way come up with a new budget for a typebound packaging. One has to take into consideration changes that occur, changes such as the production of a new car and other things. When I started my job, I carefully computed the budget for every single packaging type but I found out that this didn't add any value since it didn't create any more exact numbers.

3. How much does VCC spend on maintenance and repairs concerning typebound packagings per produced car?

In Gothenburg, we spend about 48 SEK per produced car in comparison to 26 SEK at our production facility in Ghent. Calculation wise, I usually recommend computing 2-5% of the initial investment in typebound packages to annually be regarded as the cost of maintenance and repairs.

4. Is it VCC or the article supplier that handles the maintenance/repairs of typebound packagings?

The maintenance/repairs of a typebound package is decided from case to case. Sometimes our own maintenance personnel handle the problem, sometimes the suppliers of the article. There are cases when we have had a fixed price at the supplier regarding repairs of the package but another approach is to include it in the actual price for the article. As I see it, it

is preferable to let the suppliers handle all maintenance issues and include it in the price in the purchase cost. This has however been proven to be a bit difficult since it complicates the work of the purchasing division.

5. Is every category of typebound packaging repaired/maintained?

So far, we have never repaired an EPP packaging. From time to time we wash the vacuum formed packaging, but this is however very rare. You could say that steel racks are the only noteworthy type of packaging that produce costs when being maintained/ repaired.

6. How big a part of the already constructed typebound packages can be reused in production of coming car models?

A very small one. We have one standard typebound package that can be reused but apart from that we seldom reuse any of the old packagings. Everything is specially adapted to a specific product. If you are reusing the old packagings, the cost of transportation will increase since you will have a lot of empty space inside the packing.

7. How do you think an outsourcing would affect the work of developing typebound packagings?

Before, Volvo handled all activities in-house. We developed the packagings, we owned them, handled the repairs and maintenance and so on. Volvo then adopted a strategy that focused on Supplier-owned packagings, a strategy which we at the logistics department are strictly opposed to. This strategy leads to an increase in cost. There were people that wanted to implement this system on the P28 but it wasn't durable due to all additional costs. This is why my belief is that in the future the company is better off not letting the suppliers own the packagings. This leads to the question whether Volvo is to own the packagings or if we are to outsource it to a third party. But I don't see any reason why it should be outsourced to a third party. It will only lead to a higher cost and the adding of an additional link in the chain. The only advantage, as I see it, is that you get rid of the investment, however this you have to pay back in the form of higher transaction costs.

Another problem of outsourcing is that we never build the exact number of cars specified in the car project. We always build less or more than planned/forecasted. How do you handle the situation with the third party when you discover that you have a shortage of packagings? Should VCC purchase more packagings, or should the supplier supply additional packagings not debiting VCC? These are questions that might be hard to handle.

Some of the parts are not finished in time, and sometimes late changes occur. This means that the packagings have to be changed as well. This puts high demands on a structural information flow between VCC and the third party that might complicate things since you are dealing with an intermediary.

8. Would an outsourcing release some of the workload on different departments and thereby liberate resources that can be put on other areas?

If the insourcing company or the supplier owns the packaging, I estimate that we still would put down the same amount of hours. It would be a different kind of work. If you put this on a third party, the need of specifications and control mechanisms increase dramatically. A more rigorous control process of the work becomes vital. In conclusion I could say that an outsourcing would lead to VCC loosing some of the overview of the activities and the process as a whole.

Interview – Ingmar Söderberg, CATIA Consultant VCC

1. Could you describe your area of responsibility within VCC?

I am working with construction and modelling in Catia. VCC hasn't got this competence in-house so they hire me as a consultant on a need basis. A description of my responsibilities would be:

- To construct 3d- models so that the fabric can simulate them in the flow
- To examine and make the construction foundation for typebound packagings
- To receive models from suppliers and put them into the VCC system
- To take part in the development of new materials and packagings

The competence demands on this position is rather high. You have to constantly be up to date in the development of new material. A large numbers of aspects have also to be considered when constructing a packaging, aspects such as the environment, ergonomics, well adapted heights to minimise the strain on the body, various mechanical forces etc. I am also taking part in the development of so called standard papers, which are a collection of basic demands on a typebound packaging. These standard papers are given to external actors in those cases where they are handling the construction of typebound packaging.

2. What influence do you have on the process in developing typebound packaging?

Every logistician has got his own project for which he carries the responsibility. They often come to me discussing different aspects and solution of the typebound packaging. When everything is all set, I start modelling the packaging in Catia.

3. Of the total number of packagings developed and produced, how many are you involved in?

I am involved in more or less half of those. However, the degree of involvement varies a lot. Sometimes I make very easy sketches in 30 minutes and sometimes I am involved in very complex packagings that can take several weeks to construct.

4. What is the difference between you constructing a packaging and an external company performing the service?

External suppliers require a higher degree of specifications. The in-house operations can be carried out with more flexibility. You have easier access to informal information and you get a faster feedback. Furthermore, having done the job for a while, you get certain knowledge of carried out processes that the external service providers do not have.

5. How do you decide whether a typebound packaging should be developed and constructed in-house or be outsourced to a component supplier?

That is based on strategic decisions taken higher up in the hierarchy. For P1, all packagings are to be constructed and owned by the suppliers. It was thought that it would be cheaper since they are closer to the product and in case of changes taking place, they could act faster. VCC has however recently started to investigate the consequences of this decision. So far, the conclusion that has been drawn is that everything came out more expensive. This is due to the fact that a component supplier is not a specialist on packagings. This leads to him hiring a consultant, which in turn hires a packaging supplier. A system like this creates more intermediaries in the process which all have their margins and it all comes out more expensive.

6. In an outsourcing scenario, do you think VCC should perform the Catia-construction in-house or out-house?

No matter what scenario that can be of interest, VCC still needs someone here to take care of all the models that are sent from the suppliers in order to put them into the system, some changes and conversions have to be done from time to time so the competence is needed in-house. Another aspect is that VCC could use some kind of expertise in-house in case of

trouble-scenarios. It would be a counterpart that can communicate with the external service provider with the same language and background.

7. In an outsourcing scenario, what aspects are vital to consider?

If the scenario with supplier-owned packagings is to be feasible, you have to be able to put high demands on the component supplier regarding what packaging supplier he is to use. It is vital to involve all parties in the process, educate the component suppliers in the essentials of packaging and establish mutual advantageous relationships. An important aspect is maintenance. If the suppliers are to own the packaging, who carries the responsibility of maintenance? This is a question that has to be investigated and be specified in the contract.

Interview – Henrik Pettersson – Purchasing Logistic Engineer VCC

1. Which are your responsibilities in the development of typebound packaging?

My role depends a bit upon whether the packaging is to be Supplier owned or VCC owned. If the component supplier is to be responsible for it, which they are in most my cases, then it is my job to supply them with - and put forward - the various demands that we place on the packaging device and the supplier itself. This could be details regarding handling issues, such as ergonomics, along with quality demands, volumes needed and time schedules. In essence, I initiate meetings with the suppliers and present all the specifications that have been drawn up in conjunction with the other key people that are involved in the development of it at Volvo.

2. Which are these people that are involved in this process?

These key people are normally the Purchasing Quality Engineer, Manufacturing Engineer, KU (konstruktions-uppdragsgivare) and all the others listed in Template 1, which is our working document when dealing with these issues.

3. At what point in the development process of a car project – concept phase, pre-study and industrialisation – do you get involved in this?

Approximately 2,5 years prior to production, we initiate the target agreement process. This is where we start to discuss the costs/price of specific components, which rules and specifications that are to be set and who will be responsible for the typebound packagings needed. The latter statement consists of a compromise for every single component and packaging, and there are no specific routines for this at the moment. Therefore, the contract with each supplier will be a unique one, since no standardised procedures exist. We are also

heavily involved in the pre-tryouts and tryouts (prototype manufacturing), which take place approximately one year prior to production. This is where the typebound packagings are tried for the very first time and then evaluated. When we have concluded that the packagings work as intended, we move over to establish that the actual flow of them works properly in terms of transports and EDI connections with those involved.

4. How is it decided whether VCC should develop and purchase packagings from an external packaging supplier or if this is placed on the component supplier to solve?

If the actual packagings already exist, or if only minor changes in design is required to use them, then VCC will take care of it as well as own it. If changes are to be done, our Catia consultant Ingmar Söderberg is hooked on the task. VCC will also take care of it in situations where mixed sequential flows are used (components from two or more suppliers in the same flow), since this would ease the complexity that could arise from it. Generally, however, it can be said that if new components are needed that requires totally new packaging solutions, we try to the greatest extent to make the supplier responsible for the packagings as well.

5. Is the component supplier free to choose its packaging supplier as it likes, or are there any demands from Volvo's side in this process?

From Volvo's point of view, we don't have any special restrictions on which packaging suppliers our component suppliers can chose. As long as it lives up to our specifications forwarded to the component supplier, it is no problem. However, we do recommend packaging suppliers that we have worked with before and have proven to be good partners. But although we have this list of preferred suppliers, it is ultimately up to the component supplier which one to chose.

6. Can you give a general description of how the development of a typebound packaging works?

Firstly, we set up meetings with various component suppliers where we present all our specifications and demands. The suppliers perhaps want to know details how previous packagings for similar components have worked before and which potential changes that are required. A time schedule is handed over and follow-up meetings and procedures are outlined. Before everything has been accepted and the contract is signed, target agreements are carried out so as to evaluate prices from the various suppliers. Here, it is also outlined whether Volvo should initiate contacts with packaging suppliers or if the component supplier can provide them the packaging. If the component supplier agrees to handle it, the cost will be added on the component price. If VCC takes the responsibility - and ownership - it is

passed on to our CATIA consultant who designs it according to specifications. The supplier is also asked to send over some test components to see fittings etc. When finished, VCC – through the FM&SP function – invite tenders for supplying the packagings.

7. Does any department's or function's ideas and views impact to a greater extent in the development of these typebound packagings?

Our task is to combine everybody's opinions – the packagings must not be easily damaged by handling and must fit the production line at the same time as we have to follow a tight budget. It is extremely important that everyone is involved from the very beginning – people from the manufacturing plant, MP&L, logisticians and engineers. Otherwise there is a risk that someone comes in and demand changes at a very late stage, which means that the project could be jeopardized. In other words that the best solution isn't implemented. But on the whole, the final outcome is the result of the most suitable compromise.

8. Are there any conflicts of interest between the functions involved?

They do occur. For example, it sometimes happen that people from the manufacturing plant promote their solution that perhaps is too costly, while we at our departments have a tight budget to follow. But again, compromises have to be made".

Interview – Helge Andersson, Manufacturing Engineer VCC

1. Which are your responsibilities at VCC?

My biggest task is to take part in the construction work with the responsibility of developing process-effective assembly solutions. This is turn is divided into various sub-processes. Our main contribution as manufacturing engineers is to develop and provide a product that suits the operative issues when assembling the vehicle. This means that we specify how the actual assembly process should be carried out, what tools to use and define which packaging solution that is the most optimal in an assembly perspective.

2.What role does a Manufacturing Engineer have in the development of typebound packagings?

Although packaging isn't our main area of expertise, it is still an important part of the work we carry out. In terms of the packaging used, our task is to put forward demands and specifications regarding the properties of it. It should take up the minimal amount of space in the plant, it should be ergonomically constructed, and it should be easy for the operators to unpack the component or article. And favourably, the packaging solution should contain a

minimal amount of material that has to be scrapped, such as protective material like plastic films, cardboard pieces etc. In addition, various risks are discussed, such as the abundance of sharp edges that could damage either the article or operators when handled. Potential transport damages that may occur are also evaluated. Another important thing to consider is not to sub-optimise. There is always a trade-off between cost and functionality. At the end of the day, the final outcome and its implications upon the whole organisation is the most important thing to take into consideration.

3. Who do you discuss and cooperate with in this process, and how often do you meet?

This process is carried out in conjunction with the people working in the plant, the Purchasing Logistics engineer, KU and the other stakeholders involved. The KU's main function is to have the over-arching responsibility of coordinating this process. This person also supervises costs and time-schedules, as well as initiate meetings. The meetings take place according to the composition of the team, what phase of the project you are in, and the number of external suppliers involved. The complexity of the article is also a decisive factor – whether it is a totally new article or if it is just a modification of an existing system. In addition, a number of informal meetings take place between manufacturing engineers and the purchasing logistician responsible for the project.

Interview – Dieter Dehoorne, Logistics Project Manager P2 VCC

1. Which are your main responsibilities within VCC?

I am the Logistics Manager responsible for all the projects within P2. The scope of the job is to make sure that the suppliers we choose, and the packagings we develop are quality assured. For this I work in a team together with the Quality Manager and the Sourcing Manager.

2. What were the main reasons for changing the strategy for the P1 project?

The organisation says that we are always late with packagings and that it is very costly. This decision was taken 5-6 years ago and it was thought that the article suppliers could manage the development of TB packagings better, and at a lower cost, than we do. This since they are closer to the actual component.

3. What are the pros and cons of P1 in terms of TB packagings?

This strategy could be good, but it wasn't for P1. I agree that the supplier knows the article better than we do but when it came to P1, we chose the supplier solely from a sourcing

perspective and not from a logistics point of view. For P1, we asked for the price for the article but not for its packaging. Of course this lead it to become more expensive. We hadn't really thought the strategy through.

The biggest reason for now having abandoned the P1 strategy is just that we didn't place forward a target cost for the TB packaging to the article supplier. I also think that there could be some resistance internally at VCC to have them supplier-owned.

4. Is there any interest from the suppliers' to take this ownership and responsibility?

Yes and no, some suppliers made very good packagings but others contracted it out to external suppliers since they didn't have the knowledge nor the capability to carry this out themselves. Some suppliers even developed packagings that weren't acceptable in any way to VCC.

5. What are the pros and cons of the packaging strategy for P2?

That depends on how you look at it. From a purchasing point of view, should you deal with the packagings or not? The purchasing department is not a design department, meaning that in essence we should focus more upon logistics assurance than on packaging development.

However, the positive side of it is that we have full control. We have a very big influence upon the packagings and all costs are known from the beginning. The flexibility issue is also important – it is faster and more efficient to make quick and late changes if needed. Furthermore, the market prices of packagings are always known, meaning that we have insight into what quality they can deliver and at what price.

6. What do you think of the possibilities of outsourcing the responsibility and ownership of TB packagings to a third party (VLC)?

I think it is possible. However, we will probably not be staying with VLC forever since we are not part of the Volvo Group any more. I think it would be good to have exactly the same setup for TB packagings as with Standard packagings since that would make our life easier – but I am afraid of letting VLC handle everything related to packaging.

7. What are the main risks of having one party handling all packaging activities?

You can't put everything at one supplier since you may loose the grip of the market prices. In addition, I don't believe in long-term relationships because they always turn out to be

expensive. This since they may raise their prices in knowledge that we will pay for it anyway due to our dependence on them.

Basically, I think that the optimal solution is to work with a few selected suppliers in every niche that knows our processes and how we work. These are to be chosen for a pre-specified period of time in order not to loose market overview regarding prices and service levels.

However, I don't believe that a good strategy is to choose the same company for the construction in Catia and the actual manufacturing of the product. This due to the fact that if you decide to change supplier, you loose your design competence, which can be very hard to rebuild. Because of this, I think it is better to let different actors handle these activities.

Interview – Leif Dahlgren, Plant Logistics Engineer VCC

1. Which are your responsibilities?

Concerning TB packagings, one of my functions is to gather and co-ordinate the different views and opinions from the plant regarding TB packagings. Having gathered all this information, I take part in verification meetings to discuss these aspects with the other persons and departments involved in the project. In addition, I am more or less discussing these aspects with the manufacturing engineer on a daily basis. Another responsibility is to receive and co-ordinate the vast amount of articles that is unloaded at the docks as well as controlling transaction costs of standard packaging.

2. What is your influence on the development of TB packagings?

When it comes to racks, there is a standard that defines the bottom of the item. Normally you try to use standard packagings to the greatest extent possible. If the manufacturing engineer decides that this is not a viable option in a particular case, they start the development of a prototype that they send to us, here at the factory, for evaluation. We are taking an active role in the process through all the development stages. One of our responsibilities is to perform flow try-outs with full truckloads in order to see that all processes are running the way they should and that the supply into the factory is assured. Regarding the development of type-bound packaging, we are the final instance when it comes to approving the TB packaging prototype.

3. What kind of demands/specifications do you put on a TB packaging?

There are several demands we put, for example the thickness of the bottom of the rack, ergonomic issues and material quality. The TB packaging is to be constructed in such a way

so that the elevation of the article from the packaging can be carried out in as fast and smooth as possible.

4. Could you give a description of how the payment procedure works in the current system with STD packagings?

When a supplier sends a consignment to us, he is to enclose a packaging specification that shows what kind of packagings he has used for the consignment and how many. This is registered here at VCC. The supplier sends an invoice to VCC once a month where he also specifies the amount of packagings he has used during that specific time period. The packaging specification also acts as a mean to keep track of all the packagings that are in the system. The total cost per year that VCC pay for distribution with this transaction-based system is approximately 30-35 million SEK.

This is not a good system in my opinion. There are to many variances between the figures we have and the figures that are specified in the invoice sent from the supplier. One of the major causes is that the supplier doesn't send the packaging specification on time. This leads to an imbalance in the system. Another cause is that some suppliers constantly make mistakes thus sending us invoices that are higher than they ought to be.

We are now looking into the possibilities of implementing a system that permits us sending a specification to the supplier that specifies the number of packagings we have received at the factory. The supplier would compare this specification with the numbers ha has got in his system and from this send the invoice to us. From my point of view, a transactional cost based system is not desirable.

5. In your opinion, what are the strengths and weaknesses with the different scenarios we have presented?

I see the scenario with component suppliers owning the packaging as the best option. However, there is a huge difference in knowledge between small and big suppliers. Not every supplier has got the capacity or knowledge to take care of this line of business for VCC. In addition, this system might lead to the component suppliers lowering their prices on the article in order to get the contract compensating this with a higher marginal on the TB packaging development.

Regarding the scenario when the packaging suppliers own the TB packagings, there could be a problem with the repair/maintenance issue. VCC almost always buys the smallest amount possible of TB packagings, just the amount necessary to be able to manage the flow. This is done in order to minimise costs, however, it leads to some disadvantages. Since the

packaging supplier is not in the actual flow and there is not an excessive amount of packagings, it might turn out hard to be able to send them off to him without experiencing shortages of TB packagings. Furthermore, it is always good to have the maintenance/repair station close by regarding sequential flows. The practice we have today is quite well functioning. An external firm has their own branch here in our factory. They take care of minor repairs leading to the packagings being back in the flow in a much shorter time than they would be if they were sent off to the packaging supplier.

Interview – Bertil Andersson, Manager Supply Chain Development VCC

1. What was the general reason for changing the ownership strategy for P1?

One of the arguments were that VCC didn't want to make the investment in TB packagings. These investments are huge and a variable cost was preferred. We also believed that the article supplier could supply the TB packaging in a more qualitative manner, i.e. in the right time and that they are in direct contact with the articles the packagings should carry.

2. For the next car project we have understood that this strategy shouldn't be adopted again. Why?

There are many reasons for this. The process became very complex, and the strategy lead to an increase in fragmentation i.e., that it became difficult to gain full insight and control over the various processes. Another reason is that this course of action became very costly. The article supplier would by this offer a service at a variable cost while the service itself requires hefty investments, i.e., a fixed cost. The suppliers of course take a rather large margin for this in order to make sure that their investment will pay off. In addition, the suppliers are often not willing or competent enough to take this responsibility. This leads of course to the fact that they do not really bother about the packaging cost since VCC in the end will pay for it. By having everything in-house, a consolidation of knowledge, control and development could be obtained. In addition, if the TB packagings are controlled and administered by VCC, we can still use the same TB packagings – or modify them – in situations where article suppliers have been replaced in favour to others. This is called carry-over.

3. How has this purchasing process worked for P1, now when the packagings are involved in addition to the articles?

We have placed an RFQ in order for them to submit an offer regarding a complete solution. The problem with this was that we didn't demanded separate costs (the article and the packaging) from them. We received in most cases a total price, which meant that we

couldn't spot the real cost for the packaging. This was a huge mistake from VCC's side. Another problem is that article purchasers haven't been involved earlier in the process of buying packagings. This could have lead it to the fact that the packaging was being regarded as a less important aspect, which reduced the cost awareness. However, we will anyway in the future place RFQs to the article suppliers in order to see whether they can deliver a cheaper packaging than VCC can.

4. We have heard that you have discussed with VLC regarding the possibility that they take the responsibility and ownership of the TB packagings. What was the response?

We have discussed this with them to test the idea. We got a tough cost-cutting program from Ford. VLC then came with the proposal that they could purchase all VCC-owned packagings, which value is roughly around 170-180 mSEK. In this way VCC would be able to release capital tied up in the packagings. However, you don't make such a deal without having a well-founded strategy behind it. Nevertheless, we became interested in the idea and of how this could work in practice. But they have the same problem as the article supplier has, i.e., that they would offer a service at a variable cost while the service itself requires hefty investments to provide.

In any respect, VLC was not willing to offer a solution where we would pay transaction cost every time we used the TB packagings, which we want. They were more into the idea to calculate depreciation charges and costs for repair and maintenance and by periodic means debit VCC for it.

5. Which general advantages as well as disadvantages do you see in letting a third party take the ownership and responsibility of TB packagings?

A positive thing that may arise from a third party alternative are the potential synergy effects obtained between TB packagings and Standard packagings. By perhaps using more Standard packagings with TB inner packagings, less investment is required. Another thing is that the actual construction of them, i.e., the CATIA construction, could perhaps be transferred to the third party provider. By this, construction competence could be built up at the third party and we at VCC wouldn't need to have this function in-house any more.

As mentioned earlier, one of the main reasons for transferring the responsibility to the article suppliers in the P1 project was to get a variable cost instead of making the investment. However, it has previously been found out that these TB packagings still have to be accounted for as an asset in our balance sheet, which means that they still are subject to taxation. This is because the TB packagings are viewed as dedicated assets, i.e., that they can only be used by one specific company for certain specific purposes. Recently, Ford has been

dragged in to a tax lawsuit regarding this, although the outcome is not yet known at present. In a third party alternative, a way to overcome this problem must be found. One way may be to have more companies to use the TB packagings in order to make them non-dedicated from a taxation point of view.

6. What do you think of the possibility that a few selected packaging suppliers in their respective niche own and supply VCC with TB packagings?

In comparison with VCC-owned packagings, the degree of consolidation of the mentioned issues will not be as strong. However, middlemen are not involved in this process in contrast to Supplier-owned packaging or the third party alternative where VLC are taking care of it. Many of the TB packaging suppliers possess the construction competence in CATIA, but whether they will agree to take the ownership of them or not is another question. However, I believe that this is an interesting idea that is worthwhile to investigate.

7. What impact will the higher degree of article commonality with PAG have on the development of TB packagings at VCC?

This is a very interesting topic. For the coming EUCD platform, which will be used by Ford, Land Rover and Volvo, a greater number of shared articles and components will be used. These car manufacturers have different packaging strategies at the moment. To begin with, Ford wants to outsource the ownership and responsibility of the TB packagings to its article suppliers. However, if it gets too expensive Ford will bring this back in-house. VCC's strategy, on the other hand, is currently to develop and produce them in-house at the same time as they are placed for tender. If the same actor takes the ownership and responsibility of all TB packagings for all car manufacturers, scale advantages would most probably arise. The big challenge in this is to form a process where the packagings and articles fit all manufacturers' production processes and requirements.

Appendix 8

Interviews: Emballage Poolen, VLC

Interview: Helena Sundberg, Key Account Manager Emballagepoolen, VLC
Ingemar Björk, Purchasing Manager Emballagepoolen, VLC

1. Which are the main functions carried out at the Emballage Pool?

Our work can generally be divided into three main areas; the inbound, outbound and packaging division. Distribution is our core competence; this is primarily the "product" that we sell.

2. Which are your largest customers in this field?

Almost 80% of our customers are those in the old Volvo Group, and 20% are other external customers such as Lear. VCC account for approximately 40% of the total volume.

3. Do you construct the Standard packagings internally or is this placed on an external provider?

No, we buy all of them from external companies. The pool carries approximately 100 different kinds of Standard packagings. Many of the Standard packagings have been around for a very long time, some are as old as 50 years. We are now working very close with our suppliers in the development of packagings.

4. Does VLC have its own truck-fleet, or do you primarily coordinate transports using external transportation firms?

VLC doesn't own a single truck. We purchase all the transports from firms such as Danzas, Schenker and other similar actors within this field.

5. What is VLC's responsibility in the provision of VCC's TB packagings?

The Emballage Pool is responsible for distributing what is available in it to its customers. In other words, our job is not to "hunt" for the packagings, it is to distribute the ones that we have. It is VCC that is responsible for ensuring that there is enough TB packagings in the flow and that they return them to the Emballage Pool. We then debit VCC a transaction cost once every third month. This sum is based upon transport, administration and handling. The Emballage Pool has also received a request from VCC if we can carry out inspections and stocktaking of TB packagings.

6. Does any interest from VLC and the Emballage Pool exist in acting as a third party provider of TB packagings with full ownership and responsibilities of them?

Yes. But many factors need to be evaluated and analysed before actually implementing this. At present, there is often a scarcity of TB packagings. This is due to the fact that when VCC calculate the required amount of TB packagings in their capacity planning, they don't want to have any surplus since these packagings could be very expensive. It happens that the article supplier needs to store the TB packaging for a longer period than calculated, and it also happens that they are stored somewhere in the plant longer than expected. This could lead to scarcity. There is a strong need for a great amount of control in this process, since a scarcity situation involving TB packagings can be immensely costly. It is exactly this control of the TB packagings that is extremely difficult to set a price on, if one is to realise this outsourcing relationship.

7. Which are the main issues that need to be addressed if VLC and the Emballage Pool were to take the ownership and responsibility of VCC's TB packagings?

To enter into such a venture as this, the Emballage Pool have to be aware of what kind of expert knowledge that is needed and what function for repairs and maintenance that is required. The need for long-term relationships with suppliers of TB packagings in order to rationalise processes and to obtain scale advantages has to be addressed as well.

Interview – Marie Carlsson, Marketing Manager, Emballage Poolen, VLC

1. How big is the interest in taking over the ownership and responsibilities of VCC's TB packagings?

It is interesting, since it already today exist deep collaboration between Emballage Poolen and VCC. There are always new possibilities of integrating further with our customers. There are, however, many issues that has to be considered, such as what the agreement will look like, in what ways we are to cooperate and on what premises. These are rather complex matters.

2. Does construction competence exist within VLC today? Would it be possible for Emballage Poolen to take care of the construction of the TB packagings?

We develop our packagings ourselves today, but we are not involved so much in the actual construction in CAD/CATIA of it – this is made in cooperation with the manufacturer.

Yes, I couldn't see why we wouldn't be able to build a construction competence within Emballage Poolen. But this is dependent upon what volumes we are talking about and what fluctuations there would be in demand for this service. If not sufficient volume is grasped and if fluctuations in workload are great, one has to ask if this is viable in terms of costs. The most probable scenario would be to hire external expertise in the beginning of this venture.

3. Would it be possible that Emballage Poolen took over the repairs and maintenance of VCC's TB packagings?

Sure, that would be possible. Everything depends upon the specifications of the agreement regarding price, quality demands and frequency. If one party handles this instead of many, coordinative gains could be made. This will of course imply considerable costs – but it has to be related to the costs of letting many actors carry out this. The main advantage is that the infrastructure for this, along with many other aspects, does exist at VLC.

4. Which are the biggest areas of concern in an outsourcing scenario like this?

One aspect is to decide and agree upon which volumes that are to be in the system. If VLC is to be responsible for ensuring that packagings always should be available, we must get accurate information of the volumes needed. This doesn't always work smoothly today due to insufficient information. There is a chain of stakeholders involved. We must place responsibility on others in the chain. The system doesn't become better than what everybody involved are willing to invest in it.

5. Would the information systems used today be sufficient to accommodate this venture?

Some information systems require improvement in order to secure the flow of information that is needed.

Appendix 9

E-mail Interview: Conteyor, Packaging Manufacturer

Patrick Hugenholtz, Managing Director, Conteyor

1. Which are your five biggest customers today?

Our biggest customers are GM, Ford, Premier Automotive Group (PAG), BMW, DXC and PSA.

2. Is Conteyor specialising on steel racks only, or on different packaging devices as well?

We specialise in all packaging for plastic based components. Being a specialist we do not support the one-stop-shop approach, as this is then a "generalist activity". It is our experience that Programme Management must be seen as a separate activity and not mixed with supplying the packaging. We do supply Programme Management as a separate activity and we can do this is all countries in Europe. So also with your suppliers and work with them in their language.

3. Generally, would this scenario be of any interest at all from your point of view, provided that a win-win situation is created?

Yes.

4. Which general factors would you believe to be the most critical to create a win-win situation?

Early Programme involvement and signed contracts along with a common CAD platform.

5. Would the creation of some kind of partnership between VCC and Conteyor be of interest?

Yes, possibly even via the creation of a Joint Venture between VCC and Conteyor, whereby the profits could be shared.

6. Do you think that Conteyor has the capability to handle the volume of racks that VCC need for their components?

Without knowing the capacity required it is difficult to answer. The bottleneck is usually not the production, but the design of the packaging and obtaining – on-time – the design approval from the customer.

7. Do you have any similar system with any of your other customers?

We do not at this time lease racks to customers as part of a programme, although we have done this on a smaller scale.

8. If not, do you believe that they would be interested if the possibility existed?

In any case the supplier alone could not handle the funding required. In all cases a special financial partner must be involved (banks etc). Conteyor cooperate with TNT Container Logistics.

9. Which issues do you believe would be the most complex to solve if this scenario is to be realized?

The ownership issues of the racks, who will return them at the end of the lifetime (where are they?), and the maintenance & repairs of them.

10. From your point of view, which cost implications do you think would arise compared with present procedures (risk premiums, capital costs, scrapping costs etc.)?

Nobody specialises in these activities. This means that your current component suppliers are adding extra margins on the actual cost to be on the safe side.

11. Which advantages as well as disadvantages do you see in this scenario? (We have provided some that we have been thinking of related to this scenario at the bottom page) ***Answer to this is provided below***

12. In order to reach the best possible outcome (quality etc.) of the partnership, do you believe that there would be a good idea that one of Conteyor's experts in packagings takes part in the development process of packagings at VCC? This since it would help the development work for VCC and at the same time give Conteyor better insight into VCC's processes and what packagings that are to be produced in the near future.

Yes, but you must allow us to participate at a very early stage. This means that such a project must be negotiated prior to the car programme being started; otherwise you will not have sufficient time.

13. We have noticed that the question regarding the responsibility of repairs and maintenance is complex. The manufacturer of the packaging, who knows about its construction, is probably the most suited party for carrying this out. A problem is however evident. How should this service be valued and tagged a price upon? VCC's article suppliers for the coming platform P1 - who also will provide the packagings for their components – are found to charge huge sums for having the responsibility of repairing and maintaining the racks. There are cases where these charge VCC almost 50% of the total purchasing price (packagings) per year in charges related to repairs and maintenance.

In your opinion, what would the best solution for this be?

The high price is the suppliers' answer that they really do not want to take this responsibility and also that they do not have the expertise. The best solution in our mind is to team up with a global player who has packaging design and spare part information. The prices can be pre-set based on a fixed hour rate and an "a la carte" system detailing the possible faults and pre-setting the number of hours involved.

14. Would it be possible to implement a system where Conteyor is responsible for repairs and maintenance, and that this would be paid for by VCC through a transaction based payment? (In other words that Conteyor repair and maintain them and that the payment from VCC would then be based upon actual repaired quantity and costs).

Yes, however a fixed annual minimum must be agreed upon to ensure coverage of fixed/running costs.

15. Another alternative would be that VCC take the full responsibility of it. In order to repair and maintain them all, it would be optimal if VCC employees were educated in the construction of racks provided by Conteyor. In your view, could this be a viable solution?

No, as this is not part of your core business. As company policies change, this will be the first to go. The alternative could be to create a syndicate of preferred, non-competing packaging suppliers who are responsible for the above.

Proposed advantages (Mr. Hugenholtz's comments are underlined)

- No initial investment made: running costs instead of lump investment – Lower Entry ticket, improved cash-flow, capital raising eliminated, reduction of tied capital, elimination of sunk costs

- No middleman/subsidiary: no extra margins introduced in the supply chain

- One/few partners to negotiate with: in each niche respectively (steel racks, EPP etc.)

- Economies of Scale: if having other customers in the car industry, scale advantages and sourcing efficiencies can be obtained by supplier

- Expert knowledge: negotiate directly with people knowledgeable of TB packagings instead of what is done in the P1 project.

- Supplier ownership: assumed higher quality to minimize costs of repairs etc.

- Potential for deeper collaboration: the packaging supplier (Conteyor) participates and provides input earlier in the development process, instead of just manufacture according to specification. Less errors, enhanced flexibility to product changes, things get right from the beginning.
- Focus more on core activities: VCC can concentrate more on logistics assurance instead of packaging development.

- Early involvement also means better scheduling and thus lower costs

Proposed Disadvantages

- VCC lose full control: reduced overview and control over process. Not necessarily

- Contract entrapment: tied in contracts, difficulty to cancel them. Late product changes may become very expensive.

- Low diversification of suppliers: risks of bankruptcy, strikes, accidents etc. can hit hard on VCC.

- Prioritisation: If VCC is a relatively small customer to this particular supplier that has much bigger customers, VCC may be less prioritised.

Are there any aspects that you think we have missed out on?

I think the biggest problem is starting early. One has to keep in mind that such a programme is a major activity and will impact on the business of any packaging supplier. This is not a problem provided it is started early before any timing restraints are in place. Please also ensure the financial stability of the proposed partners. These are long-term contracts and you need long-term players.

Also the partner must have extensive CAD skills. The component will only be available virtually, so you need somebody who cannot only read these files but also make comprehensive packaging designs with them.

With regards to the container pool management, it is more and more becoming a problem that the suppliers no longer have the space to store all the packaging. So the packaging provider should provide only sufficient packaging to follow the production requirements of the next week (for example) so that the supplier does not have to store many days of racks in his backyard.

Additional Questions – Patrick Hugenholtz

Regarding the CAD construction of the packagings, we had in mind that the packaging manufacturer constructs it according to VCC's specification. In other words, that VCC isn't involved at all in the CAD/CATIA construction. This task is completely outsourced to the packaging supplier.

We thought that VCC should only receive these CAD constructions and put it into VCC's system, i.e., that no modifications are made. The individual receiving these constructions doesn't need to be a packaging expert and doesn't need to be employed at the purchasing division at VCC. By this, VCC wouldn't need to hire a CATIA consultant for this task any more.

Summary of Alternative: Conteyor takes the whole construction task. They are involved at a very early stage with the actual specification work of the TB packagings, working together with the logistics engineers at VCC. VCC is responsible for repair and maintenance; this is however outsourced to an external firm.

What are your thoughts about this?

I think this is a workable construction. However, it must be made clear how the supplier can recuperate his costs. Otherwise it will be difficult to find motivated suppliers who will share their latest innovations with you.

Please keep in mind that in this case VCC must stick to the VCC spec and not change this every 3 months. I have no experience with VCC in this regards but I do know that other OEM do not wait even 3 months and change without all suppliers knowing!

With the current "Covisint" Internet bidding for projects including packagings, apples must be compared to apples. In other words any developments cost incurred during the CAD development must either be paid separately under a separate Purchase Order or a PO is given for both the development and the volume orders. The latter is to be preferred, as both parties know what to expect.

In addition the responsibility for the design of the packaging needs to be defined. Today when the suppliers make a design and the prototype is approved by VCC, the responsibility of the design is transferred to VCC. I think it should stay like this.

Finally, it must be made clear who owns the designs. Normal practice is that the supplier owns the designs unless there has been a dedicated VCC funded development. The current VCC purchase Terms & Conditions claim ownership of the designs, which is not correct. In many cases nobody talks about this but I think it is worthwhile to consider this in your project.

Appendix 10

E-mail Interviews: Article Suppliers (revised edition)

Respondents:
Brose, England
Continental Teves, Germany
Continental Teves, Czech Republic
Autoliv, Sweden
Benteler Automobiltechnik, Germany
Faurecia, France

1. *Is manufacturing of packaging one of your core businesses, or do you view the provision of them as just an additional service?*

In all cases, the suppliers didn't regard packaging development or the manufacturing of it as one of their core competencies. However, they all viewed the supplying of it as an additional service that they were willing to provide.

2. *From your point of view, what advantages as well as disadvantages do you see in having this responsibility?*

Advantages: Some of the article suppliers argued that they probably knew best which packagings that were suited for their components, since they know the most sensitive surfaces/places of the product they are to deliver. Some also argued that they are very aware of the risks involved in transports and handling of their products, and could therefore provide packaging solutions accordingly. They also stated that it was positive that they had more influence upon the design of packaging, leading to better adaptation to their assembly line and handling tools. As they gained more responsibility for the production and material handling involved in the process, these issues could be taken into consideration at an earlier stage in the development process.

Disadvantages: A lot of time is spent on the development and quality checks needed to be able to provide the packaging according to specification. In other words, it consumes much of their time and resources. Another thing that was argued was that they, who are not in any way experts in packagings, have to be responsible for providing a good packaging solution. In addition, that they have to bear all the development costs etc. until the final release, i.e. when the cars start to be produced (long transition time). One respondent stated that late changes to the packagings complicated their operations. To get compensation for these late changes, i.e. to modify the packaging quickly, and to still manage the time limits for them

was also seen as problematic. In addition, the specifications brought forward could sometimes be a bit unclear, meaning that an unnecessary number of reviews had to be undertaken. The high expenditure in general of planning, invitation of tenders and development caused higher costs than they initially calculated.

3. *Has/will your company manufacture these packagings in-house, or is this placed on an external packaging supplier?*

All of the contacted article suppliers said that this was placed on external packaging suppliers, since they didn't have this manufacturing competence themselves. In addition, investments in machinery, staff and other equipment, were seen as being so high that they would probably never do this in-house. However, some of them designs them in-house and test them themselves before final release.

4. *Will repair & maintenance of these packagings be carried out/supervised by your company? If not, who carry out this?*

Some answered that VCC had this responsibility, and a few said they carried out minor repairs themselves. If the damages were too extensive, they were either sent off to companies having greater expertise in this field or scrapped and replaced.

5. *Has the work of developing these packagings in conjunction with VCC run smoothly, or is it felt that you should have had a more integrated role in this development?*

It is felt amongst all the interviewed suppliers that there hasn't been any major problems, except from getting final approval for the solutions they are to provide. On the whole, however, the process has run smoothly and the cooperation between VCC and them has been good.

6. *For VCC's next car project, what is your company's general position in being responsible for supplying the packagings again?*

Although the outcome of this strategy isn't clear yet, they were all positive to supply the packagings again for the projects to come.

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