

The Development of a Purchasing Cost Model Facilitating Decision-making at Tetra Pak Packaging Solutions

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Abstract

Background

Several industries have faced intensified competition in recent years. To manage this challenge and to stay competitive, purchasing has gained a lot more recognition in today's companies. To contribute to the overall profitability of a company, purchasing procedures have evolved from only having a narrow focus of cost avoidance to engage in collaborative cost reduction activities with suppliers. Many companies have transcended to this mindset but there are still businesses operating traditional purchasing departments.

Problem

Tetra Pak and the subsidiary Packaging Solutions Capital Equipment has encountered increasing competition from global actors generating decreased profit margins. Cost reduction initiatives have been introduced by top-management. As a step to successfully manage the cost reduction targets, purchasing within Packaging Solutions CC&SPM have requested a tool to facilitate decision-making for sourcing scenarios. The main objective was to develop a purchasing cost model, which considers multiple cost components besides the price. The model should also be applicable for both supplier selection and later supplier evaluation and development.

Purpose

The purpose of this study is to explore the purchasing cost management field both in theory and in practice in order to propose, develop and test a purchasing cost model at Tetra Pak Packaging Solutions.

Method

A constructive research approach has been applied with the objective to deliver a purchasing cost model to Tetra Pak Packaging Solutions CC&SPM by bridging theory and practice. To further gain practical insights, an interview study has been conducted with five large industrial companies. This, in combination with our literature review provided a foundation for the work at Tetra Pak.

Theory

Purchasing and Cost Management has been investigated in parallel with supplier management. In addition, a set of purchasing cost models have been researched and presented. The sample is based on the most frequently mentioned models in literature and these are Activity-based costing, Total Cost of Ownership (TCO), Cost-ratio, Landed cost, Life-cycle costing and Cost structure analysis. The purchasing cost models have been researched with the objective to determine benefits & drawbacks, contextual aspects affecting the model as well as the application they serve among others. Lisa Ellram and her research regarding TCO and additional purchasing cost models have been the foundation of our research. Also, Young et al. Al (2009) has provided valuable insights of present research. In addition, several other journal articles constitute our literature review and have provided essential knowledge to the field. We found that the contextual dimension of purchasing cost models has not been covered sufficiently. In short, Cost-ratio, Landed cost and Cost structure analysis target the transactional stage (sourcing) whereas Life-cycle costing and Total Cost of Ownership have a broader scope, covering both pre-transactional and post-transactional costs in addition to the sourcing phase. Activity-based costing can be seen as a tool to fully manage Total Cost of Ownership.

Empirical Research

For the interview study, a case sample consisting of IKEA, Lantmännen, Siemens Turbomachinery, TeleCompany and Volvo Cars was interviewed to find out more about their purchasing departments as well as their purchasing cost models with benefits & drawbacks, application, success factors and present contextual aspects. The purchasing cost models used in practice were also covered in literature. The companies studied used Landed cost in combination with Cost structure analysis. Further, TCO and Life-cycle costing were also found in practice.

Analysis & Conclusion

There is a set of contextual aspects that will drive and enhance the output of purchasing cost models. These are industry competitiveness, cost-driven culture, supplier relation strategies, availability of data and enabling software, cross-functional orientation, organisational structure and company size. Supplier relation strategies and availability of data can be enhanced from inside the purchasing departments. Cost-driven culture, cross-functional orientation, organisational structure and enabling software require an organisation-wide transformation and industry competitiveness is derived from outside the company.

Moreover, the purchasing cost models investigated in practice are predominantly used for supplier selection and they are usually combined with other tools to cover the remaining application areas.

In general, there are both similarities and differences compared to the literature review. The purchasing cost models are well described in literature with the exception of contextual aspects affecting the models. However, simplicity, application handiness and compliance are emphasised to greater extent, by practitioners, as important areas.

The Construction

To fit the corporate environment at Tetra Pak Packaging Solutions CC&SPM, an extended Landed cost model was chosen for the development. This model covers the transactional stage, including price, payment terms, order quantity implications, transportation and inbound quality investigations. In addition, this purchasing cost model also covers the pre-transactional stage to some extent by taking into account cost of having suppliers, articles and changing suppliers. Lastly, the post-transactional stage has been incorporated by adding cost of inventory and product quality.

Along with the purchasing cost model, guidelines and recommendation were provided. In order to successfully manage the purchasing cost model, purchasing at Tetra Pak should work more cross-functionally with Program Purchasing and designers among others. As a result, CC&SPM should also be able to influence product development to greater extent and enable greater cost reductions potential. In addition, the model should also serve as a communicative tool, facilitating the collaboration with suppliers in order to find mutual cost reductions.

Key Words

Purchasing cost model, Cost management, Purchasing sophistication, Supplier management, Supplier selection, Sourcing decision-making, Landed cost, TCO, Cost-engineering

Sammanfattning

Bakgrund

Företag inom flertalet industrier har under de senaste åren ställts inför en allt hårdare konkurrens. Detta har inneburit att företag tvingats hitta nya områden och effektivisera verksamheten för att kunna bibehålla sin lönsamhet. Ett område där besparingar och kostnadsreduktioner kan genomföras för att förbättra företags resultat är inköp. För att företags inköpsavdelningar ska kunna bidra till de övergripande kostnadsmålen krävs att synsättet på inköp förändras. I många år har inköpsavdelningar fokuserat på att genomföra kortsiktiga kostnadsbesparingar. Detta har många gånger en negativ påverkan över tid och istället har företag börjat etablera långsiktiga kostnadsreduktioner i samarbete med leverantörer. För att lyckas med detta arbete krävs verktyg för att visualisera kostnadsstrukturer såväl internt som externt.

Problem

Tetra Pak och dotterbolaget Packaging Solutions Commercial Components & Spare Part Management har som många andra företag mött en allt tuffare konkurrens på den globala marknaden. Detta har genererat lägre lönsamhet och därav efterfrågas en kostnadsmodell för att visualisera denna dimension. Företaget vill ha ett verktyg där kostnadskomponenter bortom inköpspriset visualiseras. Detta i syfte att kunna identifiera potentiella områden för kostnadsreduktion. Modellen ska kunna användas vid val av leverantör, leverantörsutvärdering samt leverantörsutveckling.

Syfte

Syftet med denna uppsats är att utforska området Cost Management både vad gäller teori och praktik för att kunna föreslå, utveckla och testa en kostnadsmodell för inköp på Tetra Pak Packaging Solutions CC&SPM.

Metod

En så kallad Constructive research approach har använts för att kunna utveckla en kostnadsmodell för inköp på CC&SPM. I korthet är målet att överbrygga gapet mellan akademi och praktik och därmed kunna ta fram en modell i en verklig kontext. För att kunna erhålla relevans och praktisk användbarhet innehåller denna konstruktion även en litteraturstudie samt en intervjustudie av ett antal företag som driver framgångsrika inköpsavdelningar.

Teori

Inköp och Cost Management har studerats parallellt med Supplier Management för att erhålla en god överblick över redan utförda studier inom detta och närliggande områden. I denna litteraturstudie har flera kostnadsmodeller för inköp undersökts och beskrivits. Dessa är Activity-based costing, Total Cost of Ownership (TCO), Cost-ratio, Landed cost, Life-cycle costing och Cost structure analysis. Dessa kostnadsmodeller har undersökts och beskrivits genom följande dimensioner, kostnadskomponenter, fördelar & nackdelar, användningsområden, framgångsfaktorer och kontextuella aspekter. Tidigare forskning gjord av Lisa Ellram och Young et al. (2009) har tillfört värdefulla insikter tillsammans med ett stort antal övriga akademiska artiklar. Vi konstaterade, liksom flertalet andra författare, att de kontextuella aspekterna som påverkar kostnadsmodeller ännu inte undersökts i tillräckligt stor omfattning. I korthet tillhör Cost-ratio, Landed cost och Cost structure analysis den transaktionella fasen som också kan benämnas som sourcing. Vidare, Life-cycle costing och Total Cost of Ownership har ett bredare fokus vilket innefattar kostnadsdrivande aktiviteter både inför och efter

sourcing-tillfället. Activity-based costing å andra sidan kan ses som ett krav för att kunna uppnå Total Cost of Ownership till fullo.

Empiri

Intervjustudien i denna uppsats har utförts på IKEA, Lantmännen, Siemens Turbomachinery, TeleCompany samt Volvo Cars. Dessa företag har intervjuats i syfte att skapa oss en förståelse för deras inköpsavdelningar och hur dessa företag arbetar med kostnadsmodeller för inköp. I intervjuerna diskuterades kostnadsmodellerna och deras för & nackdelar, användningsområden, framgångsfaktorer samt hur dessa påverkas av miljön och de rådande kontextuella aspekterna. Flertalet företag använder sig av en Landed cost i kombination med Cost structure analysis. TCO och Life-cycle costing förekom också i intervjustudien.

Analys & Slutsats

Vi har identifierat ett antal kontextuella aspekter som påverkar och driver arbetet med kostnadsmodeller vid inköp. Dessa är konkurrenssituation inom industrin, kostnadsorienterad kultur, leverantörsrelationer, tillgång av data, tvärfunktionellt arbete, organisatorisk struktur samt företagsstorlek. Leverantörsrelationer och tillgång av data kan påverkas och förstärkas av inköpsavdelningen separat. Kostnadsorienterad kultur, tvärfunktionellt arbete och organisatorisk struktur kan endast påverkas om företaget i stort beslutar om förändring. Slutligen är konkurrenssituation inom industrin en kontextuell aspekt som kommer från den externa miljön ett företag opererar i.

Kostnadsmodellerna är i första hand ämnade för val av leverantör bland de studerade företagen även om teorin föreslår att de med fördel även kan användas vid leverantörsutvärdering samt leverantörsutveckling. I många fall använder de studerade företagen andra verktyg för dessa användningsområden.

Det finns både likheter och olikheter när teori och empiri jämförs. I stora drag beskrivs modeller på ett likvärdigt vis med undantag för kontextuella aspekter som ännu inte har undersökts inom akademien. Däremot understryks vikten av enkelhet, användbarhet och förståelse i större utsträckning av de studerade företagen än inom akademien.

Konstruktion av kostnadsmodell

För att bäst passa företagsmiljön på Tetra Pak Packaging Solutions CC&SPM har en utvidgad Landed cost modell utvecklats. Precis som den traditionella Landed cost, innehåller vår modell kostnadskomponenter såsom pris, betalningsvillkor, orderkvantitet, transportkostnader samt kostnad för ankomstkontroll. Till detta tillkommer kostnader för att upprätthålla leverantörsrelationer, artiklar i systemet samt kostnad för att byta ut en leverantör. Ytterligare kostnadskomponenter såsom produktkvalitet och kapitalbindning är även inkluderat.

Som ett komplement till kostnadsmodellen har instruktioner tagits fram. Vidare har rekommendationer utvecklats som beskriver hur Tetra Pak bäst ska hantera och arbeta med kostnadsmodellen vid inköp. Detta inkluderar förslag till att arbeta närmare andra avdelningar. Detta för att kunna influera design av produkter med avseende på inköp av komponenter och uppnå större kostnadsbesparingar. Kostnadsmodellen ska också kunna användas som ett verktyg vid kommunikation med leverantörer. På så sätt kan gemensamma kostnads mål få större fokus i årliga förhandlingar.

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1 Introduction

This chapter describes the background of this master thesis; it presents the principal company in short as well as the problem they face. This is consequently the main driver to why this master thesis was performed. In addition, the purpose, research questions, dimensions of analysis and scope are defined. For further clarification, directives and delimitations are presented, followed by an outline of the thesis.

1.1 Background

Purchasing has clearly evolved during the years from only being a division with the objective of securing supply to also incorporate strategic activities (Schary & Skjott-Larsen, 2001; Chen et al., 2006). Today, in many companies the proactive mindset pervades the purchasing department where activities such as supplier relations and supplier collaboration have emerged, among other activities (Schary & Skjott-Larsen, 2001; van Weele, 2010). Also, the recognition of cross-functional as well as inter-organisational orientation is evident in literature (Schary & Skjott-Larsen, 2001; van Weele, 2010). Academic research has over the years stressed the importance of purchasing in terms of the financial impact. In some industries the cost of purchasing corresponds to 50 – 80 % of the total product cost (van Weele, 2010; Schary & Skjott-Larsen, 2001; Ghodsypur & O'Brien, 2001; De Boer et al., 2001).

Previously, companies have used the principle of cost avoidance, which means that suppliers have to compete in terms of price to “get the deal” (van Weele, 2010). However, this is not a strategy that will be sustainable in the long run (van Weele, 2010). Thus, companies have nowadays started to utilize the strategy cost reduction. Cost reduction translates into reduction originating from changes in specifications, product quality or a supplier, which better fits the characteristics of the purchase (van Weele, 2010).

The transition from a commercial perspective to consider multiple aspects, which all contribute to the total incurred cost, is today evident in some companies (van Weele, 2010). However, it is still common to come across companies with a narrow focus to reduce price by any mean (van Weele, 2010). There are several catalysts affecting this change and van Weele (2010) discusses some of them: First, the more competitive a market is, the more focus is generally put on lowering the costs of purchasing. Also, the more explicitly a company describes its goals and objective, the easier it is to formalise strategies in order to attain these. Hence, this facilitates development. Further, top-management support, systems development and functional leadership also affect the development of purchasing within an organisation.

The field of strategic management accounting and cost management aims to facilitate cost reduction and thereby increasing the overall profit (Wagner, 2008; Axelsson et al., 2002). These activities can be supported by the use of a purchasing cost model, where different cost drivers throughout the life-cycle of a purchase are taken into account to various extents depending on the model. In this master thesis, a purchasing cost model is defined as:

“A purchasing cost model is a tool, which considers certain cost components specifically related to a purchase in order to enable decision-making and to determine the incurred cost”

The definition has been conceptualised by us and is inspired by the literature review performed within this field. Clearly, definitions of different purchasing cost models vary and the conceptualisation described above is intended to be general and describe the overall purpose.

The purchasing cost models described in this thesis are:

- Activity-based costing (ABC)
- Total Cost of Ownership (TCO)
- Landed cost
- Cost-ratio
- Life-cycle costing (LCC)
- Cost structure analysis

These purchasing cost models will be presented in the theoretical framework where focus has been put on describing benefits and drawbacks as well as the contextual aspects among others. Given our literature research within this field, there is evidence that contextual aspects are not sufficiently described today. This statement is also supported by De Boer et al. (2001) who highlighted the issue in 2001. In addition, Wagner (2008) stresses that the field is still immature and further research is required.

The choice of purchasing cost model is highly dependent on the corporate environment. The relation between its application and the different contextual aspects is important to consider. Whether the purchasing cost model aims to facilitate supplier selection, evaluation or development, contextual aspects such as corporate culture, purchasing sophistication and resistance to change will be affecting the end result. This phenomenon was identified in the early 1990s by Ellram (1993) and has also been highlighted by Young (2009).

1.2 Problem

The principal company, Tetra Pak Packaging Solutions Capital Equipment, is a business unit within the Tetra Pak Corporation that operates the department Commercial Component & Spare Part Management (Hereafter CC&SPM). CC&SPM is responsible for the purchasing of commercial components related to filling and packaging machines. Over the last years, the competition has intensified within the industry. Now, Tetra Pak is forced to carry out efficiency programs to reduce costs in order to meet the new market requirements. The principal company has identified the need of reducing cost throughout the business equally to the directives from the corporation (personal communication, 19 February 2015).

The need of a purchasing cost model, to prioritise and drive cost reduction activities and to evaluate and develop current suppliers, is significant. Today, suppliers' cost efficiency is mainly evaluated in terms of selling price. In fact, cost parameters connected to lead-time, delivery accuracy and quality have not been explicitly considered because of the difficulties to quantify them. This situation indicates slack in supplier base management and supplier development, which have to be restructured in order to gain the potential benefits. The vision is to have a more holistic purchasing cost model.

In order for the purchasing department to contribute to the total cost reduction, there is an initiative to introduce a broader scope of cost management instead of a system solely focusing on price. Yet, this transition has showed to be even more difficult than expected. Questions regarding what cost components to include, how to quantify these and how to consolidate this information have arisen. The need of a tool to manage this task has been identified by the purchasing department. Moreover, the tool should be applicable for both the spare part material flow and the component material flow for machine production.

1.3 Purpose of the Study

The purpose of this study is to explore the purchasing cost management field both in theory and in practice in order to propose, develop and test a purchasing cost model at Tetra Pak Packaging Solutions.

1.4 Research Question

A research question has been developed to this master thesis. In addition to this, sub-questions were established to support the overall question (RQ₁). The overall research question is formulated below (RQ₁).

What purchasing cost model is suitable for Tetra Pak Packaging Solutions
CC&SPM with respect to their corporate environment?

Accordingly, three sub-questions have been determined to provide guidance throughout the research. These are:

RQ₂ – What contextual aspects within the corporate environment affect how companies institutionalise and sustain a purchasing cost model?

RQ₃ – What are the benefits and drawbacks of different purchasing cost models and how are these affecting the company?

RQ₄ – How is the choice of purchasing cost model affected by its application?

The sub-questions will support the specific requirements requested by the company and clarify the major components of the overall research question. Also, since contextual aspects have shown to be important and currently not sufficiently described in literature, RQ₂ has been given great priority in addition to the construction.

1.5 Dimensions of Analysis

There are two main dimensions, which are considered when analysing the characteristics of the different purchasing cost models (Figure 1). By characteristics we refer to aspects such as cost components, benefits, drawbacks & barriers, application and success factors. The first layer describes the application of the purchasing cost model. This is essential because the purpose of the tool will be reflected in the design. The second layer, the context, will also affect the development of the model. Depending on what contextual aspects that are present at Tetra Pak Packaging Solutions CC&SPM, the purchasing cost model will be chosen and adjusted to fit these. Boer et al. (2001) identified that present academic literature was not sufficiently describing the contextual aspects of decision-models regarding supplier selection. Generally, this dimension is not discussed in research. However, Ellram (1993) stressed the importance of culture when implementing

TCO and Young et al. (2009) identifies purchasing sophistication and cross-functional mindset as enablers for successfully implementing Landed cost. Also, we believe that factors such as resistance to change and degree of supplier relations will affect the choice of purchasing cost model.

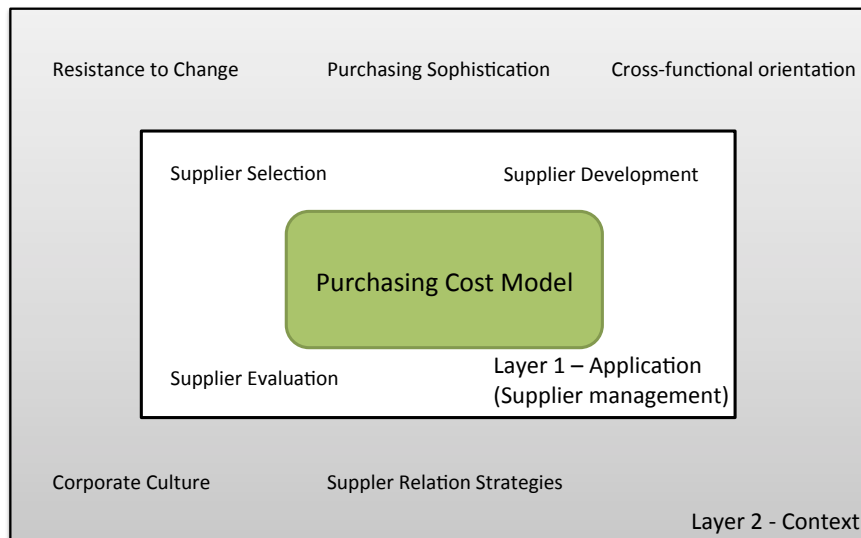


Figure 1 Layer of the purchasing cost model

1.6 Scope

Within this master thesis, the application of supplier selection, supplier evaluation and supplier development will be primarily discussed. When these are addressed together, they are referred to as supplier management. However, as for Tetra Pak Packaging Solutions, the application, supplier selection, will not have as much focus. This is due to the nature of Tetra Pak Packaging Solution's technical specification where the machines are developed based on commercial components rather than functional specifications. In most cases, the company is hesitant to change components since this would generate costs related to redesign of machines. Furthermore, the initial desire was to develop a Total Cost of Ownership (TCO) model. However, early investigation suggested that a broader scope of research was beneficial due to the strict requirements of applying TCO. This is further described in the theoretical framework.

1.7 Focus and Delimitations

1.7.1 Directives

Tetra Pak Packaging Solutions CC&SPM has requested a purchasing cost model which should be applicable to different component categories and to both the spare parts material flow and the regular component flow for machine production. Hence, there must be a high degree of generalizability of the model.

Also, since they previously have tried to incorporate the dimension of lead-time, this should be included in the purchasing cost model.

1.7.2 Delimitations

The purchasing cost model will partly cover the life-cycle of a component. The measure will start with contracting and negotiating with suppliers and will last until delivery to customer and include the customer claims. Costs related to the cost structure of the

supplier and costs related to, for instance, how customers perceive the products of Tetra Pak are excluded. Also, intangible aspects, which are difficult to translate into costs will be discarded on request from Tetra Pak. The application handiness is of great importance and thus, only quantifiable measures will be taken into account.

An interview study has been conducted in this research. However, the data collection of each case is limited since the major focus has been on the construction of the purchasing cost model at Tetra Pak Packaging Solutions.

Further, since this is a master thesis, there is a time limitation of 20 weeks. Areas that cannot be concluded within this master thesis has been proposed for future research within this field.

1.8 Outline of Thesis

Hereafter, the master thesis will proceed with the chapter 'Principle Company Description'. This chapter introduces Tetra Pak and specifically Tetra Pak Packaging Solutions CC&SPM. The chapter describes the organisational structure, the purchasing function and the drivers behind this master thesis. In short, the chapter aims to give the reader a greater understanding of the principal company.

The methodology will be described in detail in chapter three. The overall approach, research approach and research method are presented and defined. In addition, the construction of the purchasing cost model and how the analysis was conducted are described in 'Methodology'. To gain further credibility, activities related to reliability and validity are presented in parallel with how to cope with information biases.

In chapter four, the 'Theoretical Framework' is conducted consisting of the theoretical foundation, which enables the construction of the purchasing cost model. Initially, purchasing & cost management is presented followed by supplier management. The applications: supplier selection, supplier evaluation and supplier development are described in detail, which is beneficial to understand before describing the purchasing cost models. Also, the focus taken when describing the different purchasing cost models is stated. Further, the contextual aspects affecting the purchasing cost models are presented. These are later related to the different application and also conceptualised in a research model. Lastly, a portfolio of purchasing cost models is presented. These are described based on the following dimensions:

- Cost components
- Benefits
- Drawbacks & barriers
- Application
- Success factors
- Contextual aspects

In order to improve the structure of our thesis, all models are summarised in tables.

Chapter five 'Empirical Study' consists of an interview study of five companies. These are interviewed based on their use of purchasing cost models. The structure is similar to the dimension mentioned above to prove consistency of the presentation of information. In addition, the companies' purchasing departments are described to gain greater understanding.

Moreover, an analysis is performed of the interview study. Both pattern matching and cross-case analysis is established to find evidence which is important for the construction at Tetra Pak Packaging Solutions CC&SPM.

Additionally, the construction of a purchasing cost model at the principal company is presented. The results are also discussed and related back to the analysis of the interview study.

The last chapter is 'Conclusion and Contribution' where the main findings related to the research questions are described. Further, contribution to both academic literature as well as the principal company is presented. Also, future research and development for the principal company are discussed

2 Principal Company Description

This chapter gives an in-depth description of the principal company, Tetra Pak Packaging Solutions CC&SPM and the corporation of Tetra Pak overall. History, organisational structure, cost directives and supplier management will be further presented.

2.1 Tetra Pak

2.1.1 History

Tetra Pak was founded 1951 by Ruben Rausing in Lund, Sweden (Tetra Pak, 2015a). Since then, the company has developed to become one of the world's leading food processing and packaging solution companies (Tetra Pak, 2015b). In detail, Tetra Pak provides processing and packaging solutions for food (Tetra Pak, 2015c). Besides packaging liquid food, Tetra Pak has extended its product portfolio to provide packaging of ice cream, cheese, fruits, vegetables and pet food among others (Intranet, 2015).

2.1.2 Tetra Laval Group

Tetra Pak is one of three companies in the Tetra Laval Group (Tetra Pak, 2015c). Together with DeLaval and Sidel, the companies compose technologies for efficient production, packaging and distribution of food (Tetra Laval, 2015). DeLaval is a full-service supplier to dairy farmers whereas Sidel is one of the world's leading companies in solutions for liquid food packaging (Intranet, 2015).

2.1.3 Tetra Pak

Tetra Pak is a global corporation providing packages to customers in more than 170 countries across the globe (Tetra Pak, 2015d). Further, the company is employing more than 23000 people with net sales exceeding 11 billion € (Tetra Pak, 2015d). The major employee base is geographically dispersed across 85 countries (Tetra Pak, 2015f). Also, to manage close customer collaboration, Tetra Pak operates 32 market companies that are responsible for sales and service for certain regions (Tetra Pak, 2015c).

According to Tetra Laval's annual report (2014) there are some distinct market drivers, which will affect Tetra Pak. Demographics, economy and sustainability will all affect the future market where Tetra Pak operates within (Tetra Laval, 2014). Due to growing population, increased urbanisation and improved economic situation, the consumption is expected to increase (Tetra Laval, 2014). Asia and especially China will play an important role in the future due to the significant growth (Tetra Laval, 2014). The total amount of produced Tetra Pak cartons accounts for 7 % of the global packaged liquid food market (Tetra Laval, 2014). The segments, which Tetra Pak targets, are fairly diverse and the largest geographical markets for packaging solutions are China, Brazil, Russia, Iberia, USA and Mexico (Tetra Laval, 2014). In parallel, the competition has intensified from both plastics manufacturers, who have improved the efficiency and performance of their packaging systems, and non-system suppliers (Tetra Laval, 2014). These are especially concentrated to Europe and China (Tetra Laval, 2014).

A part of the company's brand and motto is "Protects what's good" (Tetra Pak, 2015e). This statement describes Tetra Pak's ambition to protect food, people and futures (Tetra Pak, 2015e). In short, this means that the company strives to make food safe and available across the globe through leading processing and packaging solutions (Tetra Pak, 2015e). Further, Tetra Pak aims to create opportunities for both employees and the

society through social responsibility (Tetra Pak, 2015e). Lastly, by driving environmental excellence, the company advocates sustainability throughout the business (Tetra Pak, 2015e).

The product portfolio can be divided into the following groups (Tetra Pak, 2015f):

- Packages
- Processing equipment
- Filling machines
- Distribution equipment
- Service products

A common denominator for the provided products is the economical mindset in terms of resources used (Tetra Pak, 2015f). By keeping consumption down, the company can contribute to the sustainable orientation (Tetra Pak, 2015f). In addition, Tetra Pak put emphasis on research and development (R&D), with 11 research centres across the globe with the objective to reduce operational cost and increase performance to its customers (Tetra Pak, 2015f). A better view of Tetra Pak and its two business units can be found in Figure 2 below.

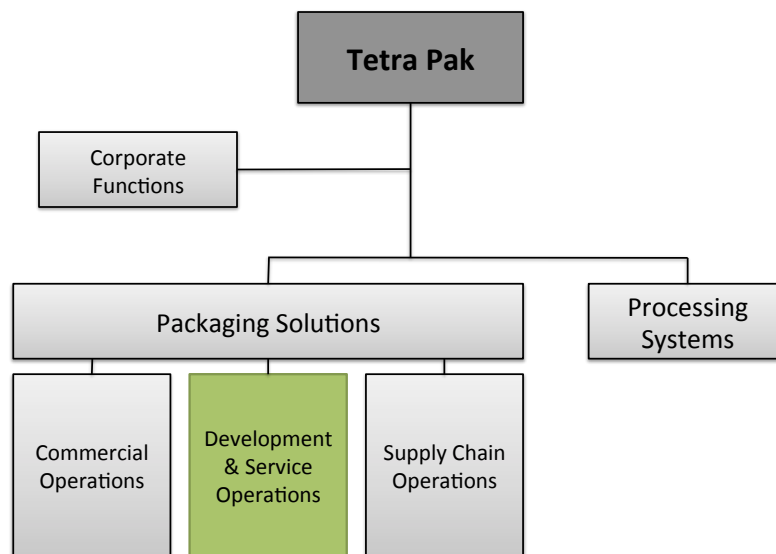


Figure 2 Organisational structure adopted from Tetra Pak's internal database (2015)

2.1.4 Tetra Pak Packaging Solutions

Tetra Pak Packaging Solutions is a subsidiary to the Tetra Pak Corporation, responsible for selling, manufacturing and distribution of filling and packaging machines (Internal database). This is made possible by the three departments; Commercial Operations, Development & Service Operations and Supply Chain Operations (Internal database). Development & Service Operations (DSO), marked with green in Figure 2, is responsible for development and manufacturing of new packaging technologies, new filling and packaging machines and the provision of spare parts and aftermarket services (through Technical Service) (Internal database). DSO also includes five clusters spread over the world as well as corporate functions (internal database).

2.1.5 Capital Equipment

The department Capital Equipment is responsible for the manufacturing of the machines, which takes place at Tetra Pak facilities by assembling modules that are received from module suppliers outside Tetra Pak (personal communication, 19 February 2015).

A machine typically consists of several modules that in turn consist of several components that are bought by the module supplier according to Tetra Pak agreements (personal communication, 19 February 2015). This means that operational purchasing and daily supplier contact takes place between the component suppliers and the module suppliers. No components, unless they are spare parts, are shipped directly to Tetra Pak (personal communication, 19 February 2015). Further, the operational purchasing of spare parts is conducted by Technical Service (personal communication, 19 February 2015).

When the modules are assembled, the machine is tested and then disassembled before it is shipped to customer (personal communication, 19 February 2015). This is visualised with black arrows in Figure 3 below. When machines break down due to defective parts, the customers send a claim to their responsible market company that issues it further upstream in the value chain (personal communication, 19 February 2015). This is visualised with red arrows in Figure 3 below.

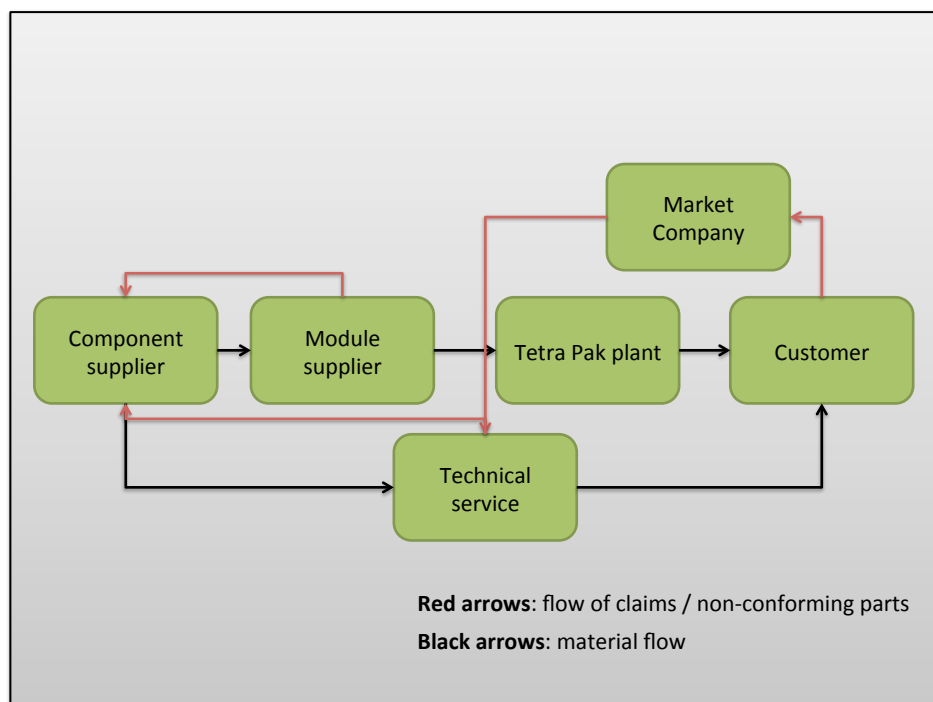


Figure 3 Visualisation of material flow and flow of claims to Tetra Pak

2.1.6 Supplier Management – Capital Equipment

The Supplier Management department within Capital Equipment is responsible for all agreements and supplier strategies related to Packaging Solution's components and modules (personal communication, 19 February 2015). The components are divided into two categories; commercial components, that are bought from the suppliers' existing product portfolio, and drawn components, where the specifications are developed and owned by Tetra Pak (personal communication, 19 February 2015). A better view of the

Supplier Management organisation for Capital Equipment can be found in Figure 4 below.

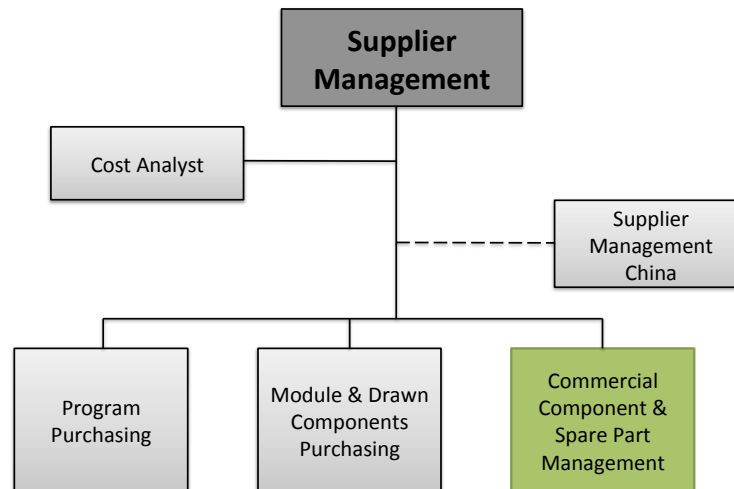


Figure 4 Supplier Management Capital Equipment adopted from Tetra Pak's internal database (2015)

Within the Supplier Management Department there are three different units. The first unit is called Program Purchasing and is responsible for purchases related to machine development projects. Further, the second unit is called Module & Drawn Components Purchasing and is responsible for agreements for modules and drawn components (personal communication, 19 February 2015). The third unit is Commercial Component & Spare Part Management, which is responsible for agreements for commercial components, which also are purchased as spare parts by Tetra Pak Technical Service (personal communication, 19 February 2015). Naturally, since components are part of modules and concept programs, the third unit also supports the prior two with agreements (personal communication, 19 February 2015).

Commercial components are grouped into categories such as pneumatics, hydraulics, software and pumps, where each category has an assigned category manager whose responsibility is to drive and implement category strategies in order to define a supply base that secures quality (Internal data). Each category can have multiple suppliers. Similarly, one supplier can provide components to several categories (personal communication, 19 February 2015). All in all, there are 194 suppliers for commercial components where every supplier has an assigned supply manager (personal communication, 19 February 2015).

2.1.7 Cost Directives

Internally, Tetra Pak advocates that other costs besides price reduction should be considered when evaluating suppliers. However, this has not yet been applied in practice to the extent they aim for (personal communication, 19 February 2015).

There have been explicit directives from Development & Service Operations (DSO) in terms of reducing the overall cost and generate better cost efficiency (personal communication, 19 February 2015). These directives have been broken down into

specific targets for Capital Equipment, CC&SPM, where there is an overall goal of reducing costs by 20 % until the year 2020 (personal communication, 19 February 2015). As a result, three categories have been defined where the savings can be materialised. They concern negotiations, replacement activities and other activities.

2.1.8 Tetra Pak's Supplier Management Process

The supplier management process (Figure 5) is commonly known within purchasing at Tetra Pak (Intranet, 2015). This ensures that employees are complying with the standardised way of working at Tetra Pak (Intranet, 2015). In order to be effective, these 'best practices' must be utilized by the staff (Intranet, 2015).

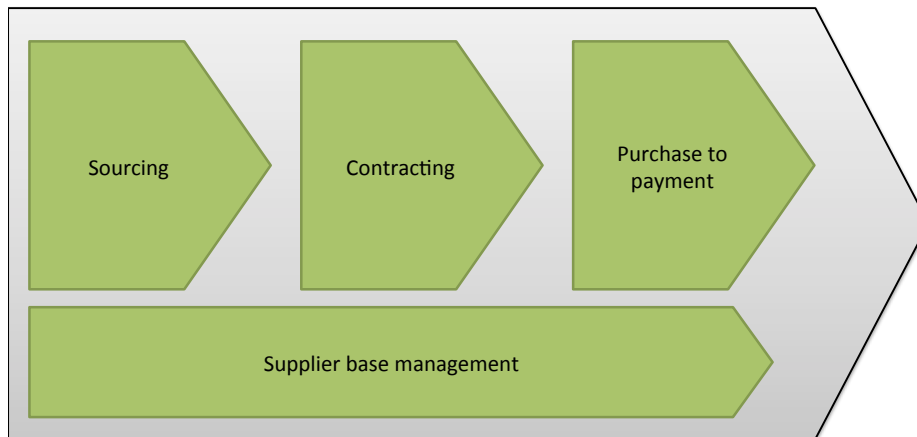


Figure 5 Supplier management process

The processes described above are institutionalised in order to create efficient procurement (Intranet, 2015). Sourcing entails how researching of suppliers should be performed and by what requirements these should be qualified (Intranet, 2015). Further, contracting describes how to select suppliers in terms of the suitability to fulfil internal needs (Intranet, 2015). Also, purchase to payment corresponds to ensuring efficient purchasing transactions to the suppliers. In addition, supplier base management describes how suppliers systematically and continuously should be managed, developed and evaluated (Intranet, 2015).

3 Methodology

This chapter describes the approach taken to manage this project. In detail, research approach, research method, analysis and how validity and reliability were generated are described in a sequence. Also, how we coped with information bias is presented in the end of this chapter.

3.1 Overall Approach

Although logistics research has been dominated by positivistic approaches (Mentzer & Kahn, 1995), this master thesis has been based upon a case study method. This is simply because the positivistic paradigm cannot sufficiently describe this research topic of ours since it suggests that findings are for instance context independent (Mentzer & Kahn, 1995). The positivistic approaches rely upon the assumption that there is an “objective” reality where objective methods can be used successfully for research (Näslund, 2002). In contrast, the method of case study allows the researcher to incorporate real world settings (Ellram, 1996; Yin, 2014). Voss et al. (2002) stresses that case study research addresses both physical and human elements within an organisation. The research area, purchasing cost models, should not only be considered as a purchasing tool. On the contrary, it can be seen as a philosophy in many cases. For instance, Total Cost of Ownership (TCO) is presented as a philosophy by Ellram (1993), where aspects such as corporate culture will influence the success of implementation. We believe that this is a common denominator when discussing this topic. Hence, the case study method is the better fit to successfully describe this research area.

The overall approach of this research has been based upon the systems view. Due to the nature of the research topic, where both application and contextual aspects influence, the systems approach is best suited to explain the phenomenon of purchasing cost models. The systems approach, which also can be referred to as the holistic perspective (Gammelgaard, 2004), is used when the phenomenon studied can be described as a system with mutually dependent components, links, goals and feedback mechanisms (Gammelgaard, 2004). According to Jackson (2006), holism has advantages in contrast to reductionism. The approach encourages transdisciplinary analogies, considers both structure and process and provides a powerful basis for critique (Jackson, 2006). The link between systems theory and case study is evident in literature (Ellram, 1996; Gammelgaard, 2004) where the underlying assumption of researcher involvement is present in both theories. By actively influencing the system, improvements can be accomplished (Gammelgaard, 2004). Hence, this philosophy provides a good basis for analysis.

3.2 Research Approach

The constructive research approach has been chosen for this master thesis. The objective was to develop a purchasing cost model for managerial use at the principal company, Tetra Pak Packaging Solutions CC&SPM. Here, the constructive research approach is favourable because its objective is to establish solutions to explicit problems with practical orientation (Kasanen et al., 1993). Kasanen et al. (1993, p. 243) describes the approach accordingly:

“Problem solving through the construction of organizational procedures or models”

Further, it is essential to relate the problem and its solution to the accumulated theoretical knowledge (Kasanen et al., 1993). Thus, bridging current academic research and the practical challenge are central in this master thesis. The overall process within this research is described in Figure 6.

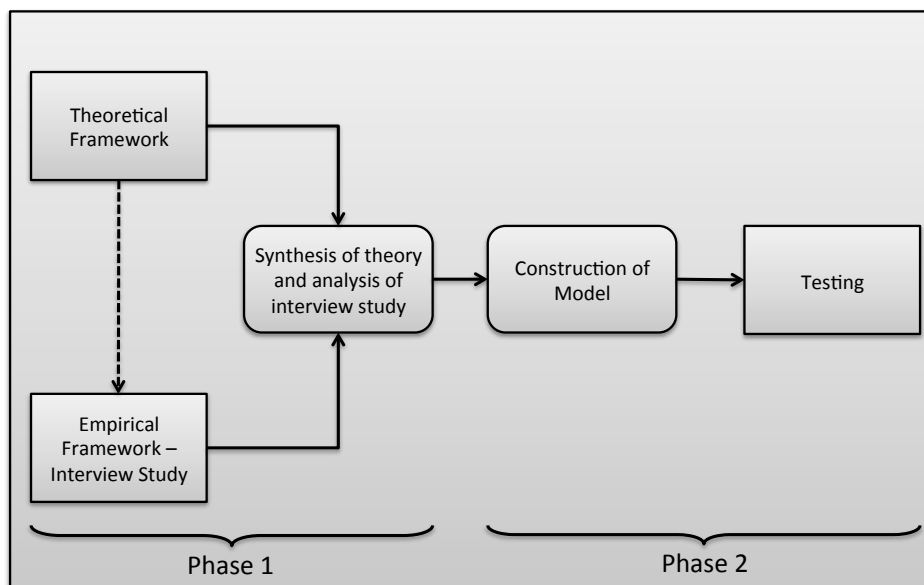


Figure 6 Structure of thesis

The structure of this master thesis can be divided into two separate phases (Figure 6). The objective of phase one was to provide the foundation of the existing purchasing cost models, benefits and drawbacks with each model and their contextual relations. This was fulfilled through a literature review along with an interview study. The limitation of generalizability when only using a single case (Voss et al., 2002) was the main catalyst to why a several cases were chosen for this phase. Also, Kasanen et al. (1993) advocate that case studies often are applied in connection to the constructive research approach. The construction of the literature review and the interview study will later be discussed in detail.

Further, the deductive approach is used where the theoretical framework has been the outset. The output of this phase, a theoretical synthesis and a cross-case analysis of the interview study, provided the foundation when applying a purchasing cost model at Tetra Pak Packaging Solutions CC&SPM. The underlying research helped in deciding which model to apply and what contextual aspects we needed to be aware of. However, we were always open for modifications of existing models to make them better fit the principal company. The interview study provided a good basis for criticism of the theoretical models since these have proven to be less effective in practice (Young et al., 2009).

In addition, the second phase provided credibility to this research in the sense that a purchasing cost model was tested in practice. Thus, difficulties concerning information availability, application handiness and general compatibility to the contextual aspects were identified. As for this phase, the construction of a purchasing cost model is central. The deductive approach was appropriate in this phase where a testing of the research was performed according to Kovács and Spens (2005). In detail, the approach aimed to

scan the existing research in order to later construct a model in a real-life setting by bridging academic research and practice (Kovács & Spens, 2005).

Kasanen et al. (1993) suggest the following procedure for the construction:

1. Find a practical and relevant problem
2. Obtain a general and comprehensive understanding of the topic
3. Innovate and construct a solution idea
4. Demonstrate that the solution is fully functioning
5. Show the theoretical connections and the research contribution of the solutions concept
6. Examine the scope of applicability of the solution

As seen in Figure 7, the procedure stresses to find an appropriate problem, which can be applied in practice. Also, the connection to prior academic research is essential in order to establish a functioning solution with practical orientation (Kasanen et al., 1993). Lastly, the objective is to further develop and contribute to the academic research by adding practical relevance and relevant experiences.

As for this research where contextual aspects such as resistance to change and the cultural affect of implementation are critical to understand, the constructive approach was suitable. Kasanen et al. (1993) highlights this issue and advocates that positivistic and hermeneutic research cannot sufficiently describe the practical dimension.

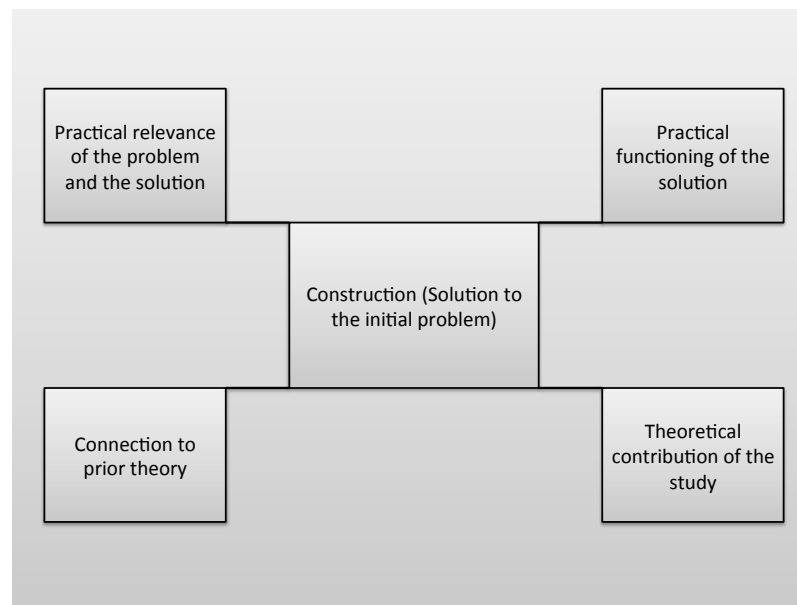


Figure 7 The constructive approach adopted from Kasanen et al. (1993)

The construction of this purchasing cost model has been performed according to Figure 8. The initial interviews were held with a focus group consisting of participants from Tetra Pak Packaging Solutions CC&SPM. All interviews were conducted individually with each participant. The interview guide is presented in Appendix I and more details regarding the interviewees can be found in Appendix II. The focus of these interviews was to determine the company specific factors we should be aware of before deciding which model to choose. In addition, we clarified what cost components they wanted to include in the model and for what purposes the model should be developed. Accordingly, we asked what they thought success factor at Tetra Pak might be and what hinders we needed to overcome. Finally, we asked questions that helped us identify the

contextual aspects at Tetra Pak Packaging Solutions. During the initial interviews we identified that purchasing (CC&SPM) as a department was disconnected from Product Development, Production, Transport & Travel and Technical Service to some extent. Thus, a second round of complementary interviews were conducted with employees from other departments in order to obtain the desired data for the construction of a purchasing cost model. The same interview guide as before was used but for each interview, we focused on the specific issues for that certain department. A detailed specification of the participants can be found in Appendix III.

Moreover, workshop 1 (stage two in Figure 8), which is further described in Appendix IV, was held in collaboration with employees. This aimed to set the range of which the purchasing cost model should cover. Also, this workshop in detail determined what cost components to include and thus set the structure of the purchasing cost model. The cost components were segmented into the following:

- Included cost components
- Cost components to include for future development (Not currently available due to lack of available data)
- Cost components which are not suitable for this purchasing cost model

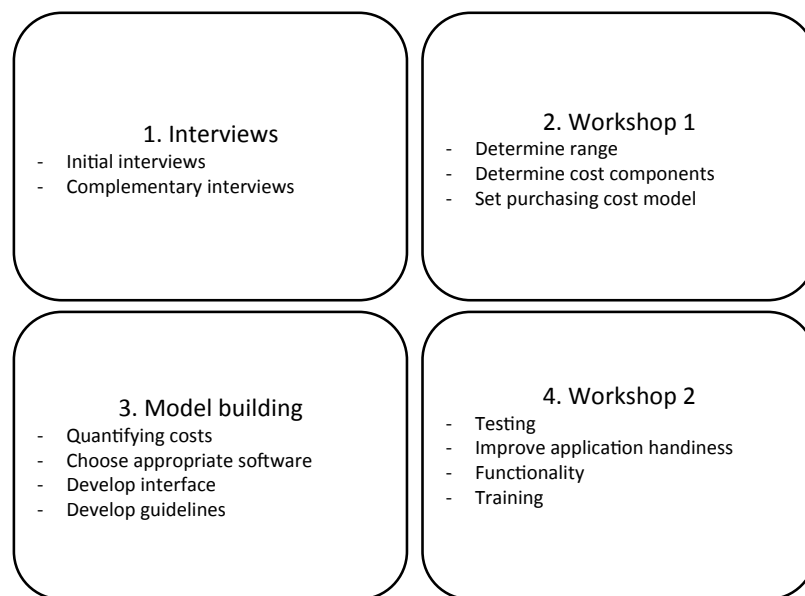


Figure 8 Activities in the constructive process

Since the theoretical framework is one cornerstone of this construction, some cost components did not suit Tetra Pak Packaging Solutions CC&SPM. Therefore, the segmentation above was necessary in order to keep the practical orientation and manage to create a simple and easy to use purchasing cost model.

To proceed, the model building was initiated. This incorporated quantifying the cost components, choosing an appropriate software program in which the purchasing cost model was to be created and also to develop an ‘easy-to-use’ interface. In addition, guidelines and instructions were established to ease the use and reduce the time necessary for calculating the incurred cost of a purchase. The construction ended up with a final workshop (Workshop 2) where the model was tested in terms of the application handiness and its functionality in everyday business. To manage this, a real data set, consisting of a group of products that are currently active at Tetra Pak Packaging

Solutions, was used. Lastly, a final discussion was performed after the construction. Kasanen et al. (1993) advocate that constructions should be applicable in other instances as well. Therefore, the construction at Tetra Pak Packaging Solutions is related back to the empirical study and compared to the previous case companies.

Workshop 2 provided reliability and validity to the construction. In addition, we gave all Supplier Managers the opportunity to test the purchasing cost model with real-life cases and seven persons did this. They then filled out an evaluation sheet (Appendix V), which is based on identified success factors from theory, empirical research and the context at Tetra Pak. The sheet consists of statements which the respondent must grade from one to four, where four is the highest score. The even number is chosen to force the respondent to take a stand and not end up in the middle. Further, along the construction, we have been collaborating with a business controller in order to validate that estimations are managed correctly.

3.3 Research Question

A research question was developed to this master thesis. In addition to this, sub-questions were established to support the overall question (RQ₁). The overall research question is formulated below (RQ₁).

What purchasing cost model is suitable for Tetra Pak Packaging solution
with respect to their corporate environment?

Accordingly, three sub-questions have been determined to provide guidance throughout the research. These are:

RQ₂ – What contextual aspects within the corporate environment affect how companies institutionalise and sustain a purchasing cost model?

RQ₃ – What are the benefits and drawbacks of different purchasing cost models and how are these affecting the company?

RQ₄ – How is the choice of purchasing cost model affected by its application?

The sub-questions support the specific requirements requested by the company and clarify the major components of the overall research question.

3.4 Research Method

As indicated in previous sections, the case study method has been an inspiration throughout phase one in this research. Yin (2014) advocates the use of this method when answering ‘How’ and ‘Why’ questions. Also, the method is useful when investigating social contexts and operational links over time (Yin, 2014). Yin (2014, p. 16) describes the scope as:

“A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident”

The unit of analysis in this research is the purchasing cost model. The objective, independent of case company, was to analyse the contextual environment in relation to

the purchasing cost model. To investigate this in-depth, both the application (Supplier management) and contextual aspects were covered.

To support the construction at Tetra Pak Packaging Solutions and complement the literature review, an interview study was conducted based on five companies. Similar to a multiple case study, having several cases provides better generalizability and prevents misjudging a single event. The interview study aimed to answer research questions RQ₂ to RQ₄.

The denomination ‘multiple case study’ in our research was questioned since the amount of data involved with each case is only based on interviews. This means that a triangulation by using several data sources has not been made. However, the focus was to get input from several cases instead of one, which means that there has been a trade-off between depth of data and the number of cases. Nevertheless, the overall multiple case study method has been used according to Yin (2014) where the cases have been analysed according to case study principles. Thus, we call this an interview study analysed with case study methodology.

The process of this research follows the method (Figure 9) provided by (Yin, 2014; Voss et al., 2002), starting with developing a theoretical reference framework. According to Wacker (1998), the theory should consist of definitions of terms and variables, contextual setting, a set of relationships and predictions. It is of great importance to create a solid theory foundation in order to succeed with the research and especially the data gathering (Voss et al., 2002). In addition, throughout the master thesis, an adaptive approach has been encouraged. On the one hand the design has been outlined in advance to support the realisation. On the other hand, this design has been temporary in the sense that if new procedures show to be more efficient, they have been adopted as Yin (2014) proposes.

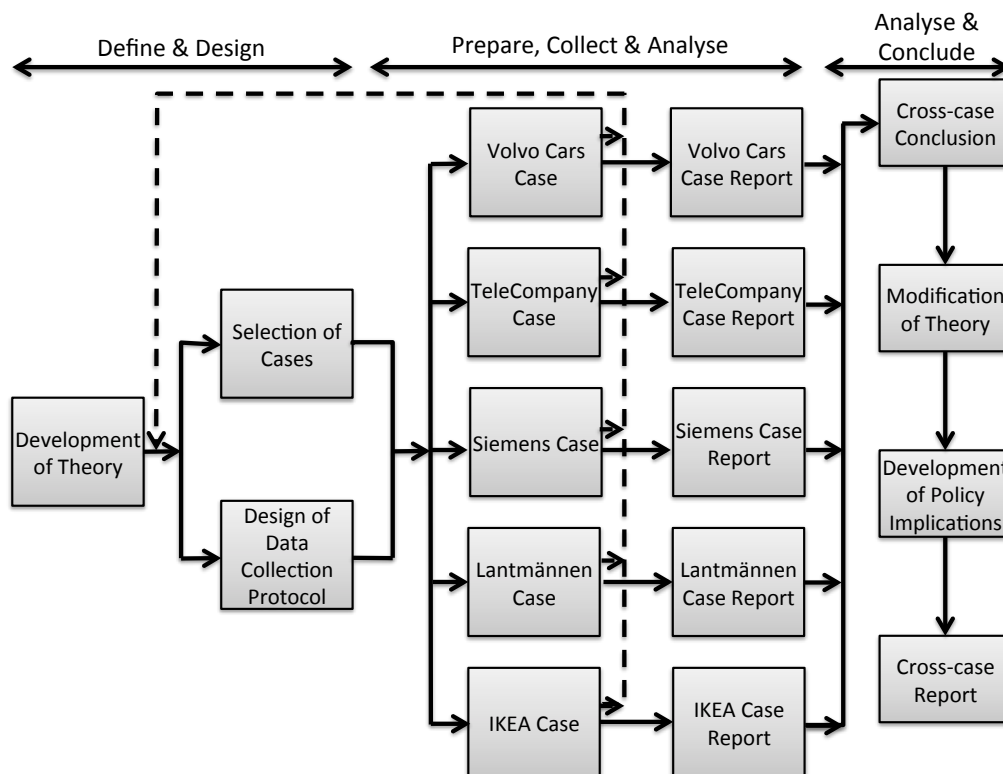


Figure 9 The case study method adopted by Yin (2014)

Yin (2014) stresses the importance of the dotted line in Figure 9 above, which symbolises a feedback loop where important discoveries in later steps are sent back and taken into consideration. This might involve rework where activities such as redesigning of protocols or theory have to be done to fit the cases and the succeeding analysis (Yin, 2014).

3.4.1 Development of Theory

The theoretical framework in this thesis consists of two major parts where the first one covers purchasing and cost management and the other part is more focused on purchasing cost models and their characteristics. For both parts, an initial search for relevant literature was conducted using the journals in Table 1. Naturally the primary focus was put on purchasing literature but due to the nature of some cost models spanning over the whole value chain, logistics journals were included as secondary literature. Also, since cost models are applied in accounting and auditing a third category, Management Accounting Journals, was added to the literature research. Regarding books, we used Purchasing and Supply Chain Management by van Weele, Purchasing and Supply Chain Management by Monczka et al. and Managing the Global Supply Chain as basis since they are considered to be well esteemed within purchasing.

Table 1 Literature Research

Primary literature – Purchasing Journals	<ul style="list-style-type: none"> • European Journal of Purchasing & Supply Management • Journal of Supply Chain Management (former International Journal of Purchasing and Materials Management) • Journal of Purchasing and Materials Management
Secondary literature – Logistics Journals	<ul style="list-style-type: none"> • Journal of Business Logistics • Logistics Information Management
Tertiary literature – Management Accounting Journals	<ul style="list-style-type: none"> • Management Accounting Research • Managerial Auditing Journal • Journal of Management Accounting Research
Books	<ul style="list-style-type: none"> • Purchasing and Supply Chain Management by van Weele • Purchasing and Supply Chain Management by Monczka et al. • Managing the Global Supply Chain by Scharry and Skjott-Larsen

At an initial phase the search phrases were focused on purchasing cost models in general and to not miss anything of relevance search words were altered (Table 2). This meant that, in all searches, both search words referring to the exact name and specific abbreviations (i.e. Total Cost of Ownership and TCO) were used to be sure to cover all titles of interest. Also, different spellings of words were used to make sure that nothing was missed (i.e. life cycle, lifecycle and life-cycle). To find articles of specific interest we also added specific applications to the search terms, for example Landed cost followed by supplier selection, supplier evaluation or supplier development.

Table 2 Search words

Area	Search words
Evolvement of Purchasing	<ul style="list-style-type: none"> • Purchasing evolvement • Purchasing evolution • Purchasing development • Purchasing history
Supplier Management	<ul style="list-style-type: none"> • Supplier management • Supplier selection • Supplier evaluation • Supplier development • Supplier collaboration
Purchasing cost models in general	<ul style="list-style-type: none"> • Cost model • Purchasing cost model • Total cost model • Management accounting • Cost management • Purchasing model • Purchasing decision-making
Specific Purchasing cost models	<ul style="list-style-type: none"> • Total Cost of Ownership • TCO • Activity-based costing • ABC • Landed cost model • Landed cost • Cost-ratio • Cost ratio • Cost ratio analysis • Life-cycle costing (with different spelling of life-cycle) • LCC • Life-time costing • Life-cycle assessment cost model • Cost structure analysis • Should-cost • Target cost • Cost estimation • Design-to-cost • Cost-engineering

The approach to carry out the part Portfolio of Cost models in the theoretical framework begun with reviewing early research by Lisa Ellram and Sue Perrot Siferd, which was published in early 1990s and a recent article by Talluri et al. published in 2013. The literature focuses on Total Cost of Ownership and is the theoretical foundation of later research within the field (Ellram & Siferd, 1993; Talluri et al., 2013). Presented substitutes to TCO was one of the cornerstones to the succeeding research of alternative purchasing cost models.

However, due to the time restrictions of this master thesis, the sample of purchasing cost models is limited. Hence, purchasing cost models of relevance and methods which appear to be appropriate substitutes of TCO have priority. This also meant that purchasing cost models, such as Zero-base pricing and All-in cost, identified in the initial literature search were excluded. A more thorough search indicated that these were only present in a few articles and were therefore assumed to be less common in industry practice as well.

A common categorisation of cost models was found where they separated multi criteria models and purchasing cost models. Given the cost focus in the principal company Tetra Pak's directives in combination with literature discussing the difference and why purchasing cost models are better suited for the three applications supplier selection, evaluation and development (Bhutta & Huq, 2002) the succeeding research focused solely on pure purchasing cost models.

Given the contextual aspects discussed in the literature and how they are related to the different applications of purchasing cost models a research model was developed to facilitate the analysis (Figure 10). For each contextual aspect the occurrence in literature was denoted and illustrated with boxes with a light grey to a dark grey nuance depending on their occurrence.

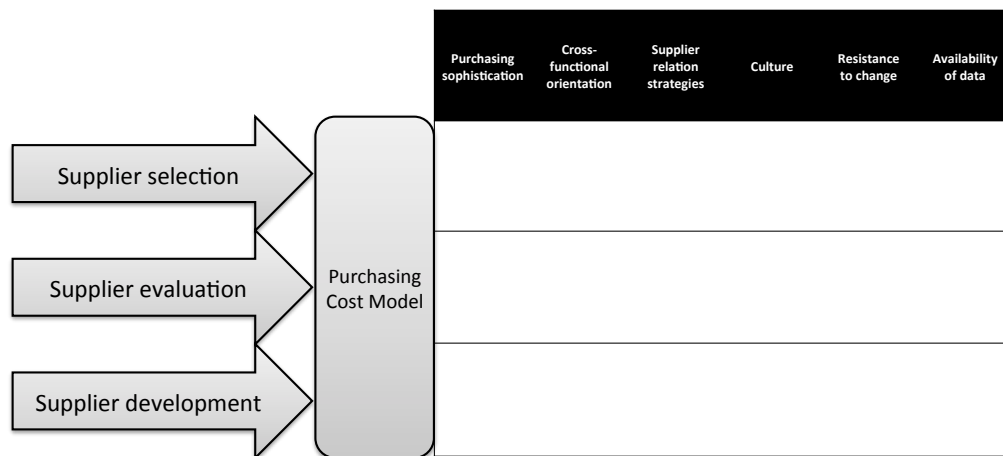


Figure 10 Research model for contextual aspects

3.4.2 Selection of Cases

The objective when selecting case sample was to find five independent companies that have implemented and are working with a purchasing cost model successfully. Voss et al. (2002) suggests that setting boundaries should be the first step in this process. We argue that the companies for this research do not have to come from a specific industry nor a certain geographical location. The key success factor was to find corporations, which have implemented a purchasing cost model based on rational decisions. In relation to the contextual aspect, a diverse set of companies were favourable to investigate. It was of interest to interview people who are not only using the models in their daily work but also have knowledge about the strategic decisions behind the choice of model to implement. In other words, these were defined as the principal informants as Voss et al. (2002) describe it. This formed the focus to initially contact managers at the companies' purchasing departments.

To obtain a good view of which companies that are good at purchasing we researched newspaper articles and conference documentation from ‘Supply Chain Outlook 2014’ and ‘Lönsamma inköpsrelationer 2014’. We were inspired by these and contacted several persons from ‘Lönsamma Inköpsrelationer’ (Conductive, 2014) where purchasing managers from several companies were invited to discuss cost optimised strategies for supplier management. Also relevant companies from ‘Supply Chain Outlook 2014’ (Silf, 2014) were contacted.

The interviewees included in the final interview study are presented in Table 3.

Table 3 Interviewees in interview study

Name	Title	Company
Martin Lidén	Vice President & Head of Car Purchasing	Volvo Cars
Anonymous	Head of Site Products Sourcing	TeleCompany
Micael Hedlund	Global Purchasing Director	Siemens Industrial Turbomachinery AB
Robin Zimmermann	Category Manager Purchasing Pasta & GoGreen	Lantmännen
Mathias Jansson	Deputy Development Manager, IKEA of Sweden	IKEA

Since we only held interviews with managers at the five companies the reliability and wealth of details can be questioned. Of course it would have been better to also include purchasers at lower hierarchical levels but due to time limitation and the fact that the study also focuses on the construction of an actual purchasing cost model we only had time to interview the managers.

3.4.3 Design of Data Collection Protocol

To further incorporate research validity and reliability, a research protocol (Appendix VI) was developed in addition to the interview guide. This protocol describes the activities performed during this research. Further, an interview guide was developed according to what Voss et al. (2002) suggest. It was developed to in a structured way cover the same areas covered in the theoretical framework for the different purchasing cost models. This facilitated the succeeding pattern matching between what the literature proposes and how the models are used in practice in the industry. The areas covered in the questions are summarised below and for a detailed description, see Appendix VII.

- General facts about the purchasing department
- Benefits
- Drawbacks
- Cost components
- Applications
- Contextual aspects
- Success factors
- Miscellaneous

The interview guide was sent to the interviewees in advance to help them prepare. However, alternatives such as a, b, c (Appendix VII) were excluded as these were only supposed to be guidance for us in the actual interview. Also, we did not want to influence the interviewees’ answers.

3.4.4 Conduct Case Studies

All interviews were held over phone using a WebEx telephone conference solution. For all cases we scheduled and conducted a first interview for approximately one hour and when necessary a shorter follow-up interview was held or specific interview questions were sent by e-mail. To validate what was written, relevant parts were sent back to the interviewee for a final check and approval. Feedback and comments were then taken into consideration for the final report.

For each of the areas covered in the interviews, we utilised the Funnel model suggested by Voss et al. (2002). The model implies that open-ended questions are used in the beginning of an interview, followed by questions of a more specific nature (Voss et al., 2002). Due to the nature of our interviews where we wanted to cover area for area separated, this was however not used for the interview as a whole but more for the specific areas. All questions were asked open-endedly but when needed we had to elaborate with the more specific questions with alternatives a, b, c etcetera.

All interviews were recorded and we had one designated secretary who took notes while the other one lead the questioning. For all questions, the secretary noted the time as they were asked so that we for uncertainties easily could track specific questions from the recording and listen to the answers again. Directly after each interview we summarised and discussed all notes.

3.4.5 Analysis

The aim was to obtain convergence in the information collected throughout the study. Consequently, the use of different types of purchasing cost models can be related to the purpose they aim to fulfil or related to the contextual setting they operate within. This generates knowledge, which also is generalizable even though the contextual interrelation is unique and situation-dependent.

There are different strategies to use when conceptualising the data. Yin (2014) presents different strategies, which can be utilized to provide a structured approach. Either you can rely on your already stated theoretical proposition and use these priorities when commencing the analysis (Yin, 2014). In contrast, you may perform “ground up” analysis where you start with the very first layer of data (Yin, 2014). Given the time limitations of this research, keeping to the already stated proposition was assumed to yield time-savings. This might have been in the expense of innovative findings, which is a risk we could not mitigate but accept.

Yin (2014) suggests five analytical techniques:

- Pattern matching
- Explanation building
- Time-Series analysis
- Logic models
- Cross-case analysis

The analysis of the interview study was conducted in two separate steps, a pattern matching with theory and a cross-case analysis between the case sample.

3.4.5.1 *Pattern Matching with Theory*

After each interview the summarised answers were compared to what the theory suggests and patterns were identified. If the company for example uses a Landed cost model, their

answers within the areas of benefits, drawbacks, cost components, application, contextual aspects and success factors were compared with the corresponding area in the theoretical framework.

3.4.5.2 Cross-case Analysis

The cross-case analysis can be managed differently. Either cases can be compared two-by-two or through a spreadsheet analysis covering all cases with their individual characteristics (Voss et al., 2002). Yin (2014) also discusses this topic and recommend to use supporting tools. However, the output is not judged in terms of quantitative measures but rather to identifying meaningful patterns. To gain the desired information from the comparison and due to relatively few case companies a spreadsheet analysis has been used.

To gain the desired information from the interview study, the cross-case analysis was applied as indicated in previous section. The aggregation provides the foundation for identifying cross-case patterns.

3.4.5.3 Explanation Building

Yin (2014) recommends a second analytic technique, which he describes as a special type of pattern matching called explanation building. To us, the comparison with theory together with the cross-case analysis provided an aggregation that helped the explanation building where interdependencies were identified. Here, the research model was used to identify gaps between theory and practice and an explanation was developed by investigating patterns between the different cases and their correlation with theory.

3.5 Reliability and Validity

It is particularly important to pay attention to reliability and validity when dealing with case study research (Voss et al., 2002). Yin (2014) suggests four tests, which are common to use when establishing quality of the empirical research. These are:

- Construct validity
- Internal validity
- External validity
- Reliability

3.5.1 Construct Validity

Construct validity describes if a research develop sufficient operational measures in relation to their research area (Yin, 2014). These measures are translated into corporate culture, purchasing sophistication, resistance to change, supplier relation strategies and cross-functional orientation in our study. These aspects are already discussed in research today, some of them explicitly and some mentioned in short. Ellram (1993) discusses the organisational characteristics affecting the success of implementing TCO as one example. To enhance construction of validity, multiple sources of evidence and chain of evidence are used (Yin, 2014).

3.5.2 Internal Validity

Internal validity is closely related to exploratory studies (Yin, 2014). It describes to what extent causal relationships can be established (Voss et al., 2002). In other words, causal relationship describes what conditions that interfered when event X led to event Y (Yin, 2014). Issues might occur when inference is present and events cannot be observed (Yin, 2014). Hence, the researcher has to determine the underlying factors based on interviews (Yin, 2014). This could have been a potential issue for the research and was therefore

mitigated. Internal validity was enhanced through pattern matching and in this case the interview structure of informants from different departments addressed the issue.

3.5.3 External Validity

External validity addresses whether the outcomes can be generalised or not (Yin, 2014). For case studies, statistical generalisation is not appropriate (Yin, 2014). However external validity could be enhanced when using replications in multiple case studies (Yin, 2014). As discussed before, this is one of the major drivers to why phase one in this study was conducted.

3.5.4 Reliability

Reliability describes whether a research can be repeated correctly (Voss et al., 2002). By using a research protocol and developing a case study database, the reliability has been enhanced (Yin, 2014). This case study has a research protocol including the interview guide and procedures necessary to repeat the study. Also, the dimension of developing and testing a purchasing cost model at Tetra Pak Packaging Solutions contributes to the overall reliability of this research.

3.5.5 How to Operationalise Validity and Reliability

Activities that enhance our research quality in this master thesis are presented in Table 4 below. These were carried out along the research.

Table 4 Quality of Research (Activities to be performed)

Quality of Research	Activities
Construct validity	<ul style="list-style-type: none"> • Multiple sources of evidence • Literature review • Develop research protocol • Clear operational measures
Internal validity	<ul style="list-style-type: none"> • Pattern matching • Interviews throughout the organisational • Benchmarking through interview study
External validity	<ul style="list-style-type: none"> • Generalizability through evidence from interview study
Reliability	<ul style="list-style-type: none"> • Research protocol & Interview guide • Develop a database • Testing of the purchasing cost model • Comparing result to already presented literature within the field

3.6 Information Bias

Throughout this research, the bias related to information gathering has been a central issue. The mitigation of such aspects has been highlighted from the very beginning. To start with, Tetra Pak Packaging Solutions requested a well-functioning TCO-tool in an initial stage. However, there was evidence pointing towards a potential misalignment. As a result, the research did not presume such a model but rather exploring the available purchasing cost models in literature as well as in practice.

4 Theoretical Framework

This chapter starts with an in-depth description of theoretical framework due to the extensiveness of the information provided. This section presents the sequence of theory as it will be presented. Also, it composes a description and motivation to how the purchasing cost models are described. After, purchasing and cost management are described followed by the theory of supplier management. Next, the purchasing cost model focus is described as well as the contextual aspects affecting the models. Thereafter the portfolio of purchasing cost models is presented which is later synthesised in the end of this chapter.

4.1 Outline of Chapter

As described above, an outline of this chapter is visualised in Figure 11. Due to the comprehensiveness of this theoretical framework, a detailed description of the content is presented initially. Also, the chapter is finalised by addressing a synthesis consisting of a summary of the purchasing cost models, a mapping of the models, general criteria of a purchasing cost model, a research model and also some issues to highlight.

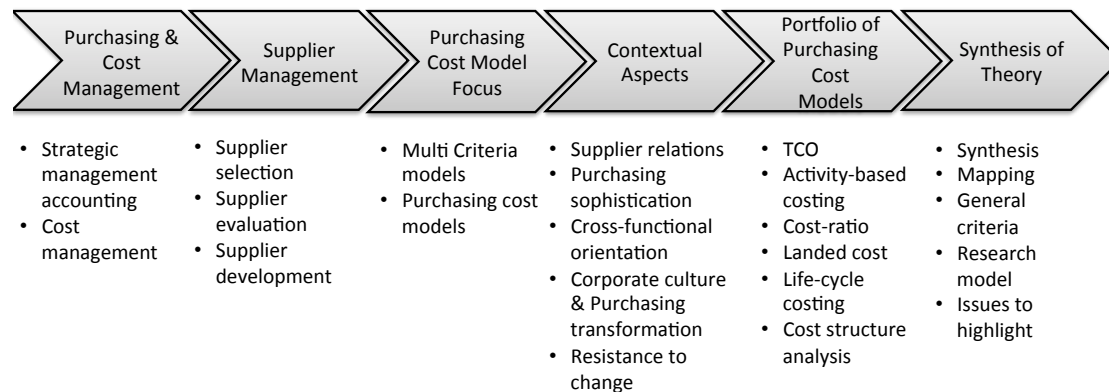


Figure 11 Outline of theory chapter

Moreover, this chapter presents the most frequent purchasing cost models to generate a holistic view of the field as it is described in academic research. As the company initially requested a Total Cost of Ownership (TCO) model, this was the starting point of the review. Subsequently, additional purchasing cost models are presented. The selection of models is based on the frequency of appearance in related academic research. For each of the reviewed purchasing cost models, several dimensions have been described to enhance the understanding of both characteristics and application. These dimensions are described below.

- General
- Cost components
- Benefits
- Drawbacks & barriers
- Application
- Success factors
- Contextual aspects

The richness of data and available research in each dimension varies among the different purchasing cost models. After reviewing the purchasing cost models, a synthesis of the

data is performed in order to visualise the differences and similarities as well as the absence of available information. When needed, there is also a short bullet point summary after each dimension to give the reader a better view of the most important aspects. This information is later summarized in a table in the end of each purchasing cost model.

4.2 Purchasing & Cost Management

To better deal with the cost reduction objectives within a company, the field of strategic management accounting and cost management can be utilized. Wagner (2008, p. 297) describes this as follows:

“Strategic management accounting and cost management practices are concerned with the provision, analysis and use of information in order to assist managers in decision making and managerial control”

This approach aims to fulfil the organisation’s goals, such as boosting profit by lowering costs (Wagner, 2008; Axelsson et al., 2002). Further, successful companies within this area have broadened the scope to not only incorporate the organisation itself but rather the external supply chain (Wagner, 2008). Monczka et al. (2009) also discuss the importance of strategic cost management. They emphasise that an understanding of price analysis, cost analysis and total cost analysis is necessary in order to perform well (Monczka et al., 2009). As illustrated in Figure 12, strategic cost management focus on the cost reductions within the supply chain, which a company operates in. Monczka et al. (2009) further stress the importance of incorporating the purchasing department early in the sourcing process. In this setting, the potential cost reduction are easier to attain. In addition, the approach of strategic cost management can influence and foster a certain type of behaviour within the organisation that can be beneficial (Axelsson et al., 2002, Wagner, 2008).

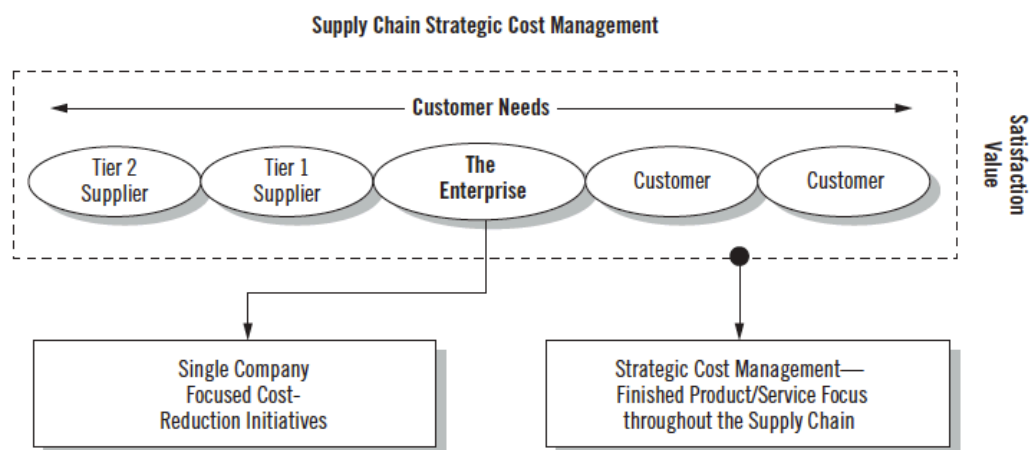


Figure 12 Visualisation of Strategic Cost Management adopted by Monczka et al. (2009)

4.3 Supplier Management

Supplier selection, evaluation and development have become more critical to the purchasing function in order to sustain healthy relations towards the supplier base. According to Ghodspur and O’Brien (2001) and Chen et al. (2006) supplier selection is essential and contributes to reduce the purchasing cost and improves the competitive advantage to a company. Also, Cebi and Bayraktar (2003) advocate that supplier

management is a central area and when assessing this, both tangible and intangible factors must be taken into account. Further, Liker and Choi (2004) discuss the importance of managing supplier development. They stress that understanding the suppliers, supervise and assess them as well as sharing central information will result in positive effects when considering cost reductions (Liker & Choi, 2004). Krause and Ellram (1997) discuss the importance of supplier development due to the trend of outsourcing nowadays. They identify critical elements that should be taken into account. These are two-way communication, top management involvement and cross-functional teams (Krause & Ellram, 1997). A purchasing cost model could facilitate these aspects by providing essential information between the two parties.

4.3.1 Supplier Selection

After a definition of requirements and specification, a market research is established to enable the supplier selection (van Weele, 2010). According to van Weele (2010) supplier selection requires cross-functional orientation. Functions such as purchasing, quality, production and production planning should be integrated to sufficiently manage the activity. From this stage, a limited number of suppliers should be qualified for further negotiations. In detail, one must first determine the method of subcontracting. Either turnkey subcontracting or partial subcontracting can be applied (van Weele, 2010). Secondly, the purchasing department should set preliminary qualification and establish the 'bidders list'. Thirdly, a request for quotation has to be developed and later an analysis of the RFQs from each supplier must be performed (van Weele, 2010).

4.3.2 Supplier Evaluation

When assessing suppliers, van Weele (2010) suggests 4 levels of investigation. These are presented below.

- Product level
- Process level
- Quality assurance system level
- Company level

However, van Weele (2010) stresses that most supplier evaluations are limited to the first two levels. There are several methods to use when assessing the performance of suppliers. Qualitative assessment, vendor rating, supplier audit and cost modelling are some of the available methods presented by van Weele (2010). Vendor rating is a method, which mainly focus on quantitative aspects to assess current suppliers whereas supplier audit aims to assess both new and current suppliers in a qualitative manner (van Weele, 2010). Also, vendor rating is a method that is computerised and performed in-house (van Weele, 2010). In contrast, supplier audits are performed in collaboration with the suppliers and requires field studies (van Weele, 2010).

4.3.3 Supplier Development

Companies are today relying on their suppliers to contribute with cost reductions, improved quality and co-developing of processes in order to reduce lead-time among others (Liker & Choi, 2004; van Weele, 2010). Liker and Choi (2004) suggests a six-step model (Figure 13), which has been used by both Honda and Toyota, two companies

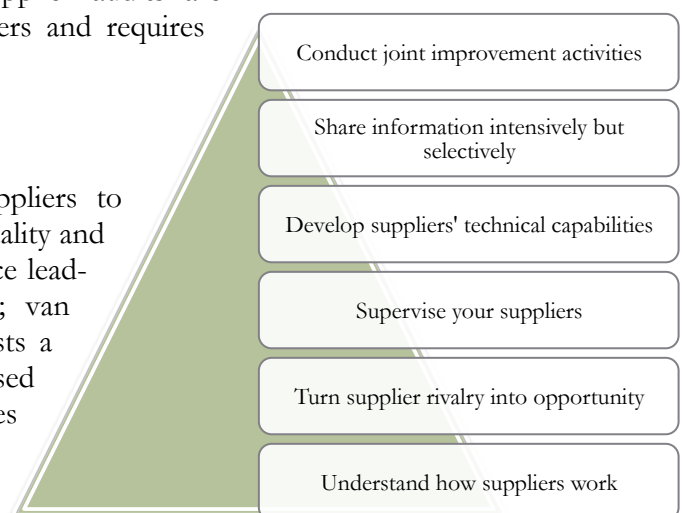


Figure 13 Six-step model for Supplier development adopted from Liker and Choi (2004)

which are considered to have favourable supplier relations. According to Liker and Choi (2004), it is required to understand your supplier in order to develop the relationship. Managers at all levels should have a sufficient understand of their suppliers. Instead of applying competitive bidding among suppliers, the purchasing department should emphasise opportunity meaning that suppliers, which are performing well will get the opportunity to supply in the future. However, if the performance slips, a new supplier will be chosen. This strategy will enhance the trust but also spark the competition between suppliers. Further, supervision among suppliers is critical (Liker & Choi, 2004). By frequently sharing reports, both the supplier and the vendor will be aware of the current situation. When proceeding in this model, developing the suppliers' technical capabilities becomes central (Liker & Choi, 2004). When engaging in collaboration, benefits can be attained such as reduced time to market, reduced development cost and increased quality (van Weele, 2010). The monetary benefits of co-development will exceed the administrative cost of engaging in collaboration. Also, by sharing information, the suppliers' understanding and contribution can be improved. However, the information provided should be carefully selected in order to provide structure (Liker & Choi, 2004). The final stage, conducting joint improvement activities, will enhance the performed output by exchanging best-practices.

4.4 Purchasing Cost Model Focus

Finding the appropriate purchasing cost model to enable efficient decision-making and thereby lowering costs is difficult. There are multiple models described in literature. Academic research mostly favours multi-criteria models such as Analytic Hierarchy Process (AHP) and Multiple Criteria Decision-making (MCDM) when considering supplier selection (Chen et al., 2006; Cebi & Bayraktar, 2003; Ghodspur & O'Brien, 2001). However, in this study Strategic management accounting and cost management practices will be analysed with the objective to facilitate the issues described previously. These models are mainly focused on targeting the actual cost incurred when executing a purchase. This is beneficial when not only considering supplier selection but also supplier development and evaluation to support future decision-making and strategies. Bhutta and Huq (2002) clearly state the difference between using a purchasing cost model such as TCO compared to a multi criteria model like AHP. The TCO model is beneficial when the company wishes to use a consistent model both for supplier selection and supplier evaluation (Bhutta & Huq, 2002). Also, TCO puts emphasis on targeting the costs at the expense of missing "soft values" and therefore it is better suited for situations where costs is of high priority (Bhutta & Huq, 2002). However, this is what Tetra Pak Packaging Solutions specifically has requested. Lastly, TCO helps to clarify suppliers' performance, which makes it a good basis for negotiation and supplier development (Bhutta & Huq, 2002). This is also an objective set by the principal company. For a detailed comparison, see Table 5.

Table 5 Comparison of multi-criteria model and TCO, data gathered from (Bhutta & Huq, 2002; Nydick & Hill, 1992; Ellram & Siferd (1993))

Dimensions	Analytic Hierarchy Process	Total Cost of Ownership
Decision-making situation	<ul style="list-style-type: none"> • Prioritising decision when having intangible and qualitative factors • Mostly used for supplier selection 	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Supplier development
Advantages	<ul style="list-style-type: none"> • Incorporating qualitative aspects into a quantitative decision model • Using pair-wise comparison 	<ul style="list-style-type: none"> • Provides a clear quantitative evaluation and selection rule • Change of focus from price to total cost which enables identifying “hidden” costs
Disadvantages	<ul style="list-style-type: none"> • Requires intense management involvement • Forces trade-offs 	<ul style="list-style-type: none"> • Complex • Requires extensive tracking and maintenance of cost data • Requires cultural change • Often situation specific
Application	<ul style="list-style-type: none"> • Multiple goal conflict • Supplier selection based on numerous factors • When price alone is not the determining factor 	<ul style="list-style-type: none"> • Supplier selection and supplier evaluation when cost is of high importance

Within strategic management accounting and cost management, there are some tools, which specifically target to enhance information for decision-making (Axelsson et al., 2002). Both Axelsson et al. (2002) and Wagner (2008) suggests Activity-based costing and Total Cost of Ownership (TCO) among other methods. Ellram (1995) also discusses different tools in parallel with TCO such as Cost-ratio and Life-cycle costing. There is a common denominator for these models, they aim to quantify costs in order to provide evidence for decision-making. These methods will later be investigated to find their characteristics and contextual fit. De Boer et al. (2001) stresses the lack of academic research performed to analyse the contextual fit for methods used to facilitate decision-making. Also, Wagner (2008) advocates that this field is still immature and further research is needed. In addition, practitioners seem to find the methods difficult to apply in practice, either because they are overly theoretic or because they do not take into account the industry characteristics (Wagner, 2008). In addition, Young et al. (2009) indicate that models often fail because they are time-consuming where decisions are made before the data is collected and analysed.

4.5 Contextual Aspects

There are further dimensions affecting the purchasing department’s procedures within a company that induce complexity to this field (De Boer et al., 2001). Some aspects have already been highlighted in academic research such as cultural context by Ellram (1993). Also, Young et al. (2009) have raised the issue of purchasing sophistication and also cross-functional orientation when discussing the contextual concerns of purchasing cost models. However, these discussions are rather scattered in research and only covered by some authors regarding few purchasing cost models. In the section below, these aspects

are further described together with dimensions that are strongly related to this field and most likely will affect the implementation of purchasing cost models (Purchasing transformation, supplier relations and resistance to change).

4.5.1 Purchasing Sophistication

The degree of purchasing sophistication will impact cost management. According to van Weele (2010), purchasing sophistication describes how far the purchasing department has come in the development. Key aspects such as degree of cross-functional orientation, centralisation and focus areas beyond the price determine degree of purchasing sophistication (van Weele, 2010). Consequently, this becomes important in strategic management accounting and cost management due to the present recognition that purchasing is important. The more central purchasing is to the core business, the more likely it is to be well developed and have sufficient resources available.

To generalise, companies can be positioned in Figure 14. The framework, provided by van Weele (2010) illustrates dimension, which simplifies the differentiation of companies' purchasing function. As seen in Figure 14, the TCO concept is first introduced in stage 4, internal integration, which requires centralisation and cross-functional orientation to a certain extent. The further companies move to the right in this model, the greater the recognition is of cross-functional and cross-organisational orientation. In addition, centralisation also enables purchasing sophistication and development.

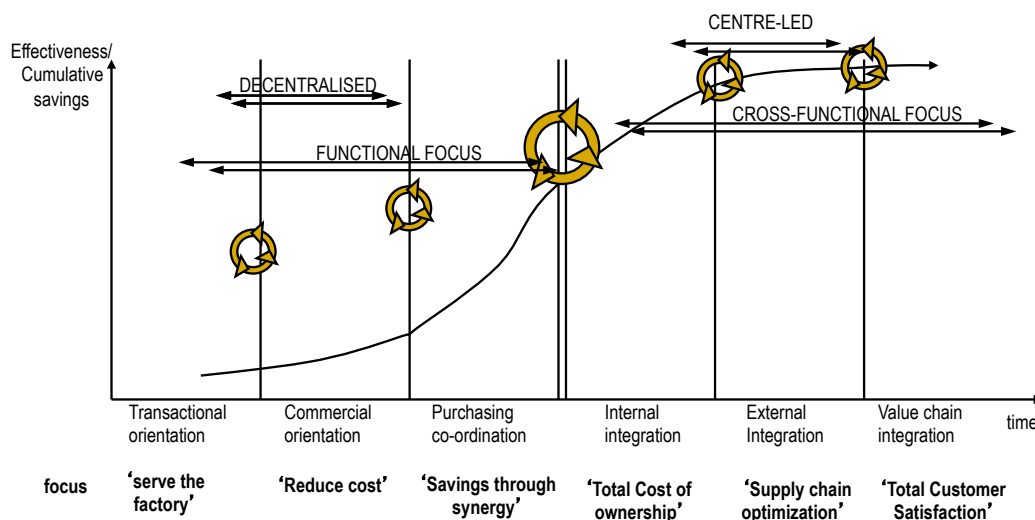


Figure 14 Purchasing development model adopted from van Weele (2010)

4.5.2 Cross-functional Orientation

Young et al. (2009) discuss the importance of having a cross-functional orientation within purchasing departments in order to facilitate efficient decision-making. Van Weele (2010) also elaborates regarding the importance of having a cross-functional mindset. The further a purchasing department has come in the evolvment, the more emphasis is put on having a cross-functional orientation (van Weele, 2010). This aspect is also related to purchasing cost models in the sense that information must be gathered from several departments in order to cover the critical costs.

4.5.3 Corporate Culture & Purchasing Transformation

The culture within a company was identified to impact the implementation of cost management tools according to Ellram (1993). Gardner (2002) presents several aspects to take into account when managing process improvements. It is highly important to

recognise that sustained improvements must be developed from within. Hence, identification of the need, the transformation and the institutionalising must be carried out internally by people who have understood the essence of the change (Gardner, 2002). Also, there is no “off-the-shelf solution” that fits every situation with its unique context. On the contrary, one must understand the underlying foundation and consequently develop a model based on the contextual prerequisites (Gardner, 2002). Parikh and Joshi (2005) also advocate that culture could potentially hinder purchasing transformation. These internal obstacles can occur when transformations generate new responsibilities and authorities (Parikh & Joshi, 2005). To cope with these difficulties both Parikh and Joshi (2005) and Kotter (1995) suggest different areas to closely consider when performing a transformation. Kotter (1995) presents eight steps for transformation, these are:

1. Establishing a sense of urgency
2. Forming a powerful guiding coalition
3. Creating a vision
4. Communicate the vision
5. Empowering others to act on the vision
6. Planning for and creating short-term wins
7. Consolidating improvements and producing still more change
8. Institutionalise new approaches

Parikh and Joshi (2005) identified some of these steps in their purchasing transformation where enabling understanding among employees, creating a coalition of users, near-term and overall objectives and creating incentives in the new procedures were used to mitigate the common errors of transformation.

4.5.4 Resistance to Change

Parikh and Joshi (2005) also mention the phenomenon of resistance to change. Individuals always evaluate changes to assess if they are favourable to them (Parikh & Joshi, 2005). If they are considered not to be beneficial, they will consequently be resisted. By incorporating incentives and a “win-win” perception for participants, the resistance to change can be mitigated (Parikh & Joshi, 2005).

4.5.5 Supplier Relation Strategy

The type of supplier relations that are carried out in a company, will determine to what extent mutually cost reductions are considered (van Weele, 2010) and thereby influence the choice of purchasing cost model (De Boer et al., 2001). According to Liker and Choi (2004) there are major positive effects when engaging in deeper supplier relationships and collaboration. However, this also requires that activities and tools are used to understand, supervise, measure and improve suppliers within your supplier base (Liker & Choi, 2004). Throughout history, these types of relationships have proven to be beneficial in relation to competitive bidding in the sense of increased quality, reduced cost and reduced lead-time among other aspects (van Weele, 2010; Liker & Choi, 2004). The task of managing a purchasing cost model will most likely be easier if the company are engaging in deeper supplier relations and also carries out supplier development due to greater understanding of external cost and how these affect their own business.

4.6 Portfolio of Purchasing Cost Models

4.6.1 Activity-based Costing

4.6.1.1 General

Activity-based costing (ABC) is a model that identifies the cost of activities related to the construction of products in order to provide a more accurate cost structure compared to traditional cost models (Turney, 1989). Overhead or indirect cost embodies activities and acquired resources that cannot be directly tied to a product or a product lines (Innes & Mitchell, 1990). Traditional models were designed when manufacturing was less automated and direct cost was the dominating cost driver (Roodhooft & Konings, 1996). In previous models, overhead rates were used to attach the indirect costs to the products or production lines (Innes & Mitchell, 1990). This typically resulted in distributing overhead costs based on direct labour, which generally is volume driven (Innes & Mitchell, 1990). ABC can be seen as a prerequisite to Total Cost of Ownership since TCO uses activities to determine the total incurred cost (Ellram & Siferd, 1993).

ABC emerged due to the fact that not all overhead costs follow the proportion of product volume and thus the old models can be seen as insufficient and out-dated (Innes & Mitchell, 1990). Supporting activities related to the acquisition, production and delivery of a product should be considered product costs and consequently overhead activities that need to be traced to a certain product (Cooper & Kaplan, 1988). By addressing overhead costs to products through the use of certain cost drivers, a more realistic distribution of costs can be attained (Innes & Mitchell, 1990). A conceptualisation of the basics of ABC is presented in Figure 15. In Figure 15 overhead costs are divided into Activity-based cost pools, which are a set of costs related to a specific task. The cost pools are later distributed to product lines by using an appropriate cost driver.

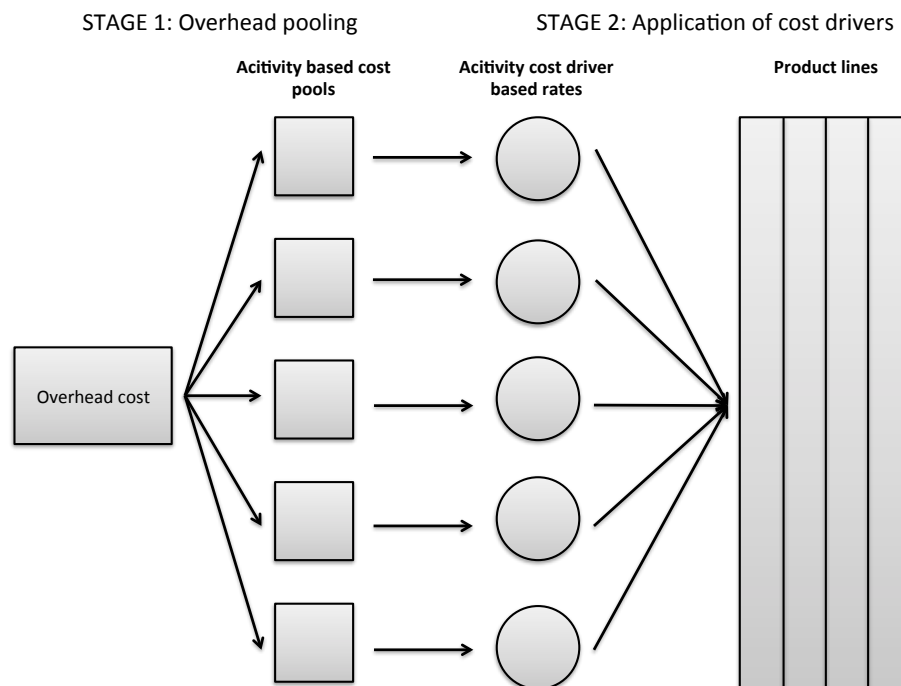


Figure 15 Activity-based costing model adopted from Innes and Mitchell (1990)

Kaplan and Anderson (2003) discuss a development of the traditional ABC, which they named Time-Driven Activity-based costing. It is said to be a less complex model with only two parameters. First, the unit cost needs to be defined. This cost should be stated as a cost per time unit and is consequently the activity cost driver for an activity (Kaplan & Anderson, 2003). Later, this cost is multiplied by the second parameter, the unit time (Kaplan & Anderson, 2003). This parameter describes the time required to perform a transactional activity (Kaplan & Anderson, 2003). In other words, by estimating the cost per time unit and observing the time required, overhead costs can be distributed to products accordingly.

4.6.1.2 Cost Components

The discussion of cost components in ABC naturally translates into cost driving activities. Turney (1989) includes all activities related to the purchase such as establishing supplier relations, the actual purchasing activities, receiving and disbursing goods, redesigning products and taking a customer order.

Innes and Mitchell (1990) mention four categories of overhead costs, logistical transactions, balancing transactions, quality transactions and change transactions. Logistical transactions incorporate order handling, receiving and shipping of goods among others (Innes & Mitchell, 1990). Balancing transactions concerns all work related to matching supply and demand in purchasing and production (Innes & Mitchell, 1990). Further, Innes and Mitchell (1990) discuss quality transactions and the cost related to these aspects. Lastly, change transactions relates to activities such as updating manufacturing information according to changes in schedules, specifications and bills of material (Innes & Mitchell, 1990).

4.6.1.2.1 Cost Components

- Sourcing
- Purchasing/ordering
- Receiving
- Distribution
- Redesigning

4.6.1.3 Benefits

Roodhooft and Konings (1996) mention several benefits when using ABC for selection and evaluation of suppliers. They discuss benefits on both the supplier and the customer side but also inter-organisational benefits such as shared incentives for developing cost management systems and an improved over-all relationship (Roodhooft and Konings, 1996). On the supplier side of the relationship, ABC provides a better understanding and an objective view of the customer's satisfaction (Roodhooft & Konings, 1996). Also, by evaluating the customer's feedback, the supplier can adjust its strategy to better fit customer expectations (Roodhooft & Konings, 1996).

For the purchasing company, ABC can be advantageous since it identifies internal cost drivers or problems caused by the supplier (Roodhooft & Konings, 1996). Further, ABC helps to identify major and minor cost drivers, which is a good basis for resource allocation (Roodhooft & Konings, 1996). Comparing absolute cost figures might lead to a redesigned strategy with focal point on improving efficiency through reduction or elimination of activities involved with the largest cost drivers (Roodhooft & Konings, 1996).

Axelsson et al. (2002) describe ABC as an accurate way of assigning indirect costs to activities and products. Consequently the cause-and-effect relationship becomes more observable, which is a good source of information for inter-organisational decisions (Axelsson et al., 2002).

Cohen et al. (2005) have gathered benefits perceived by companies that have implemented ABC. In addition to the benefits mentioned above, they conclude that ABC can provide information for improved performance measures (Cohen et al., 2005).

4.6.1.3.1 Benefits

- Improved buyer-seller relationship
- Objective view of customer satisfaction
- Identification of cost drivers and problems
- Good information base for inter-organisational decisions
- Improved performance measures

4.6.1.4 Drawbacks & Barriers

Companies that have implemented ABC in the study of Cohen et al. (2005) have not experienced any severe problems. However, another study indicates that companies might face problems when managing the implementation of Activity-based costing (Clarke et al., 1997). It is evident that difficulties regarding identification and selection of the right cost drivers might occur and companies claim that they lack sufficient computer software to managing this (Clarke et al., 1997). Further issues might be reluctance in organisations and lack of management commitment since many companies claim that they already have their overhead costs under control, which Clarke et al. (1997) question.

Innes and Mitchell (1990) list some procedural problems involved with ABC that can affect the information created. Among these, they stress difficulties with overhead costs related to more than one cost pool and the selection of cost drivers to describe the behaviour of a cost pool (Innes & Mitchell, 1990). To clarify, an activity cost pool is an aggregate of all costs required to perform a certain task. Also, the availability of cost driving activities that are quantitatively measurable can be an issue (Innes & Mitchell, 1990). Lastly, it can be difficult to measure top managerial involvement with a certain product and goodwill repayment (Innes & Mitchell, 1990).

4.6.1.4.1 Drawbacks & Barriers

- Demands sufficient computer software
- Organisational reluctance
- Difficulties with identifying and allocate overhead
- Hard to quantify qualitative cost drivers

4.6.1.5 Application

Innes and Mitchel (1995) performed a survey of the largest companies in the UK. They attained 251 respondents who described to what purpose they used ABC classification. Accordingly, ABC can be of use in stock valuation for financial reporting and in identifying non-normal period costs (Innes & Mitchell, 1995). Many companies implement ABC to get a better foundation for the pricing of their product and services (Innes & Mitchell, 1990; Innes & Mitchell, 1995). Further, the ABC adopters consider the model's output of cost figures as good input for managerial decisions due to the gained knowledge (Innes & Mitchell, 1995). ABC can also have an impact on the design

of new products or services since the model shows what product- or service characteristics are cost effective and which are not (Innes & Mitchell, 1995).

Roodhooft and Konings (1996) indicate also that ABC can be of great use when applied in supplier selection and supplier evaluation. In supplier selection, ABC provides decision data beyond the invoice cost (Roodhooft & Konings, 1996). It considers activities related to quality issues, delivery and service problems (Roodhooft & Konings, 1996). The choice of supplier is consequently determined by the overall cost rather than the contractual price (Roodhooft & Konings, 1996).

Further, as a supplier evaluation tool, ABC can be used to compare the budgeted costs to the actual costs occurred after delivery (Roodhooft & Konings, 1996). In the evaluation process, ABC also assists to identify critical activities to improve. (Roodhooft & Konings, 1996).

4.6.1.5.1 Application

- Pricing
- Input for decisions
- Product design
- Supplier selection
- Supplier evaluation
- Supplier development

4.6.1.6 *Success Factors*

Cooper and Kaplan (1988) discuss how to design a successful Activity-based cost system. First, a good basis is to gather data on direct labour and material costs followed by data on indirect resources and to which extent they affect particular products (Cooper & Kaplan, 1988). In this process, Cooper and Kaplan (1988) suggest three rules for decision making. The first rule is to focus on expensive resources, which means resources where ABC can potentially generate the largest impact (Cooper & Kaplan, 1988). The second rule is that one should look for diversity and focus on highlighting resources where consumption varies between products (Cooper & Kaplan, 1988). The third rule, which also relates to diversity, is to look at resources where the demand pattern differs from traditional allocation measures (Cooper & Kaplan, 1988).

Further, Cooper and Kaplan (1988) suggest that the key to success is to find the areas that are likely to grow when the company expands its product, line and process diversification. When quantifying costs, Cooper and Kaplan (1988) recommend realising good estimates rather than putting too much effort into collecting exact numbers.

4.6.1.6.1 Success Factors

- Focus on expensive resources
- Find diversity
- Identify differences in demand patterns
- Estimations rather than exact numbers

4.6.1.7 *Contextual Aspects*

Innes and Mitchell (1995) indicate that companies who have tried but not fully managed to implement ABC often struggle with reluctance to change in the organisation and

company constraints that limit the ability to manage change. Companies that reject ABC often refer to the amount of resources needed for the implementation and to manage such a system (Innes & Mitchell, 1995).

Anderson and Young (1999) also discuss individual contextual aspects, which refer to how individuals react to and affect an ABC implementation. They highlight factors such as the individual's belief in change, its commitment to the company and the knowledge of production processes (Anderson & Young, 1999).

4.6.1.8 Summarising Table

Table 6 Summary of Activity-based Costing

Cost components	Benefits	Drawbacks & barriers	Applications	Success factors	Contextual aspects
<ul style="list-style-type: none"> • Sourcing • Purchasing & ordering • Receiving • Distribution • Redesigning 	<ul style="list-style-type: none"> • Improved relationships • Objective view • Identifies cost drivers and problems • Good information base for decisions • Improved performance measures 	<ul style="list-style-type: none"> • Demands sufficient computer software • Organisational reluctance • Hard to allocate overhead • Quantifying qualitative cost drivers 	<ul style="list-style-type: none"> • Pricing • Input for decisions • Product design • Supplier selection • Supplier evaluation • Supplier development 	<ul style="list-style-type: none"> • Focus on expensive resources • Find diversity • Identify differences in demand patterns • Estimations rather than exact numbers 	<ul style="list-style-type: none"> • Organisational reluctance • Individual factors

4.6.2 Total Cost of Ownership

4.6.2.1 General

Ellram and Siferd (1998) discuss Total Cost of Ownership (TCO) and why it became a more commonly used model for strategic purchasing and cost management. Since TCO incorporates a broad range of aspects concerning purchasing decisions and the implication of the company's cost structure, the model is regarded to be superior (Ellram & Siferd, 1998). Ellram and Siferd define the model as an inclusion of all costs associated with the acquisition, use, and maintenance of a product over its life-cycle (Ellram & Siferd, 1993). This has been aggregated in Figure 16, which describes all activities contributing to the Total Cost of Ownership (Ellram & Siferd, 1993). These are cost driving activities lumped together in categories that better describe the costs associated with purchasing (Ellram & Siferd, 1993). There is a strong connection to Activity-based costing (ABC) since TCO uses cost-driving activities to determine the total cost (Ellram & Siferd, 1993).



Figure 16 Cost driving activities within TCO adopted from Ellram and Siferd (1993)

4.6.2.2 Cost Components

In Ferrin and Plank's (2003) exploratory survey study, the respondents replied to open-ended questions regarding the cost-drivers identified in their TCO work. These cost drivers were later categorised in terms of quantitative or qualitative nature (Ferrin & Plank, 2003).

The first category is Operations cost, which mainly includes cost drivers such as production, labour savings, line speed and long-term operating costs (Ferrin & Plank, 2003). Secondly, there is also a category for Quality that includes cost drivers such as durability, rework and inspection in parallel with customer related issues like customer returns and customer downtime (Ferrin & Plank, 2003).

Logistics is a category, which includes freight, packaging, lead-time, materials handling and warehousing, tariffs & duties, availability and logistics customer service. Warehousing specifically is broken down into inventory costs such as safety stock, perishability and stock turnover (Ferrin & Plank, 2003).

Another category is called Supplier's reliability and capability. This includes cost driving aspects such as trust, partnering costs, teaming costs as well as factors as familiarity, ability to grow, service, R&D capability and payment terms (Ferrin & Plank, 2003). Further, Ferrin and Plank (2003) have proposed a category named Initial price that involves more than the actual unit cost. For instance, an important aspect in TCO is the long-term price stability that a supplier assures or is expected to offer (Ferrin & Plank, 2003).

Cost drivers related to the assets needed for operations were categorized as Maintenance. These are for example repair costs, spare parts, training and preventive maintenance schedule (Ferrin & Plank, 2003).

Costs related to the actual procurement are categorised as Transaction cost. These are costs drivers such as ease of transaction, administration of post-purchase agreements and order size (Ferrin & Plank, 2003). Of course, many cost drivers cannot be put in any of the mentioned categories and are therefore categorized as miscellaneous (Ferrin & Plank, 2003). These can for example be disposal costs, warranty and obsolescence cost. (Ferrin & Plank, 2003).

There is no "off-the-shelf" TCO model according to Ferrin and Plank (2003), which also is supported by Ellram (1994). Ellram (1994) distinguishes standard from unique TCO models and means that the framework of a standard model is often established manually and can later be transformed into a computer-based model. Meanwhile the standard model is used for many types of purchases, the unique model is often created for a specific purchase or purchases of a certain product. Naturally the development of a unique model makes the effort of TCO modelling larger. However, many firms use a combination of unique and standard models (Ellram, 1994).

On top of Ferrin and Plank's cost components, Ellram and Siferd (1993) mention costs involved with managing a supplier relationship such as on-going communication and audits. Ellram (1993b) also divides the TCO concept into three segments, pre-transactional, transactional and post-transactional. The pre-transactional stage includes costs such as identifying a need, investigating and qualifying a source and adding a supplier to internal systems (Ellram, 1993b). The transactional stage includes cost components such as price, delivery and transportation, tariffs, payment and billing and inspection costs (Ellram, 1993b). The last stage, the post-transactional, includes costs such as field quality problems, cost of repairs & spare parts and customer goodwill and firm reputation (Ellram, 1993b). Tibben-Lembke (1998) also argues that reversed logistics, meaning the return flow from point of consumption to point of reuse or disposal, should be included in the post-transactional stage.

4.6.2.2.1 Cost Components

- Operations costs
- Quality
- Logistics
- Warehousing
- Initial price
- Maintenance
- Supplier communication
- Reversed logistics

4.6.2.3 Benefits

Several articles discuss the benefits of TCO (Ellram, 1993; 1998; Degraeve et al., 2000; Wouters et al., 2005). In two separate articles Ellram describes the benefits in terms of performance evaluation where TCO is a beneficial framework for evaluating suppliers (Ellram, 1993; Ellram, 1998). TCO quantifies all costs and thus offers a concrete way to measure results, which makes it a favourable tool for benchmarking (Ellram, 1998). Further, since it is a structured model, improved supplier performance measurement can stay consistent over time (Ellram, 1993). Companies also experience improved decision-making due to its broad approach that involves a broad spectrum of costs in addition to the initial purchase price (Ellram, 1993; Degraeve, 2000). The complete cost data can also provide a good basis for communications both internally and externally (Ellram, 1993). Performance expectations will therefore be clearer and by sending TCO data on a regular basis to suppliers, idea sharing and training can be facilitated (Ellram, 1993).

Having a good supplier communication supported by the right performance measures, the suppliers' improvement can be recognized and therefore rewarded (Ellram, 1993). This also creates a better understanding of the firm's processes meaning that the business efforts can be allocated to where they are mostly needed (Ellram, 1993). In total, the increased understanding that comes with TCO can lead to cost savings and support the company's continuous improvement (Ellram, 1993).

4.6.2.3.1 Benefits

- Concrete measures
- Structured model
- Improved decision making
- Good basis for communication
- Creates good understanding

4.6.2.4 Drawbacks & Barriers

Conceptually, TCO is a simple model to adopt and follow (McKeen & Smith, 2010). However, Ellram (1993) advocates that TCO is not only a tool but rather a philosophy for companies to adopt. Hence, companies might encounter difficulties in implementing this (Ellram, 1993).

Since TCO requires large amounts of data, the data resources at a firm are critical (Ellram, 1993). Often it is not the actual data that is missing but rather the information systems not supporting the provision of the needed data (Ellram, 1993). This implies that data must be collected manually, which can make TCO work more labour intensive

than it ought to be (Ellram, 1993). In order to avoid this situation, companies might have to invest heavily in making this activity more automated and therefore investments in modifications might be necessary (Ellram, 1993).

As mentioned previously, a TCO adoption often requires a corporate culture change where employees must leave the price oriented thinking and embrace the broad view including multiple cost components (Ellram, 1993). This, in combination with the fact that TCO in practice generates a new way of working that requires training and education. Consequently, this involves a certain resource allocation (Ellram, 1993). To manage having TCO accepted culturally and for the organisation to learn the new way of working, it is suggested and required by many firms to have a less complex model that is more applied to reality and not as theoretical (Alard, 2010).

McKeen and Smith (2010) mean that TCO is much more complex in practice than in theory. They stress that while it increases granularity and accuracy, it requires major resources. This research was performed in the field of IT (McKeen & Smith, 2010). However, these barriers might be similar to related field. McKeen and Smith (2010) group these into three challenge areas. The first challenge originates from the large amount of cost drivers that can be included in a TCO analysis. It can be difficult identify and decompose large cost drivers and some cost drivers may even be related to issues outside what is to be measured (McKeen & Smith, 2010). The second challenge area relates to the complexity of organisations. An implementation of TCO at one level in an organisation often requires changes in several other levels and departments (McKeen & Smith, 2010). It may involve issues such as training, conversion of data and additional personnel (McKeen & Smith, 2010). The third challenge is to understand the focus of TCO and to assess it accordingly. If the focus is to evaluate infrastructure investments, the costs must be well known and therefore thoroughly investigated. If the focus is the true costs of offering a customer service, the costs are more of a best guess nature (McKeen & Smith, 2010).

All these barriers can be categorized into three major issue areas according to Ellram (1995).

- Resource issues
- Education/training issues
- Cultural issues

4.6.2.5 Application

Naturally the applications or uses of TCO are highly related to the previously described benefits. The model is commonly used in the supplier selection process for evaluating make-or-buy decisions but also when reviewing request for proposal (Ellram, 1994). Further, TCO can be used for evaluating existing suppliers by measuring their performance towards established measurements (Ellram, 1994). This can also be the basis for benchmarking (Ellram, 1994). By the same approach, TCO may also be applied in decisions related to supplier base reduction or allocation of volume (Ellram, 1994).

In the continuous supplier management work, TCO is used for supplier development (Ellram, 1994). By measuring the suppliers on multiple levels, areas for improvement become more visible and the buying firm can together with the supplier allocate resources for improvement (Ellram, 1994). Having TCO data available in negotiations can be beneficial since it allows the buying firm to challenge the supplier's prices with quantitative costs (Ellram, 1994).

4.6.2.6 Success Factors

To manage a successful implementation and way of working with TCO, there are some strategies suggested by McKeen and Smith (2010). First, when implementing TCO, it is important to link it to a pain point. To support the implementation and the costs involved, it is easier to show that the benefits compensate for the expenses if they can be tied to a certain area (McKeen & Smith, 2010). Secondly, they recommend establishing a TCO office or someone responsible for the TCO initiative. His or hers responsibility should be to determine work standards, establish documentation & metrics and to further improve the application given their expertise (McKeen & Smith, 2010). Thirdly, the recommendation is to capture TCO data at key life stages (McKeen & Smith, 2010). This means that as soon data is available it should be captured since it can be beneficial information for the company (McKeen, & Smith, 2010). However, it is important to determine why, how and by whom the data should be gathered (McKeen & Smith, 2010). Lastly, McKeen and Smith (2010) recommend investing in TCO management tools. Even though off-the-shelf tools might not be available, the company should develop tools that support data capturing, data categorization, business case preparation, tracking of costs and capabilities as well reporting and analyses (McKeen & Smith, 2010).

4.6.2.6.1 Success Factors

- Link to pain point
- Responsible TCO office
- Capture TCO data at key stages
- Invest in TCO management tool

4.6.2.7 Contextual Aspects

Ellram (1994) mentions some factors that can have an impact on which model a company chooses to implement. These are corporate culture, the importance of different types of purchases to the firm, the complexity of the purchased items, the availability of computer systems and what decision the model shall support (Ellram, 1994). Bhutta and Huq (2002) also discuss the importance of a cultural change when a company transcends from a price orientation to a total cost focus. However, they do not further elaborate on the cultural impact.

4.6.2.8 Summarising Table

Table 7 Summary of Total Cost of Ownership

Cost components	Benefits	Drawbacks & barriers	Applications	Success factors	Contextual aspects
<ul style="list-style-type: none"> • Operations costs • Quality • Logistics • Warehousing • Initial price • Maintenance • Supplier communication • Reversed logistics 	<ul style="list-style-type: none"> • Concrete and structured • Improved decision making • Basis for communication • Good understanding 	<ul style="list-style-type: none"> • Resource issues • Education/training issues • Cultural issues 	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Supplier development 	<ul style="list-style-type: none"> • Link to pain point • Responsible TCO office • Capture TCO data • TCO management tools 	<ul style="list-style-type: none"> • Corporate culture • Type and complexity of purchases • Availability of data systems

4.6.3 Cost-ratio

4.6.3.1 General

There is no extensive literature discussing the Cost-ratio model for purchasing. However, Timmerman (1986) propose the model for supplier performance evaluation. He mentions three models with different characteristics that measure the performance of suppliers where the Cost-ratio model has the most quantitative approach out of the three (Timmerman, 1986).

The basics of this model is to, on top of the contracted price, add a cost percentage for the internal cost driving activities to calculate the actual cost of the purchase (Timmerman, 1986). Timmerman (1986) describes a four-step method where the initial step is to establish which internal cost driving activities to measure for a specific supplier and product. Secondly, the cost driving activities are described as a fraction of the total purchase value of all units bought (Timmerman, 1986). The third step is to find an overall cost ratio for a supplier and product by summing up the percentages for all cost driving activities (Timmerman, 1986). The final and fourth step is to apply the cost ratio percentage to the supplier's selling price to get the net adjusted number that Timmerman (1986) uses to evaluate and compare different suppliers. An illustration of the Cost-ratio model basics can be found in Figure 17 below.

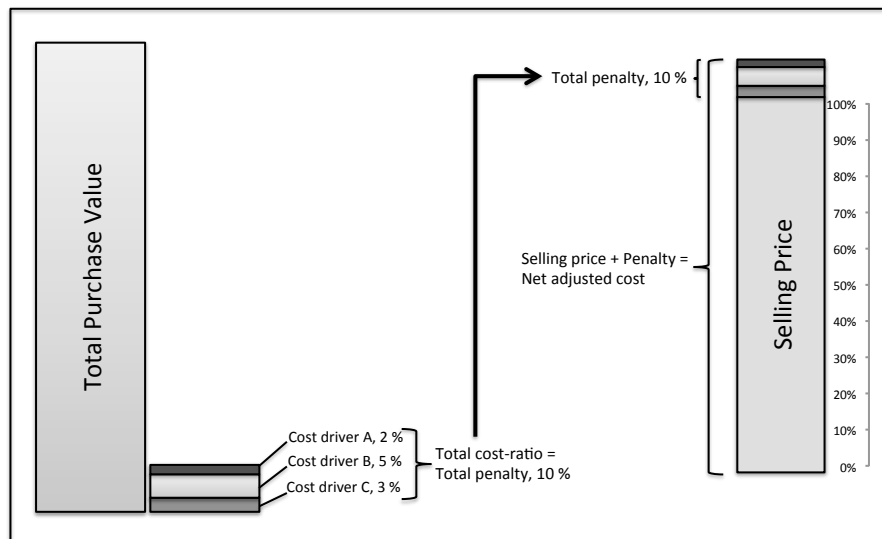


Figure 17 Visualisation of Cost-ratio

In general, the identified cost drivers differ depending on what products are targeted and which internal activities that need to be executed (Timmerman, 1986). Timmerman (1986) defines the cost of doing business with a certain supplier as penalties that raise the initial price and thus make that supplier less attractive for the purchase.

4.6.3.2 Cost Components

The cost components used might vary depending on product type and supplier. In general, all costs that occur in connection with a purchase should be measured and given a cost ratio (Timmerman, 1986). The most common cost drivers that Timmerman (1986) mentions are quality, delivery, service and the initial price.

4.6.3.3 Benefits

In comparison with other more qualitative models such as multi-criteria models, the Cost-ratio model produces results of a more quantitative orientation where costs are in

focus (Timmerman, 1986). Roodhofs and Konings (1996) describe the Cost-ratio model as a model that avoids subjectivity and is less of an ad hoc model.

4.6.3.4 Drawbacks & Barriers

To provide the amount of precise data that is required to perform Cost-ratio calculations there is a need for a comprehensive computerized accounting system (Timmerman, 1986). This can of course be a very expensive procedure if the company does not already have the right systems in place (Timmerman, 1986).

Also, Timmerman (1986) mentions the difficulties involved with translating supplier performance aspects into exact cost figures. He indicates that Cost-ratio is difficult to implement and that the clarity of the results is moderate (Timmerman, 1986). This in combination with the high implementation cost and the major situational requirements contributes to a moderate cost/benefit ratio in Timmerman's study (1986).

4.6.3.4.1 Drawbacks & Barriers

- Comprehensive accounting system needed
- Hard to quantify qualitative cost drivers
- Difficult to implement
- Expensive applications

Timmerman (1986) discusses the use of Cost-ratio in supplier performance evaluation where it can aid the purchaser in both the selection of supplier for the initial sourcing process and whether an existing supplier should be replaced or not.

4.6.3.5 Success Factors

The main success factor mentioned by Timmerman (1986), which also is common for other models, is the ease of implementation. In the case of the Cost-ratio model, it is important to have extensive preparation and to have the information systems needed to support the model (Timmerman, 1986).

4.6.3.6 Contextual Aspects

According to Timmerman (1986) the Cost-ratio model, due to its quantitative approach, fits large organisations with many decision makers. The general character enables the model to be used in different settings. Further, Timmerman (1986) describes the need of a large resource base (Timmerman, 1986).

4.6.3.7 Summarising Table

Table 8 Summary of Cost-ratio

Cost components	Benefits	Drawbacks & barriers	Applications	Success factors	Contextual aspects
<ul style="list-style-type: none"> • Quality • Delivery • Service • Initial price 	<ul style="list-style-type: none"> • Quantification of costs • Objective model 	<ul style="list-style-type: none"> • Comprehensive accounting system needed • Hard to quantify qualitative cost drivers • Difficult to implement • Expensive 	<ul style="list-style-type: none"> • Supplier evaluation • Supplier selection 	<ul style="list-style-type: none"> • Must be easy to implement • Extensive preparation • Information system in place 	<ul style="list-style-type: none"> • Large organisations • Many decision makers • Large resource base

4.6.4 Landed Cost

4.6.4.1 *General*

In comparison with Total Cost of Ownership, Landed cost does not embody all costs occurred during the time an asset is owned (Young et al., 2009). Young et al. (2009) use Ellram's (1993b) segmentation of cost activities based on pre-transactional, transactional and post-transactional activities to delimit the Landed cost model into the transactional phase. The study however shows that different companies use slightly different models (Young et al. 2009).

Landed cost models have, due to globalization, gone from only including material and transportation costs to consider two more sources of costs; inventory carrying costs and trade compliance cost (Feller, 2008). This is further discussed in the section for cost components.

The development of a Landed cost model is basically the identification of the cost components to involve for a certain product or supplier and the total landed cost is the sum of all costs measured (Young et al. 2009).

4.6.4.2 *Cost Components*

In the model suggested by Young et al. (2009) there are different modules for each cost-driving factor. The first module contains the contracted transaction price where also the cost of different payment terms is included (Young et al., 2009). According to Feller (2008) tooling costs for different suppliers can also fall under this category.

The second module is dedicated to transportation costs (Young et al., 2009). This is mainly driven by the choice of transportation mode and the agreed INCO-terms but does also include costs for fuel and additional packaging (Young et al., 2009). Similarly, Feller (2008) describes a category for logistics where he also includes the impact hazardous goods may have on the transportation cost.

Further, in the third module, Young et al. (2009) mention the cost of customs duties that a majority of the studied companies use in their Landed cost model. The reason stated is that if customs cost have large impact on the total Landed cost it can be avoided by sourcing from another country or by using a different mode of transportation (Young et al., 2009).

The majority of the companies that are sourcing globally have experienced longer lead-times and its effect on inventory levels and thus Young et al. (2009) propose a cost module for inventory management. This might include cost of average inventory, safety stock needed, pipeline inventory and warehousing cost (Feller, 2008).

According to Young et al. (2009), overhead costs related to administration are categorised in a separate module and involves transaction-related cost drivers such as the frequency of supplier communication and visits as well as management of the supplier network.

4.6.4.2.1 Cost Components

- Transaction price
- Transportation
- Customs duties
- Inventory management
- Overhead costs

4.6.4.3 *Benefits*

Beckman and Rosenfield (2008) discuss several benefits related to the use of a Landed cost model for strategic sourcing. These are reduced supplier management costs, increased coordination of product development activities, better ability to evaluate on several cost factors and capability indicators, increased ability to capitalise on supplier value-added activities by sourcing and increased supplier performance management (Beckman & Rosenfield, 2008).

4.6.4.3.1 Benefits

- Reduced supplier management costs
- Increased coordination of activities
- Evaluates suppliers on several cost factors and capability indicators
- Capitalises on supplier value-added activities
- Increased supplier performance management

4.6.4.4 *Drawbacks & Barriers*

It is difficult to develop a model comprehensive enough due to difficulties in gathering data (Young et al., 2009). Firstly, the right data might not be available and secondly, the time frame in which a company must make a decision is often short. This means that a decision might already have been made before calculations of the Landed cost are completed (Young et al., 2009).

Feller (2008) discusses organisational behaviours and a challenge in overcoming the current way of evaluating and the metrics already in use. An implementation must involve all levels in an organisation and it must be communicated that this is not only a top-down management directive (Feller, 2008). This organisational averseness is also something that Young et al., (2009) experienced in their development of a Landed cost model.

4.6.4.4.1 Drawbacks & Barriers

- Difficult to gather the right data
- Organisational reluctance

4.6.4.5 *Applications*

Young et al. (2009) discuss the use of an extended Landed cost model to improve decisions with offshore sourcing. The model developed in Feller's dissertation (2008) had the objective to be comprehensive enough to support global strategic sourcing but also a tool for supplier evaluation as well as a tool used to standardising the supplier selection process.

4.6.4.6 Success Factors

Feller (2008) describes the challenge with developing a comprehensive Landed cost model that is still easy to use, which can be difficult in terms of what aspects to include. When choosing cost components, it is suggested to exclude costs that are too subjective to validate or costs that are difficult to measure (Feller, 2008).

Many firms are not using their Landed cost models until just before the actual purchase where the Landed cost data is required (Young et al., 2009). Hence, this requires data to be gathered rather quickly and this might not be sufficient for creating an actual Landed cost model. In contrast, continuous data gathering is recommended (Young et al., 2009). It is also stated that an implementation must involve all levels in the company in order to be successful (Feller, 2008).

4.6.4.6.1 Success Factors

- Balancing breadth with usability
- Focus on objective measures
- Gather data continuously
- Involve all levels in the company

4.6.4.7 Contextual Aspects

Feller (2008) discusses the contextual challenge with implementing a Landed cost model due to the culture and history surrounding his case company. Even though the company was familiar with change since it has grown inorganically over the years there was a lot of resistance (Feller, 2008). However, the two groups that were going to work with his model were already focused on supplier relationships and on establishing supplier relationships. Thus Feller (2008) suggests they should share their knowledge to spread the belief in a Landed cost model through the whole company.

Regarding supplier relationships Feller (2008) means more collaboration with the suppliers is needed to get the data needed for a Landed cost model. Also since the company has a global supply chain there might be a cultural challenge where the model users must learn differences in transportation, customs etc. that affect the cost components in the model (Feller, 2008). In the article by Young et al. (2009) the studied firms that import goods from many countries answer that the Landed cost model is internationally applicable. It is also said that the context when using a Landed cost model requires a cross-functional mechanism for decision-making (Young et al., 2009)

4.6.4.7.1 Contextual Aspects

- Resistance to change
- Supplier relations strategies
- Cultural challenge
- Cross-functional mechanisms

4.6.4.8 Summarising Table

Table 9 Summary of Landed cost

Cost components	Benefits	Drawbacks & barriers	Applications	Success factors	Contextual aspects
<ul style="list-style-type: none"> • Transaction price • Transportation • Customs duties • Inventory management • Overhead costs 	<ul style="list-style-type: none"> • Reduced supplier management cost • Increased coordination of activities • Broad supplier evaluation • Capitalise on value-added activities • Increased supplier performance management 	<ul style="list-style-type: none"> • Difficult to gather the right data • Organisational reluctance 	<ul style="list-style-type: none"> • Supplier evaluation • Supplier selection 	<ul style="list-style-type: none"> • Balancing breadth with usability • Focus on objective measures • Gather data continuously • Involve all levels in the company 	<ul style="list-style-type: none"> • Resistance to change • Supplier relations strategies • Cultural challenge • Cross-functional mechanisms

4.6.5 Life-cycle Costing

4.6.5.1 General

A common misunderstanding is to confuse Life-cycle costing (LCC) with Life-cycle Assessment (LCA) where LCC has an economic focus while LCA concerns evaluation of the environmental impact or performance of a product or service (Norris, 2011). Life-cycle costing however, compares different alternatives from the economic perspective of a manufacturing company or a customer (Norris, 2011). However, LCC often occurs in literature with an environmental focus in combination with LCA.

According to Rebitzer and Seuring (2003) conventional cost accounting and cost management models have shown to be insufficient when calculating the total costs or revenues over a product's life-time. They stress that there is a need for models, defined as Life-cycle costing models, which assess financial cost data with a Life-cycle perspective (Rebitzer & Seuring, 2003). In Elmakis and Lisnianski's study (2006) it is said that LCC is similar to the TCO model, earlier presented, since it considers all costs related to the procurement and the ownership of a product. Woodward (1997) advocates that very few companies, with the exception of some companies in the building industry and the public sector, have adopted a Life-cycle costing approach.

4.6.5.2 Cost Components

In Life-cycle costing the cost components of interest are every activity generating an expense that occur during the life-time of an investment (Woodward, 1997). In the same manner Norris (2011) defines LCC as all activities that cause direct cost or benefits during the economic life of an investment, as a result of the investment made.

First, both Woodward (1997) and Elmakis & Lisnianski (2006) mention the acquisition cost as a component in LCC. In addition, Elmakis and Lisnianski (2006) identified several categories of costs, which are incorporated in LCC analysis. The first category is design and development where materials, labour, administration, overhead, handling and transportation are included (Elmakis & Lisnianski, 2006). Further, all costs related to production are put in one category (Elmakis & Lisnianski, 2006). The next category is operational and support costs where all costs for spare parts, maintenance, logistics management and personnel training are included (Elmakis & Lisnianski, 2006). This is considered the largest and most cost driving category and also where LCC can have the most impact (Elmakis & Lisnianski, 2006).

Further, Norris (2011) has adopted a Total Cost Assessment model, originally developed in the chemical industry, to identify all cost types to consider in an LCC model and where many of the previously mentioned activities can be put. The first four cost types are internal whereas the fifth is external (Norris, 2011). The first cost type embodies direct costs of capital equipment, raw material and waste disposal (Norris, 2011). The second cost type includes overhead costs that cannot be directly allocated to a product (Norris, 2011). The third cost type concerns contingent and forced costs, which for instance can be fines, penalties and reimbursement of personal injuries (Norris, 2011). The last internal type called Intangible Costs includes costs that are difficult to measure such as consumer acceptance, customer loyalty, worker morale, corporate image and others (Norris, 2011). Cost type five concerns external costs that also affect other parties, these should however be separated from the previous cost types since they do not affect the total cost but rather the public acceptance (Norris, 2011).

4.6.5.2.1 Cost Components

- Acquisition costs
- Design and development costs
- Production costs
- Operational and support costs
- Overhead costs
- Contingent costs
- Intangible costs
- External costs

4.6.5.3 *Benefits*

One benefit mentioned in two articles (Elmakis & Lisnianski, 2006; Seif & Rabbani, 2014) is the improved decision making in the process of replacing equipment where it becomes easier to compare alternatives. Elmakis and Lisnianski (2006) also mention the ability to compare costs of different projects and offers from different suppliers.

Furthermore, due to the longer perspective where the environment has an important role, LCC forces business management to focus on environmental and social aspects when choosing a certain product or supplier (Hunkeler & Rebitzer, 2003).

4.6.5.3.1 Benefits

- Improved equipment replacement decision making
- Comparison of project costs
- Improved supplier selection
- Environmental focus

4.6.5.4 *Drawbacks & Barriers*

Even though Cole and Sterner's (2000) article focuses on LCC in the construction industry they discuss drawbacks and barriers of general characteristics. In many cases there is a lack in motivation to adopt LCC (Cole & Sterner, 2000). This is often related to a limited understanding of LCC and the benefits it generates (Cole & Sterner, 2000). Cole and Sterner (2000) have also identified some contextual issues as barriers for implementation. This is for example teams' reluctance to undertake LCC. Further, the uncertainty of how LCC will affect other departments of the company, in other words the risk of sub-optimisation can be a barrier.

Further, they discuss methodological limitations such as LCC being too comprehensive and thus very demanding to implement (Cole & Sterner, 2000). Since a successful LCC analysis involves professional teams from different departments, the work tends to be time consuming and expensive (Elmakis & Lisnianski, 2006)

In relation to the comprehensive approach there is a lack of standard methods, which increases the amount of work needed in an implementation (Cole & Sterner, 2000; Elmakis & Lisnianski, 2006). Lastly, the access to reliable data is a major barrier for LCC where the final result is dependent on accurate data of good quality (Cole & Sterner, 2000).

4.6.5.4.1 Drawbacks & Barriers

- Lack in motivation
- Organisational reluctance
- Impact on the organisation
- Demanding implementation
- Lack of standard methods
- Lack of data

4.6.5.5 Application

There are different application areas where LCC can be useful. Seif and Rabbani (2014) discuss the use of Life-cycle costing for decision-making regarding replacement of aging equipment. In Korpi and Alu-Risku's (2008) review of published case studies there are some applications of LCC listed. LCC can be used in affordability studies to determine the cost impact of an investment on long-term budgets and operating results (Korpi & Alu-Risku, 2008). It is also used in supplier selection to compare the Life-cycle cost between different suppliers (Korpi & Alu-Risku, 2008). Further, LCC also supports decision for design trade-offs, repair level analysis and calculation of warranty and repair costs (Korpi & Alu-Risku, 2008).

Furthermore, Gluch and Baumann (2003) stress that modern LCC tools are useful for linking environmental aspects with financial consequences.

4.6.5.5.1 Application

- Equipment replacement decision making
- Affordability studies
- Supplier selection
- Design trade-offs
- Repair level analysis
- Calculation of warranty and repair costs
- Cost model with environmental elements

4.6.5.6 Success Factors

Elmakis and Lisnianski (2006) emphasise that a key success factor to accomplish an effective analysis is to have all departments, such as engineering, design, finance, logistics and accounting, united in the development and execution of a Life-cycle costing model. It is recommended to have an LCC team where the representatives should have background knowledge in areas such as probability theory, reliability engineering and quality control, systems engineering, operations research, data analysis, manufacturing methods and development of specifications (Elmakis & Lisnianski, 2006). Also, the head of the group should have enough authority to be recognised by top management (Elmakis & Lisnianski, 2006). Without top management support, the LCC program will not be effective (Elmakis & Lisnianski, 2006).

Due to the difficulties with performing an LCC analysis, Elmakis and Lisnianski (2006) suggest that companies should evaluate the opportunity of outsourcing the process to knowledgeable consulting firms.

Cole and Sterner (2000) describes two strategies that incite the adoption of LCC. First, a greater communication of the advantages of LCC is advocated, which can be achieved with greater education (Cole & Sterner, 2000). To get the most out of LCC, the quality of the input and performance data must often be improved. This might require investments in proper computer systems (Cole & Sterner, 2000).

4.6.5.6.1 Success Factors

- Involve all departments
- Top management support
- Evaluate outsourcing
- Communicate advantages
- Improved data

4.6.5.7 Contextual Aspects

Cole and Sterner (2000) mention implementation difficulties related to resistance to change in the organisation. Korpi and Ala-Risku (2008) discuss context specific nature of LCC models and stress that the model is strongly dependent on the data available in the firm.

4.6.5.8 Summarising Table

Table 10 Summary of Life-cycle costing

Cost components	Benefits	Drawbacks & barriers	Applications	Success factors	Contextual aspects
<ul style="list-style-type: none"> • Acquisition costs • Design and development costs • Production costs • Operational and support costs • Overhead costs • Contingent costs • Intangible costs • External costs 	<ul style="list-style-type: none"> • Improved Equipment replacement decision making • Comparison of project costs • Improved supplier selection • Environmental focus 	<ul style="list-style-type: none"> • Lack in motivation • Organisational reluctance • Impact on the organisation • Demanding implementation • Lack of standard methods • Lack of data 	<ul style="list-style-type: none"> • Equipment replacement • Affordability studies • Supplier selection • Design trade-offs • Repair level analysis • Warranty & repair costs • Cost plus environmental elements 	<ul style="list-style-type: none"> • Involve all departments • Top management support • Evaluate outsourcing • Communicate advantages • Improved data 	<ul style="list-style-type: none"> • Organisational reluctance • Data dependency

4.6.6 Cost Structure Analysis

4.6.6.1 General

Cost structure analysis is a strategic cost management tool, which is commonly used in practice (Ellram, 2002). There are different models within the concept of Cost structure analysis. Some of them are slightly different but they all aim to visualise and quantify the cost structure of a component, product or service. Target costing can be seen as a top-down approach where you start with the selling price. In contrast, Should-cost can be seen as bottom-up where you summarise different costs to determine what a product should cost. Below, some of the models are listed.

- Should-cost analysis
- Target costing
- Design-to-cost
- Cost estimation
- Cost-engineering
- Value analysis / Value engineering

According to Ellram (2002), Should-Cost analysis is used to determine what a product, service or a piece of equipment should cost. Consequently, this is managed by looking at the elements, which compose the end product and then add a reasonable margin for profit (Ellram, 2002). As a purchasing cost model, this can be used to benchmark with quotes provided by suppliers for a certain purchase. Also, Ellram (2002) advocates that Should-cost analysis often is used in parallel with target costing. As the name indicates, target costing facilitates to determine cost targets for departments within a company by first establishing what the customers are willing to pay, the target price, for the product or service (Ellram, 2002). Later, the operating profit is subtracted from the target price, which leaves the target cost (Newman & McKeller, 1995; Shank & Fisher, 1999; Monden & Hamada, 1991). Now, the company must focus on design-to-cost, manufacture-to-cost and purchase-to-cost (Newman & McKeller, 1995). According to Shank & Fisher (1999), Target costing is driven by market price and in order to be effective, it needs to be performed early in the product Life-cycle. They also stress that in order to obtain cost reductions, Target costing must be applied in the design phase. After this phase, many authors state that costs are fixed and difficult to improve (Shank & Fisher, 1999).

Cooper and Slagmulder (1999) have conceptualised the process of Target costing (Figure 18). The process starts with market-driven costing. From this stage, the allowable costs are translated into product-level target costs, which is important for the product designers. Here, the designers must use creativity to achieve the targets. Once this is established, the product-level target costs are translated to component level, putting pressure on the suppliers.

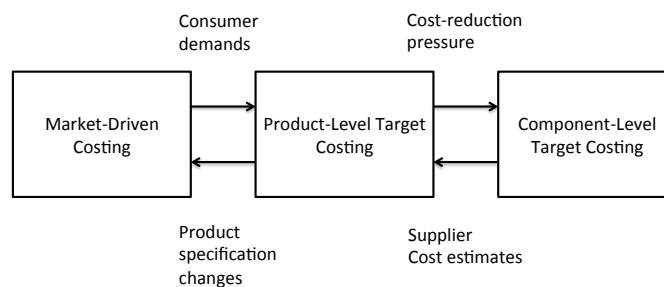


Figure 18 The process of Target costing adopted from Cooper and Slagmulder (1999)

In relation to Target costing, Value analysis (VA) and Value engineering (VE) can be useful in the design phase as this is the greatest opportunity to reduce costs according to Shank and Fisher (1999). Kendt and Nichols (1992, p. 438) define Value analysis as:

“The organised and systematic study of every element of cost in a part, material or service to make certain it fulfils its function at the lowest possible cost”

In addition, Value Engineering refers to the approach in which, the engineering department and the purchasing department continuously communicate and collaborate. Since VA requires cross-functional orientation, the presence of both engineering and purchasing is essential (Kendt & Nichols, 1992; Barlow & Rockar, 1982).

4.6.6.2 Cost Components

The cost components for the different models incorporated in Cost structure analysis differ slightly but there are a few general cost components. Newman and McKeller (1995) discuss cost components such as cost of materials, labour cost, overhead, cost of R&D and S, G&A (Selling, general and administrative). In addition they mention learning curve as a component, which should be taken into account. Further Shank & Fisher (1999) also highlights cost components related to Cost structure analysis. These are costs related to manufacturing and labour.

4.6.6.2.1 Cost Components

- Cost of materials
- Manufacturing
- Labour cost
- Overhead
- S, G&A costs
- R&D
- Learning curve
- Profit

4.6.6.3 Benefits

According to Newman and McKeller (1995) there are several benefits when using Cost structure analysis or more specifically, target-costing:

- Clear targets for the size of price reductions needed from suppliers
- The ability to assess the reduction's contribution to the overall pricing goal of the company
- The ability to compute and document purchasing's contribution on a product by product basis

Ellram (2002) also elaborates on benefits when using Should-cost and Target costing. These are:

- To facilitate improvements
- To increase understanding
- To involve suppliers
- To support evaluation

When applying this purchasing cost model, improvements can be materialised through sharing of information, by identifying cost reduction areas and by professionalising purchasing in overall (Ellram, 2002). Also, the understanding can be improved by gaining greater understanding of suppliers as well as an understanding of the impact of design changes (Ellram, 2002). Further, supplier involvement will be improved. The purchasing cost model can be used as a communicative tool, facilitating cooperation with suppliers. In addition, by facilitating the evaluation of bids, simplifying validation of cost savings and supporting operations, cost savings can be realised (Ellram, 2002).

4.6.6.4 Drawbacks & Barriers

Newman and McKeller (1995) also mention limitations and drawbacks with Cost structure analysis. When it is used as a tool to reduce costs and squeeze the suppliers, the relationship can be damaged. The price a buyer faces is not just the costs and profit margin from the first-tier supplier. On the contrary, it is the summation of a series of actors in the supply chain until it reaches the buyer. Thus, while using this tool in negotiations with your supplier, they might perceive the expected cost reductions as unfair (Newman & McKeller, 1995).

According to Shank and Fisher (1999) many authors advocate that target costing is predominantly used in the early stage of a product life-cycle. Hence, it has a narrow focus and is difficult to apply on current product portfolio. However, they also argue that the model can be adjusted if companies are flexible.

4.6.6.4.1 Drawbacks & Barriers

- Asymmetric relationship towards suppliers
- Narrow focus

4.6.6.5 Application

The application of Cost structure analysis can be seen as both internal and external. Literature suggests that Cost structure analysis can be used to control costs by having a clear target cost (Ansari et al., 2006). Next, the model is used for supplier selection. In detail, the purchasing cost model is used to analyse quotes from supplier to determine whether they are realistic or not. By gaining understanding of suppliers' cost structure, the model can be used for supplier evaluation and later supplier development. The model is a good tool for communicating and finding improvement opportunities in collaboration with suppliers.

4.6.6.5.1 Application

- Supplier selection (Basis for negotiation)
- Supplier evaluation (Scrutinizing bids from suppliers)
- Supplier Development (Finding opportunities to reduce costs, new processes)

4.6.6.6 Success Factors

According to Moden and Hamada (1991) and Kendt and Nichols (1992), cross-functional orientation is required in order to manage the Cost structure analysis. Depending on what purpose the Cost structure analysis is used for; various extent of cross-functional orientation is required. For value analysis, Kendt and Nichols (1992) stress the importance of value engineering, which refers to the collaboration between purchasing and engineering.

Moden and Hamada (1991) also suggest that motivational considerations are important in order to attain target costing. Since it is suggested to be a different way of working from what employees are used to, motivational traits must be determined to create incentives for employees to achieve their targets (Moden & Hamada, 1991).

Also, Ahmed (1995) suggests that clear targets and close monitoring should be applied in order to manage design-to-cost successfully.

Further, Ansari et al. (2006) elaborate on the importance of having top-management support when implementing Cost structure analysis. Moreover, gaining organisation-wide mandate, carrying out a pilot project and later to have a clear implementation plan is critical for success (Ansari et al., 2006).

4.6.6.6.1 Success Factors

- Top-management support
- Cross-functional orientation
- Incentives for employees
- Clear targets
- Cost monitoring and control
- Pilot project
- Clear implementation plan

4.6.6.7 Contextual Aspects

Ansari et al. (2006) discuss the organisation in terms of its ability and readiness for change. Since the implementation of Cost structure analysis can be significantly different from other procedures, the resistance to change might be an issue.

Literature also advocates cross-functional orientation when discussing Cost structure analysis. Communication between purchasing and engineering is critical in order to manage this process (Kendt & Nichols, 1992).

4.6.6.8 Summarising Table

Table 11 Summary of Cost structure analysis

Cost components	Benefits	Drawbacks & barriers	Applications	Success factors	Contextual aspects
<ul style="list-style-type: none"> • Cost of materials • Manufacturing • Labour cost • Overhead • S, G&A costs • R&D • Learning curve • Profit 	<ul style="list-style-type: none"> • Clear targets • Visualise reduction's contribution to overall goal • Ability to document purchasing's contribution • Facilitate improvements • Increase understanding • Involve suppliers • Support evaluation 	<ul style="list-style-type: none"> • Asymmetric relation towards suppliers • Narrow focus 	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Supplier development 	<ul style="list-style-type: none"> • Top-management support • Cross-functional orientation • Incentives for employees • Clear targets • Cost monitoring and control • Pilot project • Clear implementation plan 	<ul style="list-style-type: none"> • Resistance to change • Cross-functional orientation

4.7 Synthesis of Purchasing Cost Models

This section aims to give an overview regarding to what extent different characteristics are described in theory of each purchasing cost model. We have for each area graded the occurrence with a (0) if there is none or almost no literature discussing the topic, (+) if there is a moderate amount of literature available and (++) if there is an extensive discussion on the topic in existing literature. The purpose is to describe the frequency of occurrence and no conclusions are drawn regarding the purchasing cost models.

Table 12 Synthesis of existing literature in terms of how well characteristics are described

	ABC	TCO	Cost-ratio	Landed Cost	Life-cycle Costing	Cost Structure Analysis
Benefits	++	++	+	+	+	++
Drawbacks & barriers	++	++	+	+	+	++
Applications	+	+	0	+	++	+
Cost components	+	++	0	+	+	+
Success factors	+	+	0	+	+	+
Contextual aspect	0	+	0	0	0	0

As seen in Table 12, there is not much written on the contextual aspects for any of the models and this view of ours is also supported by De Boer et al. (2001). Consequently, there is a need to further investigate this field, which also is one of the objectives of this master thesis. In specific, RQ₂ aims to answer and highlight this issue.

Further, as seen in Table 12, ABC and TCO are described extensively in academics. Landed cost as well as Life-cycle costing are somewhat described in literature but not as extensively as previously mentioned models. In addition, Cost-ratio is not sufficiently explained in previous literature, which generates uncertainties regarding the use and the effect of having the model in place.

4.8 Mapping of Purchasing Cost Models

Since the models have different focus when it comes to the range of cost components, we have carried out a mapping that can be seen in Figure 19 below. The Y-axis describes the depth and relative number of the cost components within each stage and the X-axis describes the range, which they cover. The range is in detail described in Table 13. The segmentation provided by Ellram (1993b) has been used to quantify the range. These stages are pre-transactional, transactional and post-transactional.

Both TCO and LCC cover all stages within the life-time of the investment and thus they are similar in this sense. This view is also supported by Ellram (1993b) who stresses the close relation between them. One can argue that LCC put emphasis on the post-transactional cost due to the close relation to the environmental mindset. However there is evidence in literature that LCC regards costs related to the acquisition (Woodward, 1997; Elmakis & Lisnianski, 2006). Consequently, LCC considers both the pre-transactional costs in terms of sourcing and also the transactional stage.

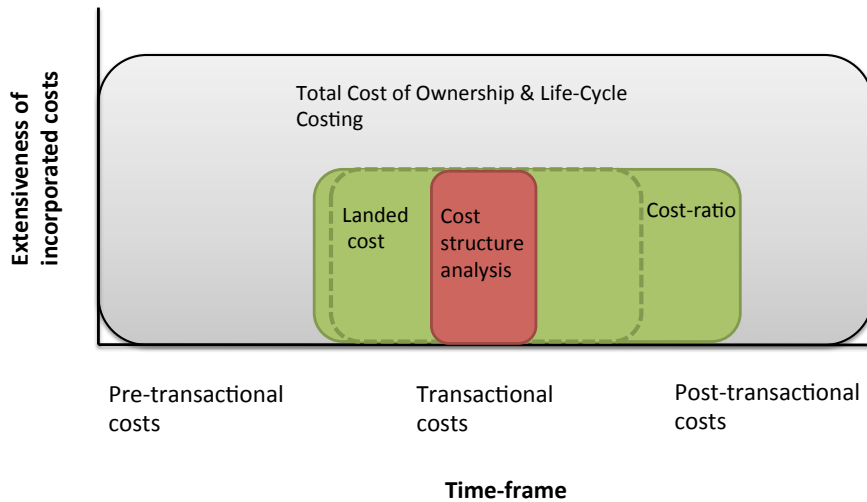


Figure 19 Mapping of purchasing cost models

Table 13 Description of range of cost components

Pre-transactional	Transactional	Post-transactional
<ul style="list-style-type: none"> Identifying a need Investigating sources Qualifying sources Adding suppliers to system 	<ul style="list-style-type: none"> Price Negotiations Ordering Delivery Transportation Tariffs Payment and billing Inspections 	<ul style="list-style-type: none"> Field quality problems Repairs and spare-parts Goodwill and reputation Reversed logistics

Further, the Landed cost model ranges from the costs of the initial purchase to the costs of inventory management, which is related to lead-times. The Cost-ratio model comprises all costs from the initial purchase to all internal operating costs but does also include the cost of quality. Further, Cost structure analysis is predominantly focused on price. Thus, it is concentrated into the transactional stage in Figure 19. In addition, Activity-based costing has not been positioned on this map since it is a prerequisite to TCO. ABC could be seen as an enabler to the remaining purchasing cost models rather than a substitute.

4.9 General Criteria for a Purchasing Cost Model

Given the literature review of different types of purchasing cost models, there are a few criteria, which are important to consider independent of situation and model. These are:

- Include only costs that are manageable to identify and calculate
- The purchasing cost model cannot be complex and should not be time-consuming to calculate in order to support rapid decision-making
- The purchasing cost model should be of general characteristic and support different types of decision, as well as different types of products
- The purchasing cost model should be developed to fit the company in question and regard the specific situational context

4.10 Research Model

Given the discussion about contextual aspects in each section of the theory, Figure 20 has been developed. It focuses on the three applications supplier selection, supplier evaluation and supplier development and which contextual aspects that are of importance when using models including these. The boxes represent the occurrence of the relation between contextual aspects and the applications in the literature reviewed. White/no box denotes no occurrence and the boxes in grey scale show to what extent the literature discuss the relations where the bright nuance means low occurrence and the dark nuance means high occurrence.

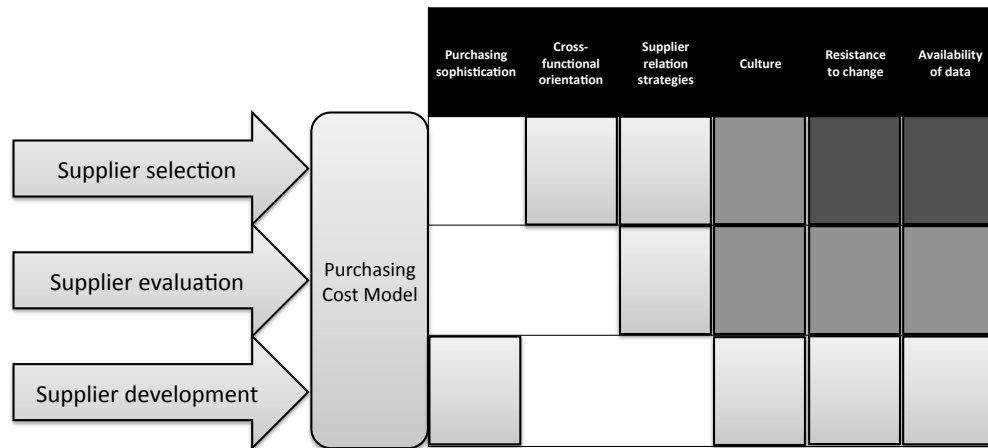


Figure 20 Research model of theory

As seen in the model a contextual aspect that has been added in addition to the initial focus is the availability of data since it is mentioned as an important factor in many articles. However, the relevance of this factor, due to the computerised environment today, can be questioned and is further discussed in the section 'Issues to Highlight' below.

Culture and Resistance to change are present in literature mentioning all three applications, which is interesting and worth noticing for further development of a purchasing cost model. Also it is interesting that the relation between supplier development and contextual aspects is not as present in literature as the other two applications. However, it is the only application mentioned in relation with purchasing sophistication, which makes sense due to higher degree of supplier involvement but in opposition to that it is not mentioned in relation with supplier relation strategies.

Supplier selection being more extensively discussed in relation with contextual aspects was not very unexpected since most literature cover supplier selection. With that in mind it is not said that supplier evaluation and supplier development are independent of contextual aspects. In addition to the previous discussion about purchasing cost model literature in general not examining contextual aspects it can be noticed that literature about supplier evaluation and supplier development in specific is lacking discussion about contextual aspects.

4.11 Issues to Highlight

There are a few aspects worth of mentioning, which concerns the literature review performed. First, we have acknowledged that a fraction of the literature reviewed and used for this theoretical framework originates from the early 90s. This mainly concerns ABC, TCO and Cost-ratio (Table 14). Since this is the case, statements such as ‘Increased computer capacity is required’ and ‘Requires improved software’ should be questioned in terms of the rapid development which has been present the last decade. This will be taken into account in following chapters, which will analyse and compare the purchasing cost models.

As seen in Table 14 useful literature is available to greater extent for TCO, Life-cycle costing, Cost structure analysis and Activity-based costing. In contrast, Landed cost and Cost-ratio is not as well-described. This situation introduces uncertainties regarding the use of these models. However, the information available will still serve as basis for comparison towards the more outspoken purchasing cost models.

We argue that the essentials of each purchasing cost model has been reviewed and presented. However, due to the time limitations, not all information available can be scrutinized.

Table 14 Summary of literature reviewed and used for each purchasing cost model

Purchasing cost model	(Author, year)
ABC	<ul style="list-style-type: none"> • (Anderson & Young, 1999) • (Axelsson et al., 2002) • (Cohen et al., 2005) • (Cooper & Kaplan, 1998) • (Innes & Mitchell, 1995) • (Innes & Mitchell, 1990) • (Kaplan & Anderson, 2003) • (Roodhooft & Konings, 1996) • (Turney, 1989)
TCO	<ul style="list-style-type: none"> • (Alard et al., 2010) • (Bhutta & Huq, 2002) • (Ellram & Siferd, 1993) • (Ellram, 1993) • (Ellram, 1993b) • (Ellram, 1995) • (Ellram & Siferd, 1998) • (Ellram, 1994) • (Ferrin & Plank, 2002) • (McKeen & Smith, 2010) • (Talluri & DeCampos, 2013) • (Wouters et al., 2005)
Cost-ratio	<ul style="list-style-type: none"> • (Roodhooft & Konings, 1996) • (Timmerman, 1986)
Landed Cost	<ul style="list-style-type: none"> • (Beckman & Rosenfield, 2008) • (Feller, 2008)

	<ul style="list-style-type: none"> • (Young et al., 2009)
Life-cycle Costing	<ul style="list-style-type: none"> • (Cole & Sterner, 2000) • (Elmakis & Lisnianski, 2006) • (Hunkeler & Rebitzer, 2003) • (Korpi & Ala-Risku, 2008) • (Norris, 2001) • (Rebitzer & Seuring, 2003) • (Seif & Rabbani, 2014) • (Woodward, 1997)
Cost Structure Analysis	<ul style="list-style-type: none"> • (Ahmed, 1995) • (Ansari et al., 2006) • (Barlow & Rockar, 1982) • (Cooper & Slagmulder, 1999) • (Ellram, 2002) • (Kendt & Nichols, 1992) • (Monden & Hamada, 1991) • (Newman & McKeller, 1995) • (Shank & Fisher, 1999)

5 Empirical Study

This chapter presents the case companies within the interview study, IKEA, Lantmännen, Siemens, TeleCompany and Volvo Cars. The empirical research is based on interviews with additional questions for clarification. The focus is put on the companies' purchasing departments and their use of purchasing cost models. To answer the research questions, benefits & drawbacks, application and contextual aspects are central and described in depth.

5.1 IKEA's Purchasing Cost Model

Industry	Retailer
Focus area	Direct material
Purchasing spend	150 B SEK
Cost of purchasing accounts for: (of total product cost)	67%
Number of purchasers (Direct material)	100 strategic purchasers
Interviewee (March 5th 2015)	Deputy Development Manager, IKEA of Sweden and previously working with purchasing for 7 years

5.1.1 About IKEA

IKEA was founded in 1943 in Älmhult, Sweden by Ingvar Kamrad. IKEA operates in the retail industry by offering affordable ready-to-assemble furniture to a broad range of customers (IKEA, 2015). Today, IKEA employs approximately 164 000 people and the company operates 361 stores worldwide (IKEA, 2015b). IKEA is the world's largest furniture retailer (The Telegraph, 2014) with sales exceeding 30 billion EUR (IKEA, 2015b).

In IKEA's sustainability strategy, People & Planet Positive, they present the targets for year 2020 (People & Planet Positive, 2012). The objective is to grow and reach 500 stores operated by over 200 000 employees with a turnover of 45–50 billion EUR. Along with these goals, IKEA states that a transformation is needed in order to maintain their low-prices when more focus will be put on lowering overall emissions and cope with increasing prices on raw materials (People & Planet Positive, 2012).

5.1.2 Industry and Product Offer

The IKEA business idea is to offer a wide range of home furnishings with good design and function at prices so low that as many people as possible will be able to afford them (IKEA, 2015d).

5.1.3 Technology

IKEA is using the term 'Democratic design' for their product portfolio. Democratic design incorporates five cornerstones, which are form, function, quality, sustainability and price (IKEA, 2015c). These aspects are always considered to create the best product for the customers.

5.1.4 Purchasing at IKEA

The information provided in this section as well as following sections is based on an interview with the Deputy Development Manager, Mathias Jansson (personal communication, 25 March 2015). Jansson has for many years been working with

purchasing at IKEA. He has also been involved with developing the purchasing structure and procedures.

The purchasing at IKEA is, by the interviewee, considered to be well developed in terms of the organisational structure and the procedures of how they work. Today, purchasing at IKEA has a spend of approximately 150 B SEK distributed over 1000 suppliers. Within purchasing of direct material about 100 strategic purchasers are employed to manage the everyday work. Since the product offer is rather diverse, the contribution of purchasing in the end product varies. In general, purchased goods constitute 2/3 of the total product cost.

Organisation-wise, direct- and indirect purchasing are operated separately. In this interview, the focus was put on direct purchasing at IKEA. This function is located in Älmhult, Sweden and they are reporting to the function Range & Supply.

Jansson describes IKEA as an industrial oriented retailer, which means that focus is always put on low cost where purchasing is essential. This mindset has been present since the early beginning of IKEA. Further, IKEA emphasise the concept 'from material to customer' to cover all steps in the value chain.

5.1.5 Purchasing Cost Models

At IKEA, several different purchasing cost models are used. For new products, Should-cost analysis is used to determine the price of the product. When this is established, a Landed cost model is utilised to determine the costs besides the purchased price. Later, additional models are used to estimate costs of quality and sustainability. Quality is measured in different ways. For instance, Cost of Poor Quality (COPQ) is a measure for quality related costs that occur in the value chain such as damages from transportation or internal damages. Distinct from this, they have another measure called Customer Experienced Product Quality (CEPQ) that measures quality from a customer's experience through return statistics, experienced satisfaction etc. There is a total cost perspective where the customer is always in focus in order to obtain affordability.

We will focus on the Landed cost model used by IKEA and describe this model in detail and how it is used in practice. This is because the Landed cost model is the central purchasing cost model whereas the others are supporting tools.

5.1.5.1 Landed Cost Model

As theory suggests, Landed cost at IKEA concern costs related to the transactional stage of a purchase. In addition, the model also incorporates inventory management and tied up capital. Consequently, the cost components included are:

- Purchase price
- Transportation
- Handling costs
- Customs and duties
- Inventory management

All costs until delivery at the designated plant are included in the Landed cost model, which means that additional costs and unique cost may be included.

As previously indicated, the model covers the transactional stage of the purchase. Pre-transactional costs, such as costs of sourcing, are not included in the model. Jansson

claims that these costs are minimal in relation to the direct costs arising. Since IKEA has a supplier base consisting of 1000 suppliers and 10 000 active articles, the costs of administration is small in comparison to the spend of 150 B SEK.

Moreover, the post-transactional stage including for instance quality aspects of goods is taken into close consideration. However, this is not included in the Landed cost model but established by other tools.

The Landed cost model is calculated in internally developed software called Cost Simulation. This tool consists of a database including all the necessary information needed to perform the calculations. Information concerning suppliers, process lead-times, transportation zones, transportation lead-times, transportation routes, products and markets among others are continuously updated and available in the simulation tool. Thus, calculations are performed rather automatically after the user has specified the parameters of interest. Also, Cost Simulation is online in terms of the continuous update, which is performed by employees that are responsible for the tool.

5.1.5.1.1 Benefits

According to Jansson, there is one major benefit of using purchasing cost models. It facilitates decision-making. The output from the purchasing cost model provides basis for correct decision-making other than narrow focus on price. Thus, a more correct view of the sourcing setup will be obtained.

According to Jansson, calculations are standardised and requires minimal effort. In parallel, large volumes are distributed on a limited number of products, which means that the time allocated for calculating the Landed cost per product is minimal.

5.1.5.1.2 Drawbacks & Barriers

Since no purchasing model is complete and does not perfectly reflect reality, one must be aware of the possibility of errors. Jansson highlights this issue and indicates that this could be a problem.

Also, when focusing on purchasing cost models, there is a risk of putting too much emphasis on the numbers at the expense of losing the holistic perspective.

5.1.5.1.3 Application

The Landed cost model is used for both new products after the Should-cost analysis has been determined which corresponds to supplier selection. Also, the model is used for existing products in order to fine-tune sourcing in terms of cost efficiency. By testing different scenarios, the optimal set up can be established. For supplier evaluation and supplier development, other tools are used such as KPIs, benchmarking, LEAN and Six Sigma.

5.1.5.1.4 Success Factors

According to Jansson, there are a few success factors related to managing purchasing cost models. First, it is important to have a clear category structure as well as a organisational structure which can enable the cross-functional work which is central for working with purchasing cost models.

Further, having transparency and sharing information to some extent with the suppliers can be an enabler for purchasing cost models.

Moreover, having the necessary knowledge in place within purchasing is essential. It is important that purchasers can adopt the tool and integrate the methodology into everyday business. Also, availability of the right data is important. To manage this, working cross-functionally is critical. This has been recognised by IKEA and according to Jansson, they have managed this area quite well.

5.1.5.1.5 Contextual Aspects

At IKEA, there is a certain culture that advocates price- and cost awareness. As previously mentioned, the 'Democratic design' promoting low price among other factors makes it natural to work with such purchasing tools. This mindset has been present for multiple years and enables compliance.

In addition, IKEA has close collaboration with their suppliers. Depending on classification, collaboration varies. For suppliers, which are partners or development suppliers, the cooperation with IKEA is extensive. Product development, capacity and performance are some of the activities, which are managed in collaboration. Jansson also stresses the cross-functional orientation present at IKEA. They have specific development teams that consist of a person responsible for the product, a person with commercial focus, a logistician, a purchaser and a product developer. This structure enables purchasing to be involved early in new product developments to find synergies and cost reduction potential in the design phase.

5.1.6 Summary

In terms of purchasing sophistication, Jansson claims that IKEA has come far in the development. Purchasing is centrally led with a clear structure and procedures. They also have managed their internal integration as well as the external integration with suppliers. The cross-functional orientation is significant and evident in the development teams for instance. In addition, the total cost perspective, which is constituted by several purchasing cost models and tools are contributing to the development. As a consequence, IKEA is positioned between External integration and Value chain integration in van Weele's Development model (Figure 21)

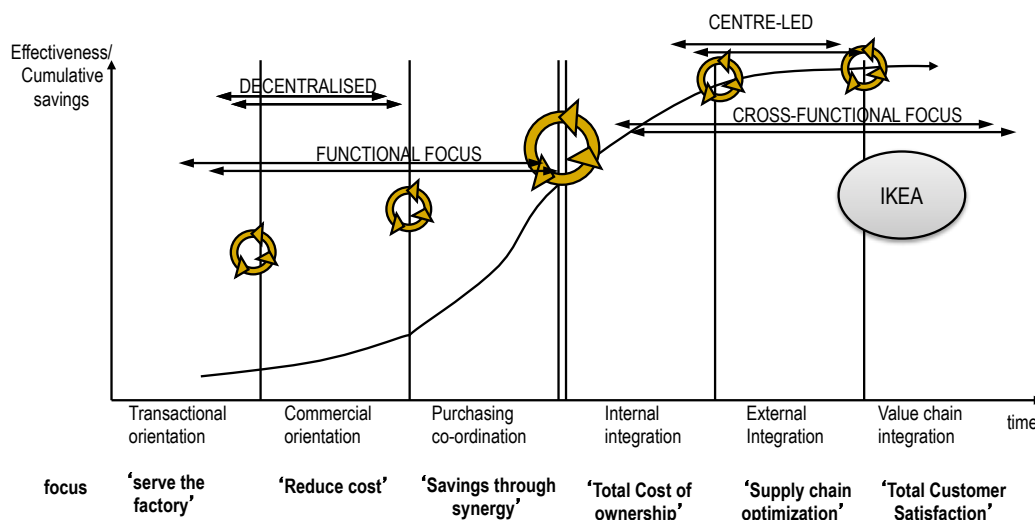


Figure 21 IKEA in the van Weele's (2010) Development Model

A summary of the Landed cost model at IKEA and its characteristics is described below in Table 15.

Table 15 A summary of the Landed cost model at IKEA

Characteristics	Landed cost
Cost components	<ul style="list-style-type: none"> • Purchase price • Transportation • Handling costs • Customs and duties • Inventory management
Benefits	<ul style="list-style-type: none"> • Facilitate decision-making • Easy to use • Minor time allocation needed
Drawback & barriers	<ul style="list-style-type: none"> • Does not perfectly reflect reality • Risk of putting too much focus on numbers
Application	<ul style="list-style-type: none"> • Supplier selection
Success factors	<ul style="list-style-type: none"> • Clear category structure and organisation • Transparency and sharing of information • Internal knowledge • Adoptability • Available data
Contextual aspects	<ul style="list-style-type: none"> • Culture • Supplier relation strategies • Cross-functional orientation

5.2 Lantmännen's Purchasing Cost Model

Industry	Agriculture and food processing
Focus area	General purchasing and Purchasing within Lantmännen Cerealia AB
Purchasing spend	N/A
Cost of purchasing accounts for: (of total product cost)	Large fraction, some products are outsourced entirely
Number of purchasers (Direct material)	8 (Lantmännen Cerealia AB)
Interviewee (March 5th 2015)	Category Manager Pasta & GoGreen

5.2.1 About Lantmännen

Lantmännen is an agricultural cooperative originating from Sweden (Lantmännen, 2015). This means that the company is owned by 29 000 farmers and their objective is to contribute to the overall profitability and generate return on investment (Lantmännen, 2015).

There are several companies within Lantmännen operating in different areas. Some of them are related to food and some are diversified into other areas of business such as Lantmännen Finans, Lantmännen Energi and Lantmännen Agroetanol (Lantmännen, 2015c).

5.2.2 Industry and Product Offer

Lantmännen is responsible for processing of farmland resources. By contributing with expertise and innovation, both a responsible mindset as well as profitability can be obtained (Lantmännen, 2015). The company operates internationally with Sweden as the foundation (Lantmännen, 2015).

Lantmännen owns, distributes and sells brands such as AXA, Kungsörnen, Start, Hatting and Regal among others (Lantmännen, 2015b)

5.2.3 Technology

The prime tasks of Lantmännen are supplying members with seeds, fertiliser, plant protection and feed. In addition, Lantmännen receives, storages, refines and sells what farmers cultivate (Lantmännen, 2015b).

5.2.4 Purchasing at Lantmännen

The information provided in this section as well as in following sections is based on the interview with Robin Zimmermann, a Category Manager in Lantmännen Cerealia AB (personal communication, 19 March 2015).

Purchasing within Lantmännen is both managed centrally on a corporate level and in individual companies. Purchasing concerning common commodities and products are managed on the corporate level. Since this type of purchasing affects several companies within Lantmännen Corporation, it is centrally led in order to generate synergies such as economies of scale and coordination of transports. The purchasing director reports to the Supply Chain division, which later reports to the corporate management.

The corporate level purchasing also supports the purchasing functions within the different companies. Each company has an individual purchasing department that operates strategically, tactically and operationally. Here, purchasing that only concern the

individual company is managed according to a separate organisational structure. When improvements and changes are carried out, the strategic purchasing on the corporate level assists these companies to manage the transformations.

When Total Cost of Ownership was introduced at Lantmännen, the corporate level carried out a program called Supply Chain Management Excellence. This group communicated the change to the different companies by having the top-management support from where the change was generated. One of the purposes of this group was to manage the transition and implement Total Cost of Ownership.

5.2.5 Purchasing Cost Models

Lantmännen is today utilising one purchasing cost model, which is Total Cost of Ownership (TCO). The TCO model was, as previously mentioned, initiated on a corporate level and then implemented within the different companies within Lantmännen. The framework was provided by external consultants and later updated by the internal corporate support function.

5.2.5.1 Total Cost of Ownership

The purpose of the TCO model is to visualise the total cost structure of different commodities and to provide a basis for improvements and changes. Further, the model enables efficient purchasing work by highlighting and addressing the critical cost components of the product life-cycle.

In practice, a general TCO structure is the foundation for calculations. This model is later modified for each commodity to fit the specific situation. As a foundation for the TCO, Lantmännen has an ABC approach to identify costs of different activities.

The TCO model consists of two layers. The first layer describes the different areas which the model embodies. These are:

- Purchasing
- Logistics
- Warehousing
- Operations
- Quality
- Administration

These are the high-level cost drivers and within the TCO model, they are broken down into tangible cost components. Some of them are presented in Table 16.

Table 16 Cost components in Lantmännen's TCO

Purchasing	Logistics	Warehousing	Operations	Quality	Admin
<ul style="list-style-type: none"> • Price • Payment terms • Cost of sourcing 	<ul style="list-style-type: none"> • Transportation • Taxes • Customs duties • Handling • Non-conforms 	<ul style="list-style-type: none"> • Tied-up capital • Warehousing • Risk • Obsolescence 	<ul style="list-style-type: none"> • Materials • Inflation • Time • Maintenance • Development • Phase out 	<ul style="list-style-type: none"> • Supplier KPIs • Obsolete goods 	<ul style="list-style-type: none"> • Overhead

The costs are derived either externally from suppliers or internally and later calculated and summarised for different products. Qualitative aspects, which are difficult to quantify such as taste and brand perception are not included in the TCO model. These

aspects are of course taken into close consideration but outside the TCO model. According to the interviewee, the pre-transactional, transactional and post-transactional stages are taken into account. As for the pre-transactional stage, the cost of sourcing is included. In contrast, post-transactional cost components such as quality are considered as long as they are quantifiable. The data often comes from the suppliers' KPIs in terms of degree of obsolescence among others.

Since Lantmännen provides fast-moving consumer goods, the price is often essential. The purchase price sometimes composes 95 % of the total product cost, which means that this cost component is strategically important. As for this area, Lantmännen evaluates the suppliers' cost structures and search for improvement in collaboration with them.

The TCO model is established for each product within the different companies on a one-time occasion. The model is later updated on a yearly basis where cost components are adjusted to match real-time settings.

Microsoft Excel is used to house the purchasing cost model. Thus, it is updated manually with data provided from suppliers and the ERP-system. As a consequence, the model is operated offline.

5.2.5.1.1 Benefits

The TCO model provides a clear description of what you actually pay for. When looking beyond the price, the costs for transportation, handling and packaging among others are visualised and quantified. Hence, other dimensions for evaluation are enabled.

In addition, the opportunity to identify and visualise problems within the value chain is seen as a benefit. The holistic perspective enables evaluation of the entire supply chain and not only the purchasing process.

5.2.5.1.2 Drawbacks & Barriers

Along with the implementation of TCO, some drawbacks have arisen. The obvious drawback is the time required to perform the TCO model. Due to the extensive covering of cost components, the process of identifying and quantifying the costs is time consuming. This is why the model is only updated on a yearly basis and also why the project was carried out thoroughly the first time when TCO was introduced at Lantmännen.

Also, difficulties concerning suppliers and their willingness to share information are evident. According to the interviewee, this issue is central to overcome in order to manage a successful TCO model.

5.2.5.1.3 Application

The TCO model is mainly used to facilitate general decision-making regarding the entire supply chain. The interviewee clarifies that a TCO model cannot be established in the process of selecting a supplier among a number of candidates. This would require major time allocation and effort as well as cooperation from the candidates. Thus, the model is used to evaluate the current situation in terms of questioning both internal and external processes.

5.2.5.1.4 Success Factors

The interviewee has identified several success factors in relation to the implementation of TCO. First, top-management support is essential as in any other transformation. Also, the model should be easy to use as well as communicative in order to be successful. In specific, the model at Lantmännen uses different layers to present data. In their TCO model, the first layer is general and easy to grasp whereas the second layer is more into details with concrete cost components. In addition, the model can be more pedagogical by using a simple layout, different colours and not incorporating too much data on each spreadsheet.

5.2.5.1.5 Contextual Aspects

There are different aspects affecting whether the implementation of TCO will be successful or not. According to the interviewee, cultural aspects have impact on the results. Different divisions and companies within the Lantmännen cooperative have different abilities to adapt to changes. In general, younger employees are more open to transformations and changes in procedures according to the interviewee.

In total, Lantmännen is regarded as an adaptive company, which is open to changes and improvements. The corporate purchasing function has mandate from top-management to carry out changes and they also support the companies within Lantmännen to implement changes.

The cross-functional mindset is commonly shared by employees within Lantmännen. According to the interviewee, several activities, which are performed on a regular basis require cross-functional work in order to be managed. Some of these are:

- Standardisation of specifications
- Innovation and finding substitutes
- Warehousing optimisation
- Co-transportation
- Improved forecasts in collaboration with suppliers

These activities require for instance purchasing to collaborate with other departments such as engineering, warehousing personnel and R&D to carry out the changes.

Further, Lantmännen incorporates suppliers in their daily work. When improvements related to suppliers are identified through TCO, they are introduced into collaborative work in order to solve the issues and improve the overall situation. Also, forecasts are shared intensively to better manage the availability of goods throughout the supply chain.

5.2.6 Summary

To illustrate the purchasing sophistication at Lantmännen, the interviewee was asked to put them in the development model by van Weele (2010) (Figure 22). Lantmännen was put in the fifth stage, external integration. To motivate this the interviewee had a few strong arguments. First, the distinction between a centrally led corporate level purchasing and decentralised company purchasing clearly puts them in a higher stage. Further, the cross-functional orientation with internal collaboration with departments such as R&D, Quality and Operations is of importance. They clearly have a Total cost of ownership focus and last but not least they are integrating suppliers externally, which places Lantmännen in the fifth stage, external integration.

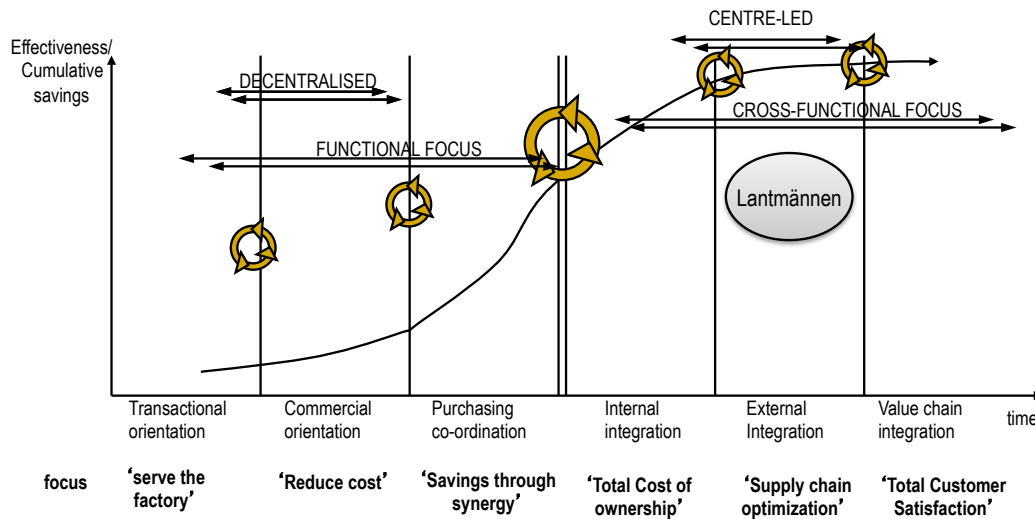


Figure 22 Lantmännen in van Weele's (2010) Development model

Also, a summary of the different characteristics related to the TCO model is presented in Table 17 below.

Table 17 A summary of Lantmännen's TCO model

Characteristics	Total Cost of Ownership
Cost components	<ul style="list-style-type: none"> • Purchasing • Logistics • Warehousing • Operations • Quality • Administration
Benefits	<ul style="list-style-type: none"> • Understanding • Identify improvements
Drawback & barriers	<ul style="list-style-type: none"> • Time-consuming • Availability of information
Application	<ul style="list-style-type: none"> • Supply chain decision-making
Success factors	<ul style="list-style-type: none"> • Top-management support • Easy to understanding • Pedagogical presentation of data
Contextual aspects	<ul style="list-style-type: none"> • Corporate culture • Cross-functional orientation • Supplier relation strategies • Purchasing sophistication

5.3 Siemens Industrial Turbomachinery's Purchasing Cost Model

Industry	Energy sector
Focus area	Direct purchasing
Purchasing spend	6-7 B SEK
Cost of purchasing accounts for: (of total product cost)	75 %
Number of purchasers (Direct material)	120 in total where 60 are strategic
Interviewee (March 5th 2015)	Micael Hedlund, Global Purchasing Director

5.3.1 About Siemens and Siemens Industrial Turbomachinery

Siemens group is a global corporation manufacturing equipment ranging from power generation, transmission and distribution to smart grid solutions and efficient application of solar energy (Siemens, 2015). The company was founded in 1847 and today Siemens employs 343 000 people in over 200 regions worldwide (Siemens, 2015). Siemens Industrial Turbomachinery (hereafter SIT), located in Finspång, Sweden, is a business unit within the Siemens Corporation that manufactures steam and gas turbines for the energy sector (Siemens Industrial Turbomachinery AB, 2015).

5.3.2 Industry and Product Offer

As mentioned, SIT operates in the energy sector by selling gas turbines that provide power generation to their customers (Siemens Industrial Turbomachinery AB, 2015b). The turbines have a capacity range from 5 to 50 MW and in SIT's product offer post-installation services are offered through their service division (Siemens, 2015b). This involves the provision of spare parts, overhauls, training and upgrades of the turbines (Siemens, 2015b).

5.3.3 Technology

The Technology in SIT's turbines is a world leading combination of high efficiency and low emission rates (Siemens Industrial Turbomachinery AB, 2015b). The turbines are mainly sold to power plants but are also used as power source for compressors and pumps in the oil and gas industry. (Siemens Industrial Turbomachinery AB, 2015b).

5.3.4 Purchasing at Siemens Turbomachinery

The information in this section, as well as the following sections, is based on an interview with Micael Hedlund, Global Purchasing Director at SIT (personal communication, 20 March 2015).

Purchasing at SIT is divided into direct- and indirect material where both departments are reporting to the purchasing director who is part of the board of SIT. Direct material refers to all material needed for the production of turbines where purchased material accounts for 75 % of the product cost. For direct material, SIT has about 800 suppliers and roughly 120 of these are categorised as strategic. The purchasing organisation consists of 120 purchasers where about 60 of these are working strategically.

Within direct purchasing, the department is divided into several units where each is responsible for the purchasing of a certain type of product and the management of suppliers related to these.

5.3.5 Purchasing Cost Models

SIT is utilising a purchasing cost model, which has been developed internally. The purchasing cost model is referred to as Life-time costing since it takes into account the post-transactional stage for the products including after-sales services. This model covers a broad spectrum where quality in the post-transactional phase has an important role. Hedlund means that the customers today do not only want to buy the turbine itself but require the whole package including post-installation services. A breakdown at customer site can therefore be very costly for SIT. This means that it can be worthwhile for SIT to consider quality to a larger extent and paying extra for improved quality.

5.3.5.1 *Life-time Costing*

The purpose of the Life-time costing model is to evaluate suppliers and to uncover costs related to the purchase in the transactional phase as well as the post-transactional phase. The output is a good basis for comparison between different suppliers and a cornerstone in the following e-bidding where suppliers must be compared on equal terms. The e-bidding is SIT's way of gathering a few chosen suppliers and let them compete to get the contract. The winner is the supplier with the lowest total cost given the life-time calculation in addition to their bid.

Hedlund says that the model is an easy-to-use model, which is based on estimations rather than exact numbers. The cost components included are:

- Price
- Transportation
- Expediting
- Other or product specific costs
- Quality costs

Costs related to quality are an important component in the purchasing cost model. No administration costs are included and the cost of changing supplier and sourcing a new supplier is seen as an investment, which is not included in the purchasing cost model. Thus, the pre-transactional phase is not covered by the model but is somehow considered in the purchasing process.

All cost components are calculated internally and the point of gravity of the model is put on the transactional phase but as previously mentioned, the post-transactional phase is of great importance due to SIT's product offer in terms of maintenance. For the post-transactional costs, a risk premium is calculated based on the supplier's quality record and delivery capability.

The directives to work with a cost model and the actual model comes from Siemens' headquarter in Germany. This model is, according to Hedlund, upgraded or changed about every three years but the basic principle is always the same. The updates are mostly visual improvements or add-ons that put more focus on the environment.

The model today is Microsoft Excel-based and data has to be entered manually. The model is therefore considered to operate offline. Further, the model is standardised to fit most purchases conducted by SIT.

5.3.5.1.1 Benefits

Hedlund sees some major benefits when working with their Life-time costing model. First of all, the model considers more than the price and highlights the importance of

seeing the total cost over the life-cycle. Further, the model provides a good basis for negotiations where SIT gets a better view of the costs involved with a certain supplier. This requires an acceptance of transparency from the supplier's side, which is not the case for all suppliers. However, SIT encourages transparency since this is important for a long-term relationship.

Furthermore, SIT has experienced benefits related to supplier management costs. The Life-cycle costing model reduces the cost of future risks involved with poor quality.

5.3.5.1.2 Drawbacks & Barriers

The first drawback mentioned by the interviewee is the fact that a model is only the theoretical view and does not always reflect reality. Further, it only gives an instantaneous picture of the costs. Factors such as currency changes or shipping tariffs can affect the total cost considerably and the outcome of the model can vary from time to time.

Further, working with cost modelling is time consuming when performed manually. Calculating transportation costs is especially time-consuming since this is not part of the purchasers' regular tasks. If one component of the model ought to be automated, Hedlund argues the transportation costs would yield most time-savings.

5.3.5.1.3 Application

As mentioned the Life-time costing model is used for supplier selection. The model facilitates e-bidding and enhances decision-making by complementing suppliers' bids with a holistic cost perspective.

5.3.5.1.4 Success Factors

The interviewee suggests that the calculations should be performed as close to the decision as possible. This is because of the contingency aspect that currencies and freight tariffs generate.

Another important success factor is to create a culture where all purchasers use the model. Hedlund means that the easiest way to accomplish this is by continuously ask for cost calculations for all sourcing decisions. In relation to this, top-management support is essential for the culture to be established.

5.3.5.1.5 Contextual Aspects

The interviewee sees the industry specific characteristics, such as competition and demanding customers, as important contextual aspects that trigger the need for a purchasing cost model. The interviewee highlights the automotive industry as a good example but advocates that several other industries are evolving towards the same nature.

Furthermore, the supplier relations are mentioned where it is said that long term relationships require a purchasing cost model but that it also works the other way around. Hence, by introducing a purchasing cost model to discussions with suppliers, the relation towards these actors might evolve. Moreover, these kinds of relationship require continuous evaluations where a purchasing cost model plays an important role.

Another aspect mentioned is the need for a cross-functional orientation in the organisation. The Life-time costing model at SIT requires groups consisting of people from different departments such as logisticians, technicians and purchasers.

Last but not least, the culture is mentioned as an essential contextual aspect that affects the purchasing cost model and the success of it.

5.3.6 Summary

To illustrate the purchasing sophistication at SIT, the interviewee was asked to position the company in the development model (Figure 23) provided by van Weele's (2010). Siemens sees themselves in the fifth stage, External integration, since they are involving suppliers, and even suppliers' suppliers, in the product development phase. Within SIT, purchasing is centrally led and directives come from the headquarter in Germany. Further, they are working cross-functionally where their Life-time costing model requires input from several different departments.

Regarding cost focus, SIT does have a Total Cost of Ownership mindset where they consider more than the price and the transactional phase only.

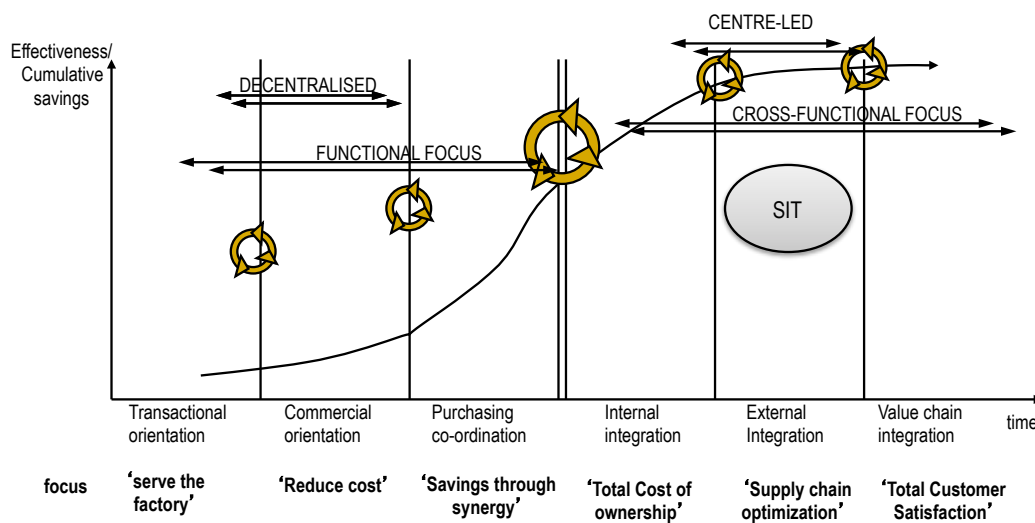


Figure 23 SIT in van Weele's (2010) Development model

A summary of above discussed topics can be found in Table 18 below.

Table 18 A summary of SIT's Life-time costing model

Characteristics	Life-time costing
Cost components	<ul style="list-style-type: none"> • Price • Transportation • Expediting • Quality • Other or product specific costs
Benefits	<ul style="list-style-type: none"> • Considers more than price only • Good basis for negotiations • Creates transparency • Reduced supplier management risks
Drawback & barriers	<ul style="list-style-type: none"> • Does not reflect reality • Instantaneous picture • Time consuming
Application	<ul style="list-style-type: none"> • Supplier selection
Success factors	<ul style="list-style-type: none"> • Use model just before decision • Create a culture that encourages use of model • Top-management support
Contextual aspects	<ul style="list-style-type: none"> • Industry characteristics • Supplier relation strategies • Cross-functional orientation • Culture

5.4 TeleCompany's Purchasing Cost Model

Industry	Communication Technology
Focus area	Product Purchasing
Purchasing spend	130 B SEK
Cost of purchasing accounts for: (of total product cost)	60 %
Number of purchasers	800 Globally
Interviewee (March 5th 2015)	Head of Site Products Sourcing

5.4.1 About TeleCompany

Due to the company's request to be anonymous, we will not cover specific company facts in this part. The company is however working with communication technology and is present worldwide. Due to the desire to be anonymous, the company will in this thesis be referred to as TeleCompany.

5.4.2 Industry and Product Offer

The industry as a whole has many different actors but a few major corporations. This part cannot be covered due to the anonymity reasons.

5.4.3 Technology

This part cannot be covered due to the anonymity reasons.

5.4.4 Purchasing at TeleCompany

The information provided in this section as well as the following sections are based on the interview with a Purchasing Manager for one of the business units, focusing on physical goods, at TeleCompany (Personal communication, 10 March 2015).

Due to the orientation of the product and service portfolio at TeleCompany, their purchasing functions are not divided into direct and indirect spend. Instead, the purchasing is separated with one purchasing director for physical products and one purchasing director responsible for service-related purchases. These directors are also part of the management team, governing all business units, which is reporting to the board of executives. In other words, TeleCompany does not have a Chief Procurement Officer (CPO) on the board, but purchasing is still closely related to strategic company decisions and is not located within other functions such as Manufacturing or Research & Development. This type of organisational structure generates direct and indirect purchasing in both the physical-product purchasing and in the service purchasing. The information in the following sections is mainly focused on the product purchasing but is also touching upon, on a conceptual level, the service purchasing.

Within the product-purchasing department there are several units responsible for certain types of products. These units are however working cross-functionally and together, the teams are utilising the function Networks Sourcing. Networks Sourcing is part of TeleCompany's sourcing organisation and has the purpose of handling sourcing related to their product business, meaning the development and delivery of products, both hardware and software.

In total, the supplier base consist of approximately 30 000 active suppliers. However, 1500 of these suppliers correspond to 80 % of the total spend. To manage these suppliers, TeleCompany has 800 strategic purchasers globally.

5.4.5 Purchasing Cost Models

For product purchases at TeleCompany, a Landed cost model is primarily used. This model is complemented with Cost-engineering. This section will first describe the two models in general followed by in-depth sections focusing on benefits, drawbacks & barriers, application, success factors and contextual aspects. The latter section is however more focused on the Landed cost model since this was primarily discussed during the interview.

5.4.5.1 *Landed Cost Model*

The Landed cost model at TeleCompany is mainly used for supplier selection when choosing which supplier that will deliver to a certain market. Further, the model is also used for supplier development where it focuses on improving the suppliers' performance. The model targets the transactional phase and is somewhat dependent on the Inco-terms negotiated with the suppliers. In their definition of Landed cost, TeleCompany is referring to the total cost of a delivery to point of location. Within this range the model has the following cost components:

- Initial price
- Cost of transportation (Depending on Incoterms)
- Customs duties
- Warehousing fees for goods in transit (Depending on Incoterms)

When working with a Landed cost model, TeleCompany sees Microsoft Excel as a great tool that is sufficient enough and well known for most employees.

5.4.5.2 *Cost-engineering*

The Cost-engineering is, in comparison to the Landed cost model, more detailed. The focus of Cost-engineering at TeleCompany is to, in detail, break down the cost structure in order to understand and validate the price of purchased components. It can both be used in the design process of new products where a design-to-cost approach is used and for existing products as an evaluation through cost breakdown.

5.4.5.3 *Benefits*

The interviewee sees many benefits with the Landed cost model at TeleCompany. First, the model considers costs beyond the price. Having more information is of great importance when entering negotiations with new as well as existing suppliers. This does not only improve the negotiation position for TeleCompany. In many cases, both parties end up with a better result.

The Cost-engineering model also allows TeleCompany to put focus on certain parts for improvement. This of course requires a lot of transparency from the suppliers' side but TeleCompany argues that a good supplier relation needs transparency and suppliers that emphasize this should be rewarded.

5.4.5.4 *Drawbacks & Barriers*

In terms of drawbacks, TeleCompany implies that managing a Landed cost model gives extra administrative work if not conducted effectively. They argue that these types of models often are over engineered, meaning that they include too many parameters and are too difficult to use in everyday work. This causes a situation where compliance is low and the cost savings are not materialised. There is therefore a fine balance between having an extensive model and a model that works in practice.

Further, the interviewee at TeleCompany also sees a drawback when relying too heavily on the Cost-engineering model. It might not be 100 % correct and perhaps it does not reflect the real costs sufficiently. In this case, miscalculations can result in poor decision-making.

According to TeleCompany, the access to data is a limiting factor when working with cost modelling. If the situation was ideal, with all data available at hand, the models would be much more refined and a real picture of the reality. They find this to be a common problem that has to be worked around with estimations and models of a conceptual orientation.

5.4.5.5 Application

The Landed cost model is used in supplier selection when TeleCompany is choosing a supplier for delivery of a certain product to a given market. This can be a question of sourcing globally or locally and the chosen supplier will be the supplier that has the overall best performance, in other words, the lowest cost when considering all transactional factors while still providing sufficient quality. Another part of the supplier selection application is the initial make-or-buy decision where they compare outsourcing with their internal production costs. This is however said to be more applicable to whole systems than to the purchased components.

The Landed cost model is to some extent also used for supplier development. The information gathered in the model is discussed with the supplier in terms of feedback. The centre of this feedback is price performance, which measures how the supplier performs in relation to its selling price. This is a great foundation for pinpointing areas of improvement and according to TeleCompany these are often related to the supplier's logistics strategy.

Cost-engineering is used to evaluate and scrutinise suppliers' bids. By calculating the 'should-cost', greater understanding of suppliers and the components sourced can be obtained. This will provide better conditions when performing negotiations with suppliers. Also, when applying the bottom-up approach, new projects can be evaluated.

Further, supplier evaluation and supplier development are not facilitated by the Cost-engineering model in terms of calculations. However, contracted suppliers must be willing to collaborate in terms of development with TeleCompany. Hence, this is a decision-criteria for supplier selection.

5.4.5.6 Success Factors

In terms of success factors for an effective use and implementation of a purchasing cost model, TeleCompany has identified some aspects. A successful Landed cost model presupposes involvement of different departments and it is essential to create trust for the model in all parts of the organisation. This is ensured through working cross-functionally and not only involving the responsible purchasing department, but also other functions such as R&D and Operations.

Further, it is important to find a balance between breadth and simplicity when developing the model. The interviewee means that many models described in theory are too complex to work with in practice. It can be vigorous for a company to have a model that is standardised and requires minimal time for calculation but still is applicable to most purchases. However, some scenarios require a more extensive analysis and due to

high costs or large volume, the savings achieved from the analysis can then be worthwhile. This approach of having different tools for different decisions translates to having a standardised purchasing model for the majority of decisions in combination with a specific model for certain decisions corresponding to major financial impact.

5.4.5.7 Contextual Aspects

TeleCompany sees the corporate culture as an important contextual aspect. It is crucial for departments to collaborate and to use the model in everyday business. For this matter, it is just as important for the model to be easy to understand for the purchaser as it has to be understandable for non-purchasers, i.e. a product developer. In relation to this, the company must have a cross-functional orientation.

Furthermore, the supplier relations are of importance for the purchasing cost model. The relation must provide transparency for cost components to be visible, especially in the case of cost-engineering. TeleCompany argues that the relations should be focused on cost reduction instead of cost avoidance.

5.4.6 Summary

To summarise the purchasing at TeleCompany, van Weele's (2010) development model has been used (Figure 24). The interviewee was asked to put TeleCompany into the model and they ended up in the phase of external integration. They are working with a cross-functional focus where the purchasing department is working together with other departments, both to get input for decisions and to influence the product and service development according to cost reduction strategies.

The interviewee says that TeleCompany is working with integration of their suppliers but a future goal is to integrate them to a larger extent in product development. This would mean integrating them in an earlier stage where they can help defining component specifications both according to 'design to cost' and 'design to quality'.

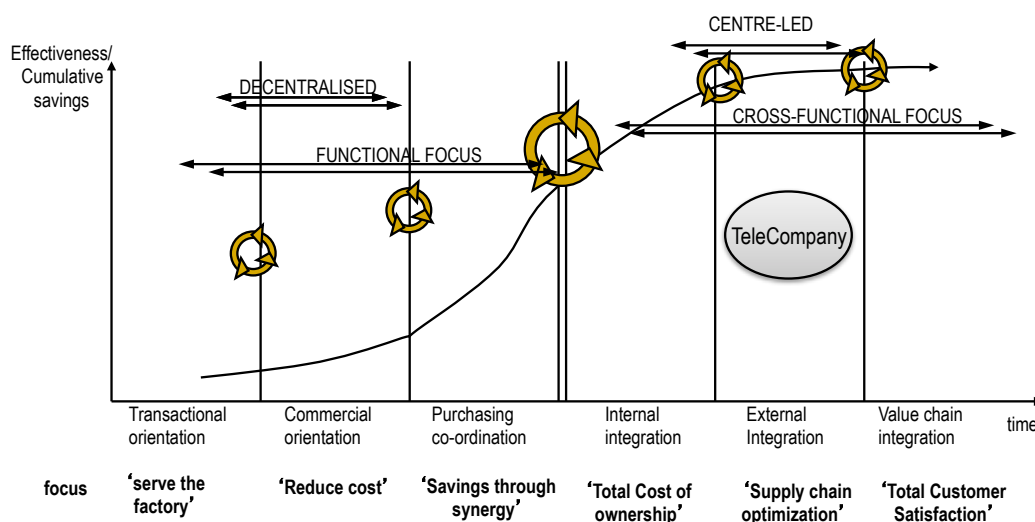


Figure 24 TeleCompany in van Weele's (2010) Development model

A summary of the topics previously discussed for the Landed cost model and Cost-engineering can be seen in Table 19 A summary of TeleCompany's purchasing cost models.

Table 19 A summary of TeleCompany's purchasing cost models

Characteristics	Landed Cost	Cost-engineering
Cost components	<ul style="list-style-type: none"> • Initial price • Cost of transportation • Customs duties • Warehousing fees 	<ul style="list-style-type: none"> • Bill of material • Manufacturing • Overhead
Benefits	<ul style="list-style-type: none"> • Considers more than price only • Good negotiation basis • Identifies improvement areas 	<ul style="list-style-type: none"> • Encourages transparency • Identifies improvement areas
Drawback & barriers	<ul style="list-style-type: none"> • Extra administration • Too complex • Availability of good data 	<ul style="list-style-type: none"> • Does not necessarily reflect the real cost structure
Application	<ul style="list-style-type: none"> • Supplier selection • Supplier development 	<ul style="list-style-type: none"> • Supplier Selection
Success factors	<ul style="list-style-type: none"> • Involve whole organisation cross-functionally • Balance between breadth and simplicity • Easy to use 	<ul style="list-style-type: none"> • Involve whole organisation cross-functionally
Contextual aspects	<ul style="list-style-type: none"> • Corporate culture • Cross-functional orientation • Supplier relation strategies 	<ul style="list-style-type: none"> • Corporate culture • Cross-functional orientation • Supplier relation strategies

5.5 Volvo Cars' Purchasing Cost Model

Industry	The Automotive Industry
Focus area	Direct material
Purchasing spend	100 B SEK (80 direct & 20 indirect)
Cost of purchasing accounts for: (of total product cost)	70 %
Number of purchasers (Direct material)	230
Interviewee (March 5th 2015)	Vice President & Head of Car Purchasing

5.5.1 About Volvo Cars

Volvo Cars was founded in 1927 in Gothenburg (Volvo Cars, 2015). More recently, in 2010, the company was acquired by Zhejiang Geely Holding Group (Geely Sweden AB, 2013). Today, Volvo Cars is growing in a rapid pace. According to European Automobile Manufacturers' Association, Volvo Cars grew by 10,6 % during 2014 and outperformed the other premium brands in that sense (Automotive purchasing, 2015). Also, Volvo Cars strives to reach a global sales of 800 000 cars yearly (Ludwig, 2014).

Recently, Volvo Cars has reclaimed the responsibility of the inbound and outbound logistics (Ludwig, 2014). To better understand and control the supply chain management, Volvo Cars has step-wised repossessed outbound- and inbound logistics purchasing and operations since 2012 (Ludwig, 2014).

In 2013, Volvo Cars received the European Supplier Choice award (Automotive News Europe, 2013). The survey was conducted by Deloitte on behalf of Automotive News Europe and assesses the automakers' ability to adopt and implement suppliers' innovations.

5.5.2 Industry and Product Offer

Volvo Cars operates within the Automotive Industry and they strive to target the premium segment (Geely Sweden AB, 2013). Today, Volvo Cars have four core values, quality, design, environment and safety (Volvo Cars, 2015c).

5.5.3 Technology

Volvo Cars has a great history of providing new technology and safety has always been a major concern (Volvo Cars, 2015b).

5.5.4 Purchasing at Volvo Cars

The information provided in this section as well as the following sections are based on the interview with Martin Lidén, Vice President & Head of Car Purchasing (personal communication, 5 March 2015).

Lidén means that the intensive competition and the low margins within the automotive industry require a well developed purchasing department, which they have at Volvo Cars. As seen in the organisational structure (Figure 25), the department of purchasing is reporting to an overall function called 'Purchasing and Manufacturing'. Lars Wrebo who is responsible for this function is also part of the top-management team consisting of R&D, Sales and Marketing among others.

Further, purchasing is divided into 'Car Purchasing' (Direct), governed by Martin Lidén, and 'Powertrain and IDP (Indirect), governed by Anders Svensson. In general,

purchasing accounts for 70 % of the total product value at Volvo Cars. In addition, major investments are put into capital equipment and development and integration of suppliers. Thus, Purchasing is a crucial function, which needs to be streamlined in order for Volvo Cars to be successful.

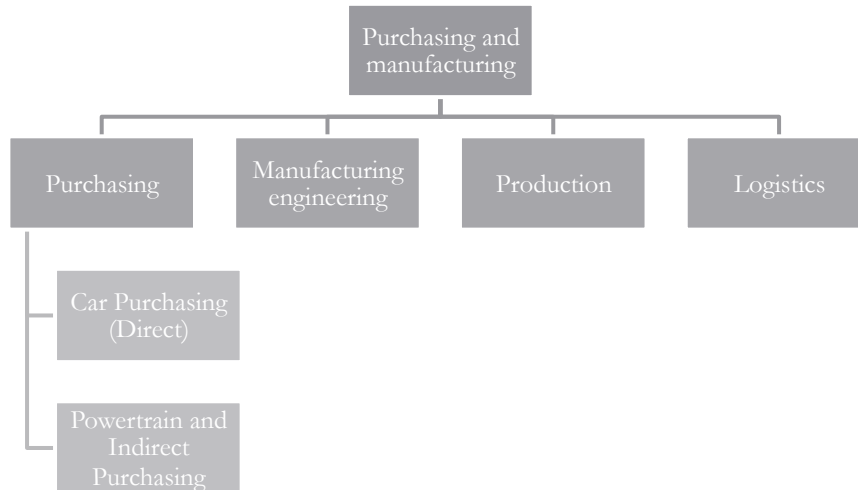


Figure 25 Organisational structure of Volvo Cars

Concerning the direct purchasing at Volvo Cars, 500 suppliers are utilised. Further complexity arises since these suppliers in total compose 1200 production sites all over the globe. Within direct purchasing, there are over 60 000 active components and the staff consists of approximately 230 employees. To support the purchasers, there are functions such as Cost estimating that works with estimating purchasing prices through a Should-cost model. To illustrate, Volvo Cars produces one car every second minute and the margin of these is only a few percentages. This generates strict requirements for the purchasing department in order to contribute to the overall profit. Minor miscalculations can result in major costs and to prevent this, clear procedures are stated and decisions are based on calculations and facts rather than experience and “gut feeling”.

5.5.5 Purchasing Cost Models

At Volvo Cars, two purchasing cost models are used. These serve different purposes and thus the design of them is quite unlike. The models are:

- Landed cost model
- Should-cost model

5.5.5.1 Landed Cost Model

The Landed cost model is used to determine which supplier to choose when sourcing a new component (supplier selection). In addition, net present value (NPV) calculations are also performed for the total purchase turnover. The model targets the transactional phase, determining the total cost starting from the order and ending when the goods have arrived to Volvo Car’s plant. Their argument for not including the pre-transactional phase, such as cost of sourcing, is because it has minimal financial impact compared to the transactional phase. Also, they do not include post-transactional costs such as the cost of insufficient quality. When a supplier has been chosen, Volvo Cars expect the supplier to perform as stated in the contract. This is possible since Volvo Cars has evaluated the supplier on beforehand in terms of capability and provided quality. This is

done in the supplier's plant. Thus, assuming quality issues is unnecessary according to the interviewee.

As indicated above, the model aims to facilitate decision-making when having several quotes from different suppliers. The model is institutionalised in a process named the Global Sourcing Process, a process with the purpose to enhance compliance and ensure a correct purchasing process. In addition to this process, a sourcing committee is established. This committee has to approve all new sourcing decisions before the purchases are completed. In this process, the Landed cost has a central role. Decisions must be made upon factual calculations.

The Landed cost model has the following cost components:

- Purchase price
- Delivery and freight rates
- Customs duties
- Packaging
- In-transit inventory cost (Depending on Incoterms)

Volvo Cars often considers the whole project cost when calculating their Landed cost. This means that price, packaging and transportation are multiplied by yearly volume and how many years the project is planned for. The cost for additional tools or equipment needed for the product in this particular project is then added as a one-time cost on top of the volume dependent cost. Thereafter a present value calculation is made according to Volvo Cars internal rate of return.

As mentioned before, all these cost components relate to the transactional phase. In some cases, in-transit inventory cost is included. This is when Volvo Cars is responsible and owns the goods when it leaves the supplier. Pre-transactional costs are not included. According to Lidén, these costs are insignificant in Volvo's context since they correspond to only a fraction of the total spend. Post-transactional costs such as quality issues are not included. According to Lidén, these are not relevant because Volvo Cars expect the supplier to perform according to the agreement. In addition to the Landed cost model, suppliers are also evaluated based on their capabilities as well as the general characteristics of the company.

Moreover, the model is calculated manually and Volvo Cars has developed the model internally, using Microsoft Excel. The model is also standardised and can be used for all types of purchases within the direct spend.

5.5.5.2 Should-cost Model

The Should-cost model is used at Volvo Cars to determine realistic prices of purchased goods. This information is later used when negotiating with suppliers (supplier selection). To compute the numbers, a software solution has been acquired (Teamcenter Product Costing, TPC), which is well known within the industry. Since the collaboration with suppliers is intensive in the automotive industry, the Should-cost model can be used for supplier evaluation and supplier development in the sense of investigating potential cost reductions. Volvo Cars demands that suppliers use an open-book approach, meaning that their cost structure is presented and this can later be compared to the Should-cost calculations performed in-house. Lidén stresses that innovations in the automotive industry often are performed by the suppliers and by using this tool, communication and

sharing expectations can be improved. In addition, the Should-cost model is also used to identify the most cost efficient manufacturing method for components.

The following cost components are included in the Should-cost model:

- Bill of material
- Cost of manufacturing
- Overhead
- Profit

The model is both used to investigate what different components should cost, by building it up from raw material to assembly etc., and what components can cost by breaking down the price of a car from selling price minus profit margin etc.

To calculate the Should-cost of different components, purchasers at Volvo Cars are supported by a function called Cost-estimating. Within this function, senior people from related industries are working. These employees have deep knowledge within their fields, which is necessary when determining the cost of producing certain components.

In addition, the Should-cost model can be used for cost optimisation in the sense that different setups can be investigated in order to find the optimal solutions for a given component. As a result, depending on the component to investigate, the model has to be adjusted to fit that specific situation.

5.5.5.3 Benefits

There are several benefits related to both models used at Volvo Cars. The Landed cost model provides central metrics, which are closely related to the KPIs in place at Volvo Cars. The total cost related to a purchase is of great importance when determining what supplier to contract. Moreover, the model provides transparency in the decision-making. Decisions must be made based on factual evidence and purchasers cannot make decisions based on 'gut feeling' and previous knowledge. This mitigates the risk of biased supplier selection cases.

Regarding the Should-cost model, a perspective that comprehends the total cost of delivering a component is beneficial. By having the competence and the ability to calculate what price a component should have, suppliers can be challenged and scrutinised in detail. This information is also a good basis for improvement potential in terms of finding new manufacturing approaches in collaboration with a supplier or a new supplier which is more suitable for Volvo Cars. In addition, the Should-cost model increases the understanding of suppliers and the issues related to manufacturing of components. This can improve the overall relationship with suppliers.

5.5.5.4 Drawbacks & Barriers

Along with the potential benefits to gain from the purchasing cost models, there are also drawbacks and barriers that can hinder the success. Both models require administrative work in order to function properly.

Regarding the Landed cost model, the calculations need to be in place before a decision can be made. Since it composes a part of the Global Sourcing Process, the procedure of sourcing might be more time-consuming compared to not applying the model. Also, to manage compliance can be difficult. Volvo Cars has resolved this by incorporating the model in the Global Sourcing Process.

Furthermore, there are also a few difficulties concerning the Should-cost model. First, the results can be biased in the sense that suppliers do not perceive the situation equally to Volvo Cars. Thus, conflicts might arise due to this concern. The model is of a theoretical nature and if it is not performed correctly and match the supplier's cost structure, the creditability towards suppliers can be affected. Equally to the Landed cost model, time and administrative work is required to manage the calculations.

5.5.5.5 Application

Both the Landed cost model and the Should-cost model are used for supplier selection. Further, the Should-cost model is used also for supplier evaluation and development because it enables understanding and clarification of potential improvement projects and recognition of areas, which are well-functioning and vice versa.

5.5.5.6 Success Factors

Volvo Cars has identified a few distinct success factors related to the use of their purchasing cost models. Concerning the Landed cost model, the human dimension is critical. The model must be understandable and training has to be carried out in order for employees to gain the needed knowledge.

Further, Lidén sees discipline as a very important factor. To get the model working and to see results from it, it must be used for all purchases of relevance. It should not be up to the individual purchaser to choose whether to use the model or not.

In contrast, the main requirement for the Should-cost model is that the applied software should be commonly known in the industry. Hence, when providing the results to suppliers, this would be both compatible and recognised by them. Equally to the Landed cost model, training and understanding is also of great importance.

5.5.5.7 Contextual Aspects

As for the contextual aspects influencing the purchasing cost models, the industry characteristics are critical. Since the industry requires close supplier relations and collaboration, the supplier relation strategies are critical. Also, the minimal profit margins contribute to the natural use of purchasing cost models used for cost optimisation.

Top-management support is also recognised to affect the results. There is a clear connection between top-management and purchasers and this is bridged through The Global Sourcing Process and the sourcing committee.

As before mentioned, the purchasing department at Volvo Cars is said to be working cross-functionally and involving R&D and other departments in their decision making.

5.5.6 Summary

To illustrate how developed the purchasing at Volvo Cars is, the development model by van Weele (2010) has been used. Volvo Cars see themselves in the fifth stage, external integration (Figure 26). The major catalysts to this decision relates to the well-developed purchasing function at Volvo Cars. It is centrally coordinated and purchasers work closely with other departments such as R&D, manufacturing, quality among others. Purchasing is involved in an early stage of product development. Also, the recognition that price is not only the main driver to determine what suppliers to use. However, Volvo Cars is not using a 'Total Cost of Ownership' mindset. Due to difficulties in quantifying costs outside the transactional phase and that some costs have minimal affect, these are not included in their purchasing cost model. Also, as mentioned

previously, Volvo Cars are not focusing solely on cost when selecting supplier. Their capabilities as well as general characteristics are also taken into consideration.

Further, Volvo Cars is also working in close relation to their suppliers. According to Lidén, this is commonly occurring in the automotive industry where innovation often originates from the suppliers. The term early supplier involvement (ESI) describes their way of working, meaning suppliers are introduced in an early stage of the development process of new car models.

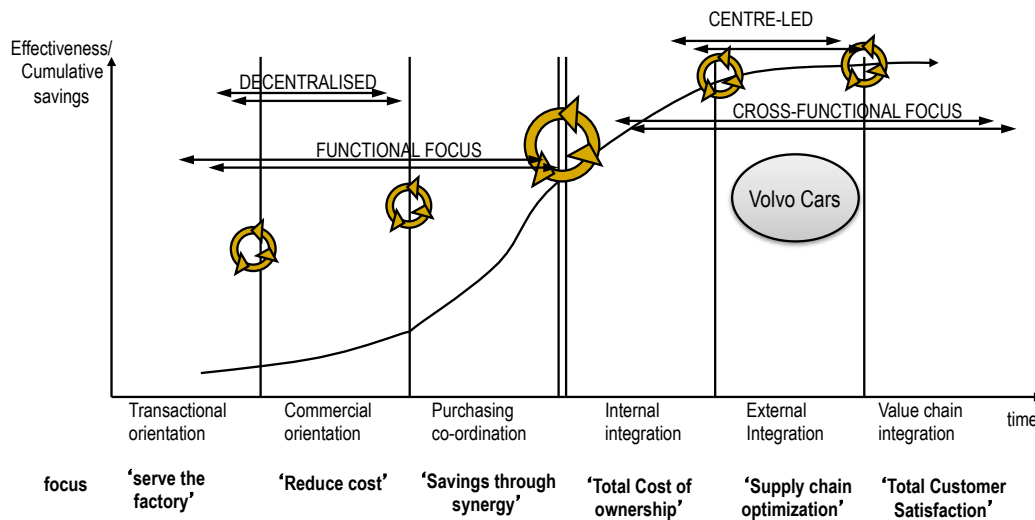


Figure 26 Volvo Cars in van Weele's (2010) Development model

A summary of the topics discussed previously can be seen in Table 20. Here, the characteristics of both the Landed cost and the Should-cost model are presented individually.

Table 20 A summary of Volvo Cars' purchasing cost models

Characteristics	Landed cost	Should-cost
Cost components	<ul style="list-style-type: none"> • Purchase price • Delivery and freight rates • Customs duties • Packaging • In-transit inventory cost 	<ul style="list-style-type: none"> • Bill of material • Cost of manufacturing • Overhead • Profit
Benefits	<ul style="list-style-type: none"> • Close relationship to KPIs • Transparency in decision-making • Based on factual calculations 	<ul style="list-style-type: none"> • Includes all costs • Credibility to suppliers • Enables problem identification • Enables greater understanding of suppliers' cost structure
Drawback & barriers	<ul style="list-style-type: none"> • Time-consuming • Administrative work required 	<ul style="list-style-type: none"> • Biased view • Administrative work required
Application	<ul style="list-style-type: none"> • Supplier selection 	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Supplier development
Success factors	<ul style="list-style-type: none"> • Application handiness • Understanding • Training • Compliance • Discipline • Clear policies 	<ul style="list-style-type: none"> • A system that is commonly know in the industry • Understanding • Training
Contextual aspects	<ul style="list-style-type: none"> • Supplier relation strategies • Top-management support • Cross-functional orientation 	<ul style="list-style-type: none"> • Supplier relation strategies • Top-management support • Cross-functional orientation

6 Analysis & Findings

This chapter embodies both the individual analysis of each case as well as the cross-case analysis performed in regards to the entire case sample. The individual case analysis is based on pattern matching and consequently the structure presented in the theoretical framework is adopted here. In addition, the cross-case analysis aim to answer the research questions 2- 4 presented in the introduction of this master thesis. Lastly, findings from the interview study are presented.

6.1 IKEA's Purchasing Cost Model

The positioning of IKEA in between External integration and Value chain integration (Figure 27) seems appropriate according to us. Given the industry and IKEA's fundamental focus on managing low cost to enable low prices have generated a genuine cost awareness within purchasing. To facilitate this, cross-functional teams and early introduction of the purchasing mindset have been institutionalised across the business. This has generated procedures where finding a low total cost has been central, not only in the last phase of purchasing, but rather a proactive structure. In addition, a diverse set of purchasing cost models and tools are used. Thus, the recognition of purchasing's importance has pervaded the everyday work. This mindset is not only found within the boundaries of IKEA but also externally. Suppliers are classified according to their contribution and importance. For some, the collaboration with IKEA is extensive and the furniture retailer frequently co-develops products, enhances performance and improves the overall relationship according to Jansson (personal communication, 25 March 2015).

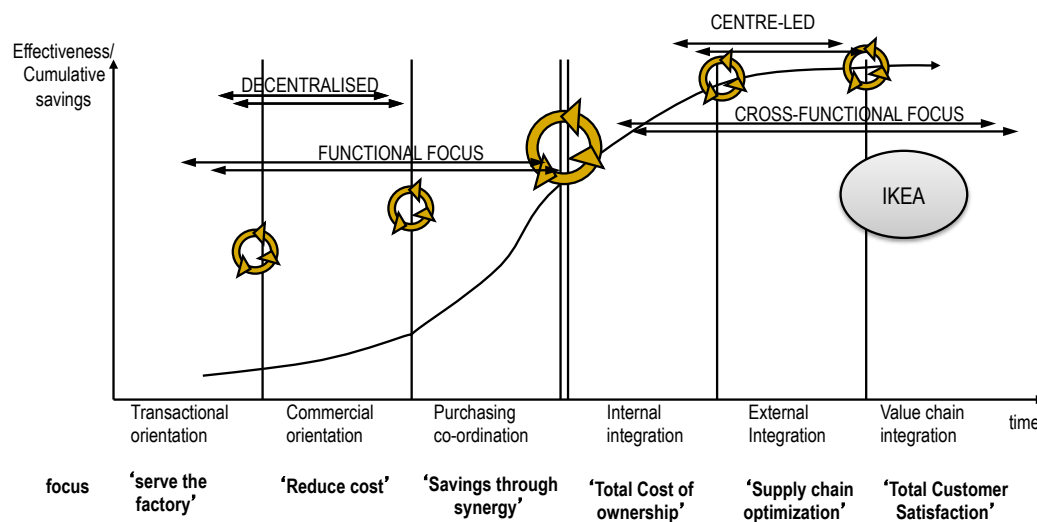


Figure 27 IKEA in van Weele's (2010) Development model

The company strive towards value chain integration and they are close. This is also evident throughout the interview where the customer is always put in focus and where the perspective of 'from material to customer' is frequently emphasised. The entire value chain is regarded, perhaps not with a single and complete purchasing cost model but rather with multiple tools available to facilitate the view.

6.1.1 Purchasing Cost Models & Cost Components

Worth of highlighting is that Cost-engineering is performed in order to establish the product price. In addition to the price, a Landed cost model is used to describe the

transactional stage. Further, to estimate the cost of quality and post-transactional cost drivers, additional tools are used actively such as the quality tools Cost of Poor Quality (COPQ) and Customer Experienced Product Quality (CEPQ). Equally to the focus of the IKEA case description, the Landed cost model will be further analysed.

6.1.1.1 Landed Cost Model

A comparison between the Landed cost at IKEA and in theory has been done and is presented below (Table 21). As for cost components, these two models are similar. One can say that the Landed cost at IKEA is standardised in terms of coverage. However, the execution is different due to the extensive simulation tool used internally. By utilising such a tool, calculations are managed quickly and by adjusting input parameters sensitivity analyses can be performed to find the best possible sourcing decision for a given product and market. The model is considered to be rather automated for purchasers, since other responsible departments perform the information updates.

Table 21 A comparison between IKEA's Landed cost model and theory

Characteristics	Landed cost at IKEA	Landed cost in theory
Cost components	<ul style="list-style-type: none"> • Purchase price • Transportation • Handling costs • Customs and duties • Inventory management 	<ul style="list-style-type: none"> • Transaction price • Transportation • Customs duties • Inventory management • Overhead costs
Benefits	<ul style="list-style-type: none"> • Facilitate decision-making • Easy to use • Minor time allocation needed 	<ul style="list-style-type: none"> • Reduced supplier management cost • Increased coordination of activities • Broad supplier evaluation • Capitalise on value-added activities • Increased supplier performance management
Drawback & barriers	<ul style="list-style-type: none"> • Does not perfectly reflect reality • Risk of putting too much focus on numbers 	<ul style="list-style-type: none"> • Difficult to gather the right data • Organisational reluctance
Application	<ul style="list-style-type: none"> • Supplier selection 	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation
Success factors	<ul style="list-style-type: none"> • Clear category structure and organisation • Transparency and sharing of information • Internal knowledge • Adoptability • Available data 	<ul style="list-style-type: none"> • Balancing breadth with usability • Focus on objective measures • Gather data continuously • Involve all levels in the company
Contextual aspects	<ul style="list-style-type: none"> • Culture • Supplier relation strategies • Cross-functional orientation 	<ul style="list-style-type: none"> • Resistance to change • Supplier relations strategies • Cultural challenge • Cross-functional mechanisms

6.1.1.1.1 Benefits

Ease of decision-making is the main benefit IKEA expresses. By using the model, more correct decisions can be made due to the factual foundation created. This is enabled both when introducing new products but also when fine-tuning current setups or when sourcing from new locations among others.

In addition, IKEA expresses advantages, which are related to their software. The tool, Cost simulation is easy to use and it does not require much time allocation. This statement is contradictory to what theory suggests. In the research performed by Young et al. (2009), Landed cost is suggested to be time-consuming and difficult to manage many times. The key might be the simulation tool, which IKEA uses for the calculations. It contains a database of all the information necessary and this is updated continuously. Hence, purchasers only need to worry about the input parameters and the results. Another reason for the different views can be the history of keeping count of costs at IKEA. Thus, a culture of always taking into account the total cost when managing purchasing has been developed internally.

Theory also mentions reduced supplier management cost as a benefit. This benefit is not recognised by IKEA since they claim that their cost of handling the supplier base and sourcing in general is minimal in comparison to the direct cost associated with a purchase.

Moreover, the remaining benefits, which differ, could potentially be because IKEA sees these as given conditions in their way of managing purchasing.

6.1.1.1.2 Drawbacks & Barriers

The drawbacks identified by IKEA also differ from what theory proposes. IKEA claims that there are no major drawbacks with their purchasing cost model. However, such models do not perfectly reflect reality, which can become an issue if they are regarded in isolation. Thus, putting too much focus on the actual number and disregarding the holistic view can create problems. These issues are not highlighted in theory. In contrast, the literature review suggests difficulties concerning finding the correct data and managing organisational reluctance. The reason why this is not mentioned by IKEA is probably due to their well-developed structure, their extensive database and established clear procedures. As discussed previously, finding the data is not an issue due to the simulation tool with the additional database. Also, reluctance is mitigated by the paradigm of having cost in mind at IKEA. This finding is interesting since Young et al. (2009) stresses the difficulties of developing a model that is comprehensive but still manageable to operate.

6.1.1.1.3 Application

IKEA's use of the Landed cost model differs from what theory suggests. They are only applying Landed cost for supplier selection. For supplier evaluation, they utilise other tools such as KPIs, benchmarking, LEAN and Six Sigma. In theory Landed cost, serves as a tool that can prioritise supplier candidates better than when only considering the price. Also, for already established supplier relations, the tool can enable a visualisation of potential improvement areas in collaboration with the supplier. Since IKEA already has multiple tools institutionalised, specific tools for this purpose are used instead of the Landed cost model.

6.1.1.1.4 Success Factors

The success factors seen by IKEA and literature are somewhat similar. First, IKEA acknowledges data as an important aspect. The data needed to manage the calculations need to be easy to gather. Theory highlights this aspect by promoting continuous collection of data. Second, IKEA addresses the human factor. Having the right knowledge in place and effectively manage the adoption is essential. In addition, theory suggests that all levels in the organisation should be involved and that the design of the model should be easy to grasp.

Further, IKEA also recognises the need of clear structures and organisations to be successful in this area. In combination with transparency with suppliers, these aspect are essential to succeed. Liker and Choi (2004) also recognise the importance of sharing information when developing relationships towards suppliers. Consequently, the success factors are related and to summarise, there are three important levels to consider:

- The organisation
- The human
- The model

6.1.1.1.5 Contextual Aspects

The contextual aspects recognised by IKEA are aligned with the findings from the literature review. Theory highlights cultural challenges when implementing purchasing cost models such as Landed cost. At IKEA, this is not an issue. Due to the certain cultural characteristics of having the cost focus in mind, not only in purchasing, this challenge is mitigated. Throughout history, this mindset has been pervading IKEA and established within the term Democratic design. Hence, the cultural dimension is seen as important and acting as a facilitator at IKEA.

Along with purchasing sophistication, greater focus is put on supplier relation strategies and cross-functional orientation. In relation to purchasing cost models, these two aspects can facilitate the process in terms of gathering the data and suggesting improvement potential to suppliers. These aspects are also highlighted by Feller (2008) and Young et al. (2009) in terms of having significant impact on the output. Further, resistance to change has not been identified by IKEA and Jansson stresses that the procedures of determining the total cost are adopted by the employees.

Moreover, the size of IKEA and their spend, which is concentrated to a limited number of suppliers, result in a high degree of direct costs whereas the overhead is minimal in comparison. Consequently, the Landed cost model does not cover administrative activities such as cost of sourcing and maintaining suppliers.

6.1.2 Summary

To conclude, the contextual aspects affecting IKEA's situation are presented in the research model (Figure 28). To begin with, the purchasing sophistication is highly developed at IKEA. The recognition of purchasing along with the technical capabilities and the organisational structure provide the foundation for the purchasing cost model. In parallel, a cross-functional orientation enables the total cost mindset and eases the data gathering.

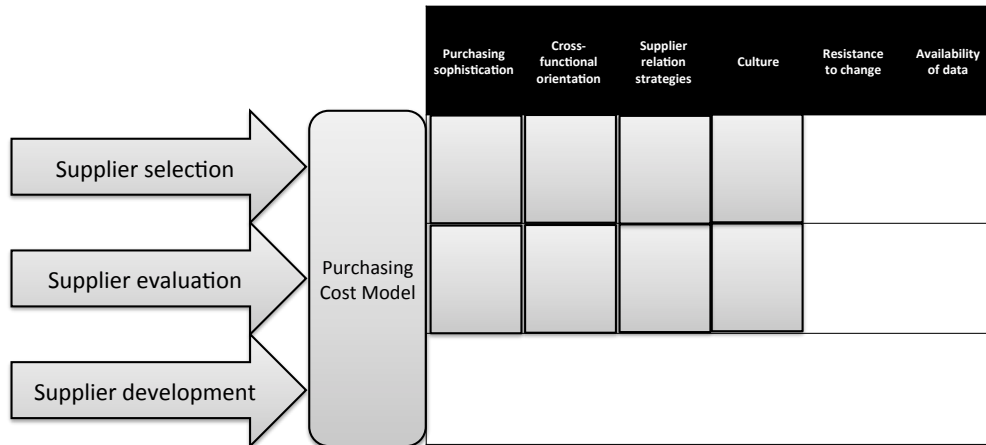


Figure 28 IKEA's contextual aspects in relation to the application

Purchasing also contributes with well-developed relations with its suppliers. This enables sharing of information in both directions. On the one hand, IKEA can gather information from suppliers, which is essential for the calculation. On the other hand, IKEA can communicate the results of the Landed cost model in order to improve the relations.

Moreover, a major reason why IKEA is successful in working with purchasing cost models is the cost-driven culture present at IKEA. By having this mindset, the acceptance and compliance of the tools will be significantly enhanced. To employees, it is natural to work this way.

6.2 Lantmännen's Purchasing Cost Model

As seen in the description of Lantmännen's purchasing cost model, the interviewee positioned the company into 'External integration', stage five (Figure 29). The underlying arguments for this decision are the following:

- Distinction between centrally led corporate purchasing and decentralised company purchasing
- Cross-functional orientation
- Total Cost of Ownership focus
- Internal collaboration with departments such as R&D, Quality and Operations
- External integration with suppliers

We agree that Lantmännen qualifies for the stage 'External integration' and the characteristics described above indicate that the purchasing functions at Lantmännen are thought through to a considerable extent. In addition, the supporting function instituted on corporate level, to facilitate implementations of for instance TCO, shows that Lantmännen understands the importance of bridging top-management with the purchasing functions within every Lantmännen company. This group also facilitates training and education, which frequently is mentioned in theory as a critical factor for success.

It is evident that the TCO concept pervades the purchasing work and that the focus on price is replaced by a holistic perspective on the total supply chain. In addition, the close collaboration, both internally among different departments as well as externally with suppliers, suggests that Lantmännen is positioned into 'External integration' within the development model.

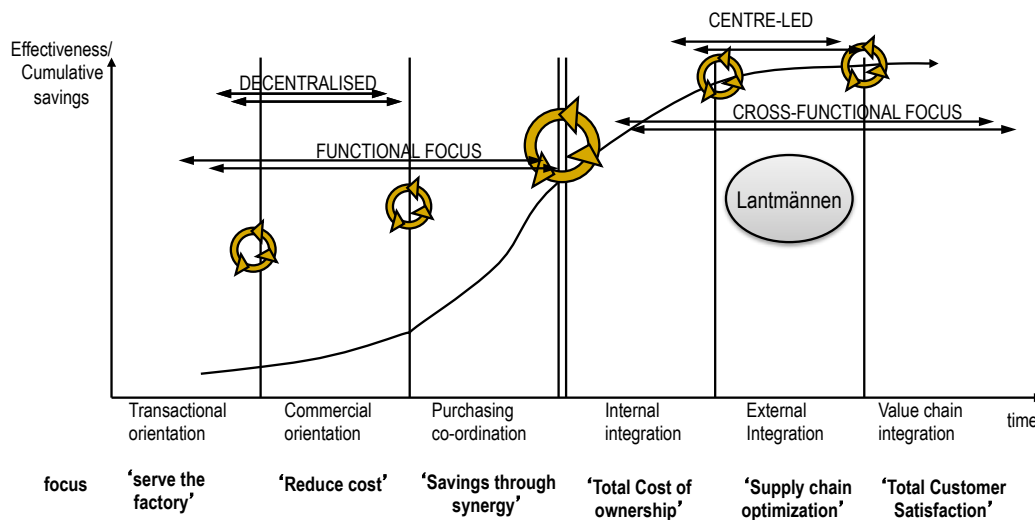


Figure 29 Lantmännen in van Weele's (2010) Development model

The industry in which Lantmännen operates within seems to be, if not as competitive as the automotive industry, highly focused on competition through both price and quality. With this said Lantmännen Cooperative seems to adapt to new concepts and technologies. The TCO implementation is a good example of using theoretical knowledge to make rationale decisions within purchasing. This, in combination with the previously mentioned organisational infrastructure provides opportunities to manage purchasing work more efficiently.

6.2.1 Purchasing Cost Models & Cost Components

At Lantmännen, only one purchasing cost model is utilised. Total Cost of Ownership as a purchasing cost model covers the pre-transactional, transactional and post-transactional stages and does not require any other model as a complement. Also, the TCO model itself is rather time consuming to manage, which means that having additional cost models would simply not be useful in terms of allocating time efficiently.

6.2.1.1 Total Cost of Ownership

The TCO model at Lantmännen has been compared to what literature suggests in terms of characteristics. This comparison can be viewed in Table 22.

Table 22 A comparison between Lantmännen's TCO and theory

Characteristics	Total Cost of Ownership at Lantmännen	Total Cost of Ownership in theory
Cost components	<ul style="list-style-type: none"> • Purchasing • Logistics • Warehousing • Operations • Quality • Administration 	<ul style="list-style-type: none"> • Operations • Quality • Logistics • Warehousing • Initial price • Maintenance • Supplier communication • Reversed logistics
Benefits	<ul style="list-style-type: none"> • Understanding • Identify improvements 	<ul style="list-style-type: none"> • Concrete and structured • Improved decision-making • Basis for communication • Good understanding
Drawback & barriers	<ul style="list-style-type: none"> • Time-consuming • Availability of information 	<ul style="list-style-type: none"> • Resource issues • Education/training issues • Cultural issues
Application	<ul style="list-style-type: none"> • Supply chain decision-making 	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Supplier development
Success factors	<ul style="list-style-type: none"> • Top-management support • Easy to understanding • Pedagogical presentation of data 	<ul style="list-style-type: none"> • Link to pain point • Responsible TCO office • Capture TCO data • TCO management tools
Contextual aspects	<ul style="list-style-type: none"> • Corporate culture • Cross-functional orientation • Supplier relation strategies • Purchasing sophistication 	<ul style="list-style-type: none"> • Corporate culture • Type and complexity of purchases • Availability of data systems

The cost components incorporated in Lantmännen's TCO model are similar to what literature suggests a model should include. The area purchasing includes the initial price in combination with payment terms. Operations, logistics, quality and warehousing costs are equal to theory. Further, Reversed logistics is included at Quality at Lantmännen. Thus, maintenance and supplier communication are the only components, which differ. However, depending on definition, these two cost components can be seen as a part of administrative costs.

Consequently, the TCO model at Lantmännen seems to be in line with how literature perceives the concept.

6.2.1.1.1 Benefits

Concerning benefits, Lantmännen seems to perceive the model equally to literature. Improved understanding and the ability to identify improvements are emphasised by Lantmännen. Literature also suggests improved decision-making and basis for communication. Lantmännen are most likely not unfamiliar with this since communication and decision-making are mentioned in other circumstances. However, the TCO model at Lantmännen is not a tool, which is used for certain sourcing decisions. On the contrary, the model is used as an underlying framework providing opportunities for continuous improvements.

6.2.1.1.2 Drawbacks & Barriers

Both Lantmännen and theory agree upon the fact that having a TCO model requires time and resources. Such purchasing models have been criticised due to their characteristics of not being agile enough to support fast decision-making (Young et al., 2009). This is also confirmed by the interviewee who clarifies that calculating a total cost for several suppliers in a sourcing stage would not be possible due to the time required. Hence, the model is not used in such a context within Lantmännen.

Further, theory highlights issues regarding education and training, which is not mentioned by Lantmännen. This could be because Lantmännen has managed this issue by incorporating the Supply Chain Excellence program from corporate purchasing to support the transition and implementation.

Lantmännen also highlights the potential issue of not getting the information needed from suppliers. This issue arise when the purchasing price is investigated in the TCO. Especially for consumer goods where the purchase price often compose the majority of the product cost. Depending on whether the suppliers use an open-book approach or a closed-book approach regarding their cost structures, the difficulty of calculating the total cost will vary. This dimension has not been stressed in literature yet. The issue can be difficult to handle because it lies in the hands of your suppliers rather than internally.

6.2.1.1.3 Application

Lantmännen is using their TCO model to facilitate general decision-making. The model assists to identify and visualise the supply chain cost structure and the potential improvement opportunities. In contrast to literature, the interviewee does not explicitly relate the TCO model to neither supplier selection, nor evaluation nor development. However, one could argue that both supplier evaluation and supplier development will be affected when finding and adjusting opportunities which have an external nature. Because the model targets the entire supply chain with its cost structure, suppliers' performance will naturally be questioned if they do not reach expected performance.

Moreover, supplier selection is not incorporated in the TCO model. The interviewee stresses that calculating a TCO case for several suppliers would require major time allocation. Since Lantmännen is only utilising a Microsoft Excel model, which requires manual data collection, this solution is not possible today. Nevertheless, the TCO model at Lantmännen is more of a "backbone framework" to provide visibility of the total cost structure rather than a specific tool targeting supplier management.

6.2.1.1.4 Success Factors

When investigating the success factors provided by theory and the aspects highlighted by Lantmännen, there is a slight difference. McKeen and Smith (2010) states that finding a pain point is essential in combination with showing that the benefits connected to TCO exceed the cost of implementation. Also, McKeen and Smith (2010) emphasise that a TCO department should be established, in which the responsibility of the model should be allocated to. In contrast, Lantmännen does not stress these aspects. One reason could be that the organisational infrastructure manages this issue through the corporate purchasing function, which rolled out the TCO model. This function bridges the directives from top-management with the strategic purchasing work in each Lantmännen company. Thus, these issues might not be critical in the same sense at Lantmännen. In addition, they also have the mandate for change supported by top-management.

Further, McKeen and Smith (2010) stresses the importance of capturing data and using management tools for this purpose. However, this is not seen as a success factor within Lantmännen. Potentially, this could be due to the fact that Lantmännen is only calculating the total cost on a yearly basis. In this case, the issue might not be as significant as for companies updating the costs more frequently.

In contrast, Lantmännen stresses the importance of having a model that is easy to grasp. By designing the model, having the application handiness in mind, the calculations as well as interpreting the results can be simplified. Literature does not fully describe this dimension even though they stress the issue of managing the concept.

6.2.1.1.5 Contextual Aspects

Both literature and Lantmännen indicate that the corporate culture affects the result of TCO. Ellram (1994) specifically advocates that culture has a major impact since the TCO not only can be seen as a purchasing cost model but rather a philosophy and a certain mindset. Lantmännen seems to have a culture supporting such implementation. Cross-functional orientation, external collaboration with suppliers and the organisational infrastructure are evidence that Lantmännen actively work to enhance purchasing. In addition, Lantmännen has close collaboration with its customer with for instance Vendor Managed Inventory (VMI) according to the interviewee. This is further evidence that Lantmännen is an organisation adapting to new methodologies and procedures. According to Literature, such a mindset is critical for managing TCO (Ellram, 1993).

As mentioned previously, cross-functional orientation and well developed supplier relations are institutionalised which are shown to also impact the success of TCO.

Literature also mentions the complexity of purchases as a contextual aspect affecting TCO. The interviewee discusses differences when buying a diverse set of products. Some products are easier to determine the total cost for, such as fully outsourced products. In contrast, more complex purchases will be harder to calculate and this is consequently reflected in the TCO model. This is also the reason why Lantmännen uses one TCO model for each product.

Also, when taking into account the position of Lantmännen in the development model (Figure 29), the purchasing sophistication is regarded as significant. The structure and procedures of purchasing seems to be developed based on rationale decisions. Centralisation, cross-functional integration, a TCO mindset and external collaboration with suppliers all indicate that Lantmännen has evolved in this matter.

6.2.2 Summary

When relating the findings to the research model presented below (Figure 30), modifications need to be done. Since Lantmännen does not explicitly use their model for neither supplier selection, evaluation nor development, the research model is not applicable. However, in supply chain decision-making, supplier evaluation and development are incorporated to some extent. Thus, the contextual aspects identified at Lantmännen are related to these areas of application.

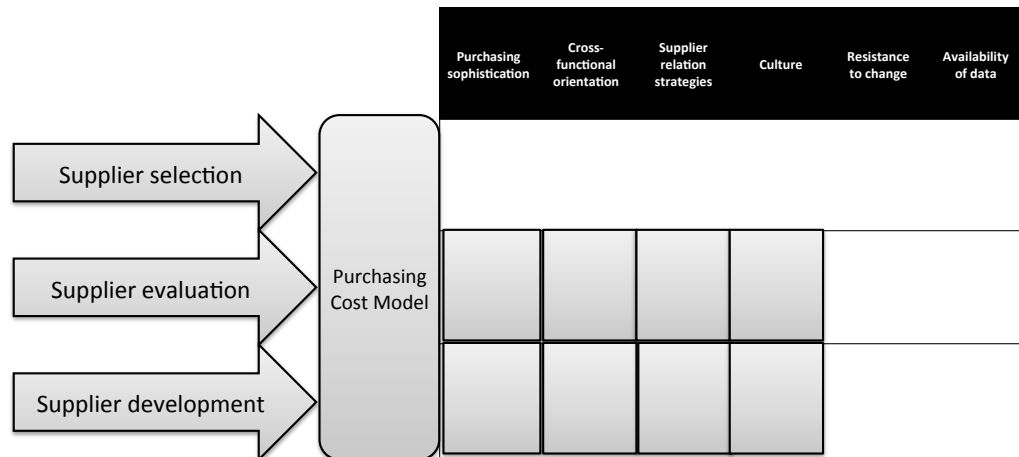


Figure 30 Lantmännen's contextual aspects in relation to the application

The point of gravity is focused to the lower left part of the research model compared to literature. Lantmännen does not highlight resistance to change or availability of data. There are possible explanations to this phenomenon. First, Lantmännen has a developed organisational structure to cope with such implementations and this could potentially be facilitating TCO. In addition, the availability of data might not be highlighted because of the concentration of calculating the total cost once a year.

Moreover, since TCO is not incorporated in supplier selection, no contextual aspects can be related to this application.

6.3 Siemens Industrial Turbomachinery's Purchasing Cost Model

Regarding SIT's positioning in van Weele's (2010) development model, we agree with their view (Figure 31). They have an outsourcing strategy in place and are not only considering price in their supplier selection. This is more or less demanded from the market since SIT's offer has gone from only including the product to also involving after-sales service. This puts more focus on the quality of components since a breakdown due to defect parts can be very costly. Also, to manage this purchasing cost model, SIT has a cross-functional orientation with teams consisting of people from several departments.

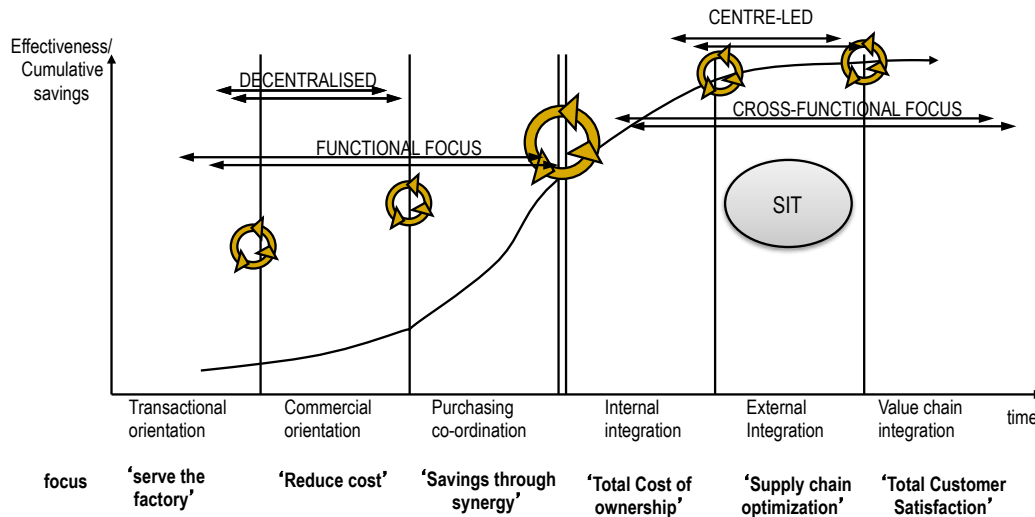


Figure 31 SIT in van Weele's (2010) Development model

Further, they are integrating suppliers in product development, which also strengthens the positioning in the fifth stage, external integration. Suppliers are contributing to R&D and long-term relationships are emphasised. Also, tools such as purchasing cost models are used to facilitate purchasing work.

The interviewee directs critique towards the purchasing cost model for not being enough automated, especially when calculating transportation costs. This view is also shared by us and we argue that more automation would take SIT's purchasing cost modelling to the next level.

6.3.1 Purchasing Cost Models & Cost Components

We consider SIT's Life-time costing as closest related to the Life-cycle costing model in our literature review and therefore this section aims to compare these two and analyse the difference. To give a better view of the two models, Table 23 presents the different sections for each model.

As seen in Table 23, the combination of cost components included in SIT's model is not as extensive as in Life-cycle costing from theory. As previously mentioned, the pre-transactional costs are seen as investments rather than cost components in SIT's purchasing cost model and therefore this stage is overlooked. Further, cost types mentioned in theory, such as contingent costs, intangible cost and external costs, are most likely located in other or product specific costs at SIT. However, the interviewee advocates that the Life-time costing is only used for the products that have after-sales services, otherwise a landed perspective is used.

Table 23 A comparison table between SIT's Life-time costing and theory

Characteristics	Life-time costing at Siemens Turbomachinery	Life-cycle costing in theory
Cost components	<ul style="list-style-type: none"> • Price • Transportation • Expediting • Other or product specific costs 	<ul style="list-style-type: none"> • Acquisition costs • Design and development costs • Production costs • Operational and support costs • Overhead costs • Contingent costs • Intangible costs • External costs
Benefits	<ul style="list-style-type: none"> • Considers more than price only • Good basis for negotiations • Creates transparency • Reduced supplier management risks 	<ul style="list-style-type: none"> • Improved Equipment replacement decisions • Comparison of project costs • Improved supplier selection • Environmental focus
Drawback & barriers	<ul style="list-style-type: none"> • Does not reflect reality • Instantaneous picture • Time consuming 	<ul style="list-style-type: none"> • Lack in motivation • Organisational reluctance • Impact on the organisation • Demanding implementation • Lack of standard methods • Lack of data
Application	<ul style="list-style-type: none"> • Supplier selection 	<ul style="list-style-type: none"> • Equipment replacement • Affordability studies • Supplier selection • Design trade-offs • Repair level analysis • Warranty & repair costs • Cost plus environmental elements
Success factors	<ul style="list-style-type: none"> • Use model just before decision • Create a culture that encourages use of model • Top-management support 	<ul style="list-style-type: none"> • Involve all departments • Top management support • Evaluate outsourcing • Communicate advantages • Improved data
Contextual aspects	<ul style="list-style-type: none"> • Industry characteristics • Supplier relation strategies • Cross-functional orientation • Culture • Purchasing sophistication 	<ul style="list-style-type: none"> • Organisational reluctance • Data dependency

6.3.1.1.1 Benefits

Regarding benefits, SIT emphasises the fact that the model considers more than price and therefore is a good basis for negotiations and creates transparency in supplier relations. This is not mentioned as clearly in literature but the broad range of costs is however the basis for comparison of project costs as mentioned by Elmakis and Lisnianski (2006). Furthermore, literature mentions more specific benefits related to equipment replacement decisions (Elmakis & Lisnianski, 2006; Seif & Rabbani, 2014), which is not mentioned by SIT for obvious reasons.

SIT does not mention the environmental focus to be part of the cost model as mentioned in literature (Hunkeler & Rebitzer, 2003). However, the interviewee mentions that future models will have a greater focus on the environmental footprint. Also, Life-cycle costing is commonly used in combination with Life-cycle assessment in literature. At SIT, this is not the case with Life-time costing. This model is predominantly used to assess the total cost for their product portfolio to assist in sourcing decisions.

6.3.1.1.2 Drawbacks & Barriers

When considering drawbacks with the Life-time costing model, the interviewee puts focus on the fact that it does not always reflect reality and only gives an instantaneous picture of the costs, which is not mentioned by literature. This is due to the fluctuations of currencies and freight tariffs which can make the model out-dated rather quickly. This finding is not evident in our literature but most industrial companies face these challenges.

Literature however, puts more focus on the barriers for implementation where culture and reluctance are seen as factors. The reason why this is not mentioned by SIT might be due to their history of using purchasing cost models. Since the directives come from the headquarter and are communicated downwards by purchasing directors, who advocate a cultural change rather than forcing the employees to using the model, the organisational reluctance is mitigated.

Moreover, the interviewee claims that the model is time consuming even though they are working with a standardised model. He does mention the difficulties with transportation data but besides that, the strategic purchasers have good knowledge in collecting relevant data. Thus, the gathering of data is not seen as a drawback as in literature (Cole & Sterner, 2000).

6.3.1.1.3 Application

As mentioned SIT mainly uses their Life-time costing model for supplier selection. Supplier selection is mentioned in literature by Korpi and Alu-Risku (2008) and on top of that, literature brings up many more specific applications, such as affordability studies and design trade-offs that are not mentioned by the interviewee. However, these applications are not specifically targeting purchasing work, which is most likely the reason why they differ. Life-cycle costing is often described in literature for other applications than purchasing such as Life-cycle assessment.

6.3.1.1.4 Success Factors

Both literature and the interviewee mention top-management support and the importance of creating a culture, which in literature is described as communicating advantages with using the model (Cole & Sterner, 2000). Involvement of all departments is not mentioned by Hedlund, but as discussed before, SIT already have a cross-functional orientation wherefore this is naturally incorporated in their culture.

6.3.1.1.5 Contextual Aspects

The organisational reluctance seen in literature (Cole & Sterner, 2000) is not mentioned by SIT. This is most likely due to their culture of adapting to what top-management suggests. The interviewee advocates that if managers ask for the total cost calculations when sourcing decisions are to be made, the purchasers will adapt to this transition.

Further, data is not seen as an issue at SIT except for transportation costs. The interviewee advocates that strategic purchasers will manage to find the required data. He does not mention the computer systems as bottlenecks in this sense. The difference to literature might be because some journal articles are out-dated and written when computer systems were lacking the ability to collect essential data.

The interviewee highlights that the industry characteristics is a major driver for development of purchasing cost models. When competition is intensive and customers have clear requirements, companies must adhere to this situation. The interviewee stresses that this is part of the reason why SIT has developed in this manner.

In addition, the cross-functional orientation, which enables the internal integration in combination with supplier relation strategies that pervade the external integration are also major drivers for well developed purchasing cost models. In total, the purchasing sophistication at SIT is seen as developed.

6.3.2 Summary

After comparing the two models in theory and practice, it is found that the Life-time costing model at SIT is not aligned with Life-cycle costing described in literature. The reason for this might be because the model at SIT is developed internally whereas life-cycle costing in literature is closely related to environmental studies.

When putting our findings discussed above into the research model presented below (Figure 32), it can be seen that compared to the literature review, no focus is put on resistance to change and availability of data. However, purchasing sophistication, cross-functional orientation and supplier relation strategies are major drivers for the development of purchasing cost models. In combination, the culture at SIT is also seen as an important factor for the success. Compared to literature, the point of gravity is located to the upper left of the model. Furthermore, since their Life-time costing model does not embody supplier development no contextual aspects are tied to this application.

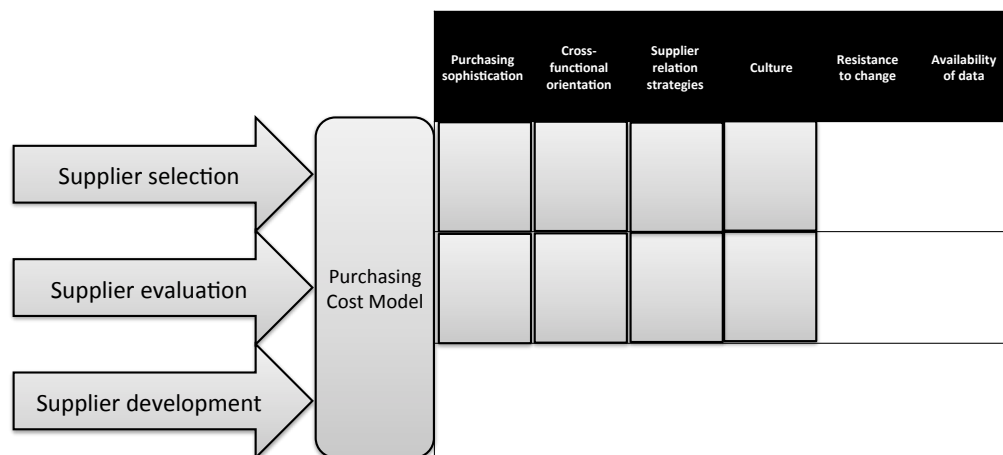


Figure 32 SIT's contextual aspects in relation to the application

6.4 TeleCompany's Purchasing Cost Model

One can argue around TeleCompany being in the external integration stage or not concerning the development model (Figure 33). Van Weele advocates that this stage is characterised by an explicit outsourcing strategy and extensive collaboration with suppliers in product development (van Weele, 2010). In addition, EDI and other supporting software systems are commonly used as well as cost models. Regarding outsourcing they have historically gone through major changes where they outsourced entire plants across Europe¹. Moreover, e-procurement has been present at TeleCompany for years to enable purchasing in general².

Despite this, we argue that TeleCompany is not completely in the fifth stage but rather somewhere in between internal and external integration (Figure 33). They have not yet reached an external integration with their suppliers but as mentioned earlier, it is a future goal to involve them further in product development. This would take TeleCompany further to the right in the development model.

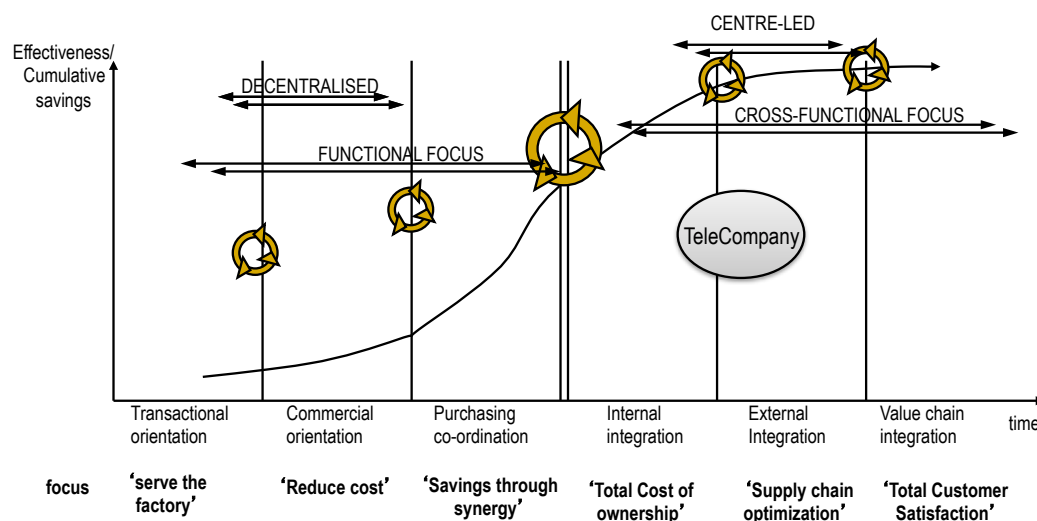


Figure 33 TeleCompany in van Weele's (2010) Development model

6.4.1 Purchasing Cost Models & Cost Components

TeleCompany is using two cost models where one is of a more standardised character, Landed cost, and the other one, Cost-engineering, is used for a more extensive analysis of important purchases.

6.4.1.1 Landed Cost Model

To better compare TeleCompany's Landed cost model and how it is used with what theory suggests, a comparison has been performed in Table 24. Regarding cost components, it can be seen that their model embodies the same components with the exception of logistics costs where TeleCompany in most cases does not include Customs duties due to Incoterms.

¹ Reference cannot be presented due to anonymity reasons

² Reference cannot be presented due to anonymity reasons

Table 24 A comparison between TeleCompany's Landed cost model and theory

Characteristics	Landed cost at TeleCompany	Landed cost in theory
Cost components	<ul style="list-style-type: none"> • Initial price • Cost of transportation • Customs duties • Warehousing fees 	<ul style="list-style-type: none"> • Transaction price • Transportation • Customs duties • Inventory management • Overhead costs
Benefits	<ul style="list-style-type: none"> • Considers more than price only • Good negotiation basis • Identifies improvement areas • Encourages transparency 	<ul style="list-style-type: none"> • Reduced supplier management cost • Increased coordination of activities • Broad supplier evaluation • Capitalise on value-added activities • Increased supplier performance management
Drawback & barriers	<ul style="list-style-type: none"> • Extra administration • Too complex • Availability of data 	<ul style="list-style-type: none"> • Difficult to gather the right data • Organisational reluctance
Application	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Supplier development 	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation •
Success factors	<ul style="list-style-type: none"> • Involve whole organisation cross-functionally • Balance between breadth and simplicity • Easy to use 	<ul style="list-style-type: none"> • Balancing breadth with usability • Focus on objective measures • Gather data continuously • Involve all levels in the company
Contextual aspects	<ul style="list-style-type: none"> • Corporate culture • Cross-functional orientation • Supplier relation strategies 	<ul style="list-style-type: none"> • Resistance to change • Supplier relations strategies • Cultural challenge • Cross-functional mechanisms

6.4.1.1.1 Benefits

When describing the benefits involved with using a Landed cost model, TeleCompany focused on the information it constructs, which is a good basis for improvements and supplier negotiations. This focus can also be seen in literature where it discusses supplier performance management and supplier evaluation (Beckman & Rosenfield, 2008). However, literature mentions the reduced costs concerning supplier management, which is not mentioned by TeleCompany. This might be due to TeleCompany historically having a focus where cost reductions are put aside in favour of good quality.

6.4.1.1.2 Drawbacks & Barriers

TeleCompany puts focus on the handiness and complexity of the model. They argue that this is a drawback and is essential to handle for the model to be adopted by the organisation. Related to this, literature discusses the organisational reluctance as a problem that has to be bridged (Feller, 2008; Young et al., 2009). The interviewee suggests the possibility of having two models. One standardised purchasing cost model used for regular sourcing decisions and one model for specific purchases. This might generate compliance when having a standardised model, which is easy to understand and use. Literature also mentions difficulties with gathering data (Young et al., 2009), which is also seen as a problem at TeleCompany.

6.4.1.1.3 Application

Just as literature suggests, TeleCompany is using their Landed cost model for supplier selection. TeleCompany also says that they are using their model for supplier evaluation and development while literature means it involves supplier evaluation but not development (Feller, 2008). These two terms are somewhat closely related and supplier development can be seen as an extension of evaluation, which takes action based on the evaluation. Consequently, TeleCompany is somewhat performing supplier evaluation in order to manage supplier development.

Since the suppliers' ability to manage the distribution is critical and often the key aspect when selecting suppliers, the Landed cost model can be used to visualise and communicate this to already contracted suppliers. In this case, a type of supplier development is utilised through the use of Landed cost.

TeleCompany is using their Cost-engineering model for expensive or large volume purchases but using their Landed cost model for regular purchases. This allows the Landed cost model to be of a more standardised and simple character, which facilitates the daily work. This is somewhat described in literature. Ellram (1994) elaborates on having two types of models within TCO. One model should be of standardised nature allowing application handiness and fast calculations. Meanwhile, the unique model targets specific purchases requiring a non-standardised purchasing cost model. This is in a sense performed at the TeleCompany where the Landed cost model and Cost-engineering are utilised in combination to support each other.

6.4.1.1.4 Success Factors

There is a clear connection between what literature propose and what TeleCompany sees as success factors for effectively working with Landed cost. Both focus on usability and the importance of involving the whole organisation are mentioned (Feller, 2008; Young et al., 2009). Hence, a model that is easy to understand, not only for purchasers but also for employees within R&D, Design and Operations is essential. As previously mentioned, some purchasing cost models are considered to be too complex. Thus, there is a trade-off between having a purchasing cost model covering multiple cost components and having a model, which is easy to grasp and use by employees.

Again, literature mentions data gathering while TeleCompany does not. Literature puts focus on the importance of gathering data continuously and not only right before the decision is to be made (Young et al., 2009).

6.4.1.1.5 Contextual Aspects

TeleCompany mentions about the same aspects as those discussed in literature. However, they have not seen the resistance to change as a contextual aspect that has

influenced their choice of a Landed cost model. Their large and well-developed organisation for strategic purchasing might be a reason for this and the importance of cost management has been well communicated in the organisation.

6.4.1.2 Cost-engineering

Similar to the Landed cost analysis, Cost-engineering has been compared to what theory proposes within this field (Table 25). Since this interview focused on the Landed cost model, this section will not be as well described.

Regarding cost components the model at TeleCompany goes well in line with what theory suggests. However, it is not as extensive as theory since it lacks consideration of S, G&A, R&D and the cost of the learning curve. Also, theory highlights labour costs, which is included in the manufacturing cost at TeleCompany.

Table 25 A Comparison between TeleCompany's Cost-engineering model and theory

Characteristics	Cost-engineering at TeleCompany	Cost structure analysis in theory
Cost components	<ul style="list-style-type: none"> • Bill of material • Manufacturing • Overhead • Profit 	<ul style="list-style-type: none"> • Cost of materials • Manufacturing • Labour cost • Overhead • S, G&A costs • R&D • Learning curve • Profit
Benefits	<ul style="list-style-type: none"> • Encourages transparency • Identifies improvement areas 	<ul style="list-style-type: none"> • Clear targets • Visualise reduction's contribution to overall goal • Ability to document purchasing's contribution • Facilitate improvements • Increase understanding • Involve suppliers • Support evaluation
Drawback & barriers	<ul style="list-style-type: none"> • Does not necessarily reflect the real cost structure 	<ul style="list-style-type: none"> • Asymmetric relation towards suppliers • Narrow focus
Application	<ul style="list-style-type: none"> • Supplier Selection 	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Supplier development
Success factors	<ul style="list-style-type: none"> • Involve whole organisation cross-functionally 	<ul style="list-style-type: none"> • Top-management support • Cross-functional orientation • Incentives for employees • Clear targets • Cost monitoring and control • Pilot project • Clear implementation plan
Contextual aspects	<ul style="list-style-type: none"> • Corporate culture • Cross-functional orientation • Supplier relation strategies 	<ul style="list-style-type: none"> • Resistance to change • Cross-functional orientation

6.4.1.2.1 Benefits

Regarding benefits, both TeleCompany and theory put emphasis on improvement potential and visualisation of information (Newman & McKeller, 1995). TeleCompany claims that Cost-engineering to some extent encourages suppliers to be more transparent with their cost structure. This is also required for their preferred suppliers. Theory also discusses this topic but in a different approach, where a greater understanding of suppliers is mentioned. In literature, focus is put on documentation, visualisation of reduction potential and clear targets which requires transparency to a certain extent (Ellram, 2002). Further, the identification of improvement areas is shared by both TeleCompany and theory. In addition, theory elaborates further on the understanding and the possibility to see how purchasing is contributing to the overall goal (Newman & McKeller, 1995).

6.4.1.2.2 Drawbacks & Barriers

When discussing the drawbacks regarding Cost-engineering with TeleCompany, the risk of not reflecting the actual costs is mentioned. This is not discussed in theory. However, the risk of damaging supplier relations due to demanding cost reductions, which are derived earlier in the value-chain is highlighted (Newman & McKeller, 1995). In this case, pressure is put on suppliers for costs, which they cannot govern. Also, the narrow focus of Cost-engineering is stressed in literature due to the focus on the product design stage (Shank & Fisher, 1999). The reason why TeleCompany is not mentioning this issue might be because they have a Landed cost model supporting this.

6.4.1.2.3 Application

Cost-engineering is used for supplier selection at TeleCompany. In literature, both supplier evaluation and supplier development is suggested in combination with supplier selection (Ansari et al., 2006). As previously mentioned, this situation could arise from the fact that Cost-engineering is supported by the Landed cost model.

6.4.1.2.4 Success Factors

TeleCompany is only discussing the importance of including the entire company and to work cross-functionally whereas literature mentions a number of success factors. For instance, top-management support, incentives for employees, clear targets and cost monitoring are highlighted (Ansari et al., 2006; Moden & Hamada, 1991; Ahmed, 1995). In addition, the use of pilot project and a clear implementation plan are also mentioned (Ansari et al., 2006). However, these two aspects are directly related to the initial phase of implementation, which was not recently done at TeleCompany. This can explain the absence for such aspects.

6.4.1.2.5 Contextual Aspects

Concerning contextual aspect, TeleCompany is referring to cross-functional orientation both for the Landed cost model as well as Cost-engineering. The importance of sharing information, working in collaboration and communication across departments is critical according to the interviewee. This is also confirmed by literature (Kendt & Nichols, 1992). Further, supplier relation strategies is mentioned by TeleCompany as a contextual aspects affecting purchasing cost models and especially Cost-engineering. Since this acts as a tool for communication and negotiation, the type of relationship is central. The deeper the relationship is, the greater is the need for a purchasing cost model. Also, resistance to change is mentioned by literature but not by TeleCompany (Ansari et al., 2006).

6.4.2 Summary

How TeleCompany uses their Landed cost goes well in line with what literature suggest in most cases. However, they are using it for all three applications by extending evaluation to development, which is not mentioned in our literature review.

As mentioned previously, we have put TeleCompany in the fifth stage but in the lower part of it. This, since TeleCompany's activities are similar to those suggested by van Weele (2010) but they are not fulfilling them to a full extent. To be put further to the right in the development model, TeleCompany has to involve suppliers to a greater extent in product development and in supply chain activities such as VMI.

Putting their contextual aspects in relation to the applications performed (Figure 34) it can be seen that the cross functional orientation and supplier relation strategies are of more importance to TeleCompany compared to what is suggested in literature.

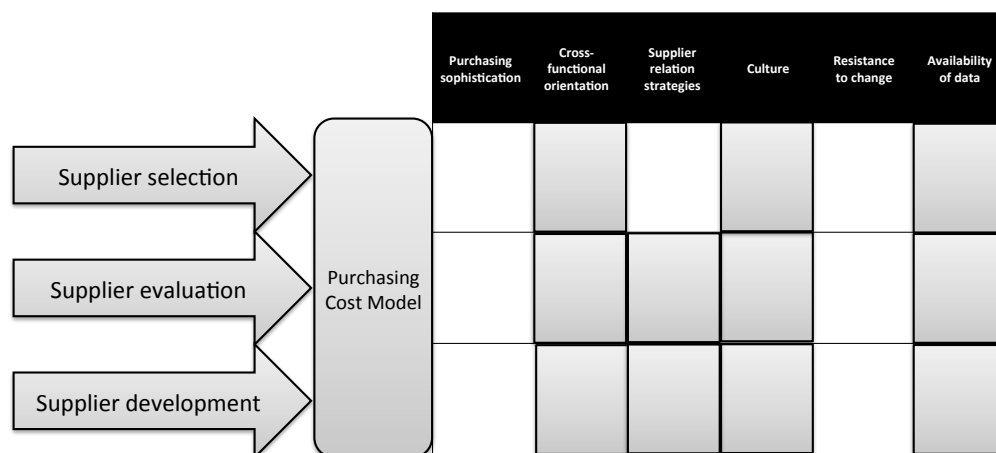


Figure 34 TeleCompany's contextual aspects in relation to the application

The cross-functional orientation for purchasing is most likely highly related to the organisational structure that is divided into products and services. To successfully manage this separated organisation in an effective way a cross-functional orientation and knowledge exchange between the departments is required. Also they put much effort into managing supplier relation strategies where they argue that suppliers that assent transparency should be rewarded. However, the relation is not of as much importance in the initial selection.

Further, TeleCompany sees the culture as an important aspect for managing a purchasing cost model successfully. Ultimately, getting everybody on board is important. This is highly related to having an easy to use model that gets accepted and used by the purchasers.

Last but not least, the availability of data at TeleCompany is an aspect of importance when working with cost modelling. However, this should not be seen as a major obstacle but rather something to consider in the model development. Some parameters might have to be estimated and some left out due to intangibility. TeleCompany knows that this is a common problem and their view is also supported by literature.

6.5 Volvo Cars' Purchasing Cost Model

We agree with Volvo Cars' positioning in van Weele's (2010) development model (Figure 35) and as seen their purchasing department is highly developed and the recognition that purchasing is essential for success has been identified. Further, they outsource parts and components and engage in close supplier collaborations. In addition, Volvo Cars are utilising different purchasing cost models and other tools to facilitate purchasing.

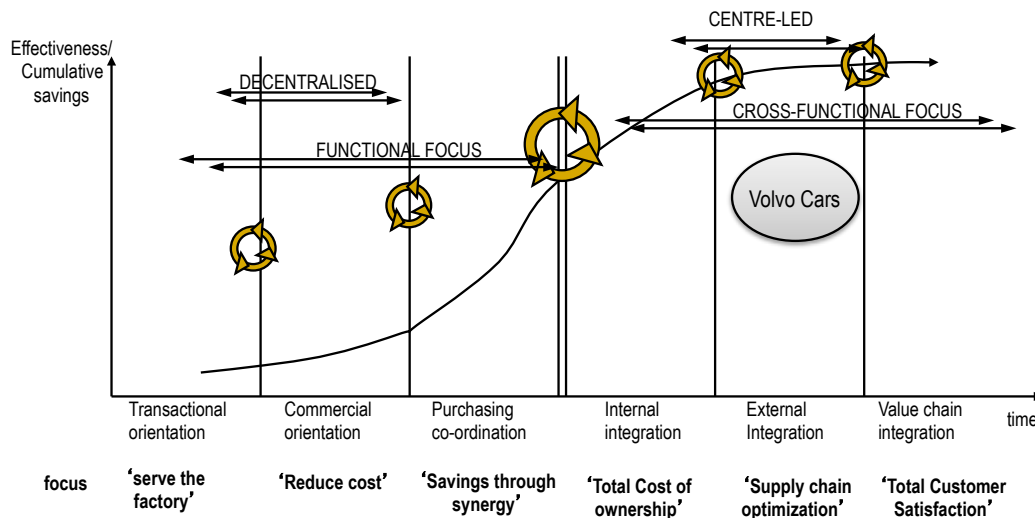


Figure 35 Volvo Cars in van Weele's (2010) Development model

As van Weele (2010) claims, a major driver for development is the intensity of competition within the industry. This is particularly true for the automotive industry where margins are low and competition is intensive. Given this information, one can assume that Volvo Cars would utilise well-developed systems to facilitate efficient purchasing processes. In parallel, the same would be true for purchasing cost models, where the proposition would correspond to a model such as TCO or equivalent, covering all transactional stages. However, Volvo Cars is using a Landed cost model for the decision-making concerning supplier selection. Volvo Cars' argument for not taking into account the pre-transactional phase is because it has minimal financial impact in relation to the transactional phase. More interesting, the post-transactional phase is not included because Volvo Cars expect the suppliers to perform according to agreements. As previously addressed, this is simply possible through rigorous evaluation of suppliers in advance. Thus, cost of insufficient quality is not included in the purchasing cost model. These costs are also regarded as difficult to quantify according to literature. This is equivalent to the critique towards TCO. In many cases these types of costs are difficult to quantify and the time and effort required to manage this is not proportional to the benefits generated by including them. Also, as indicated by Volvo Cars, the model in use today is already time-consuming. By extending the model further, one can assume that the process of obtaining the total cost is not sustainable in terms of practical usability.

Volvo Cars expressed their ambition of developing their Landed cost model for further improvements. Since the model uses the software Microsoft Excel, manual work is required. The ambition is to manage the Landed cost model in a dashboard environment where updates can be done automatically as information changes. This objective has not yet been investigated by Volvo Cars but it is denominated as the next step.

6.5.1 Purchasing Cost Models & Cost Components

Volvo Cars is using two separate purchasing cost models for two different purposes. The Landed cost model is focusing on the supplier selection application where costs specifically related to the transaction are taken into account. In contrast, a Should-cost model is used for evaluating quotes from suppliers. This is partly used for the supplier selection activity but also supplier evaluation and supplier development in the sense of finding opportunities to reduce costs in collaboration with suppliers. It is said that supplier involvement is central in the automotive industry to improve and generate innovations and this view is also shared by Binder et al. (2008).

In contrast, having two parallel purchasing cost models to serve different purposes is not described in literature. Since different models have different benefits, it is reasonable to assume that this is a widely spread approach in practice. However, opportunities in terms of synergy effect between two or more models might exist and should be investigated further. In the case of Volvo Cars the two models have a different purpose and are not very related to each other. Though, in the best of worlds the output, in terms of price or cost, from the Should-cost model could be seen as an input for the purchase price in the Landed cost model.

6.5.1.1 Landed Cost Model

A comparison of the Landed cost model between theory and Volvo Cars has been performed in Table 26. As seen, the Landed cost model embodies cost components such as purchasing price, delivery, customs duties, packaging and in some cases the in-transit inventory costs. This is equivalent to how literature presents the model with the difference that other companies sometimes include inventory costs to greater extent.

Table 26 A comparison between Volvo Cars' Landed cost model and theory

Characteristics	Landed cost at Volvo Cars	Landed cost in theory
Cost components	<ul style="list-style-type: none"> • Purchase price • Delivery and freight rates • Customs duties • Packaging • In-transit inventory cost 	<ul style="list-style-type: none"> • Transaction price • Transportation • Customs duties • Inventory management • Overhead costs
Benefits	<ul style="list-style-type: none"> • Close relationship to KPIs • Transparency in decision-making • Based on factual calculations 	<ul style="list-style-type: none"> • Reduced supplier management cost • Increased coordination of activities • Broad supplier evaluation • Capitalise on value-added activities • Increased supplier performance management
Drawback & barriers	<ul style="list-style-type: none"> • Time-consuming • Administrative work required 	<ul style="list-style-type: none"> • Difficult to gather the right data • Organisational reluctance
Application	<ul style="list-style-type: none"> • Supplier selection 	<ul style="list-style-type: none"> • Supplier selection

		<ul style="list-style-type: none"> • Supplier evaluation
Success factors	<ul style="list-style-type: none"> • Application handiness • Understanding • Training • Compliance • Clear policies • Discipline 	<ul style="list-style-type: none"> • Balancing breadth with usability • Focus on objective measures • Gather data continuously • Involve all levels in the company
Contextual aspects	<ul style="list-style-type: none"> • Supplier relation strategies • Top-management support • Cross-functional orientation 	<ul style="list-style-type: none"> • Resistance to change • Supplier relations strategies • Cultural challenge • Cross-functional mechanisms

6.5.1.1.1 Benefits

Regarding benefits, Volvo Cars focused on the benefits associated with a model based on factual calculations. To Volvo Cars, that created transparency in the sourcing process. Also, the Landed cost model, as a part of the Global Sourcing Process, contributes to a standardised procedure aiming at increasing compliance. Further, the close relationship with KPIs is significant. In contrast, literature elaborates on benefits concerning reduced supplier management cost, increased coordination and the opportunity to capitalise on value-adding activities (Beckman & Rosenfield, 2008). Theory presents benefits related to cost savings to a greater extent whereas Volvo Cars emphasized opportunities to manage the purchasing procedures. Also, theory presents benefits related to supplier evaluation such as broad supplier evaluation and increased supplier performance (Beckman & Rosenfield, 2008). These are not mentioned by Volvo Cars, which is justified since this application is not used currently. In addition, the Landed cost model at Volvo is seen as a prerequisite to manage the cost-focused environment rather than an opportunity to further reduce costs. This might be a result to why cost-savings are not addressed to equal extent as in literature.

6.5.1.1.2 Drawbacks & Barriers

Volvo Cars indicates that using the Landed cost model requires administrative work and that it is time-consuming to manage. However, gathering of data is not considered as an obstacle at Volvo Cars. Due to the fact that the purchasing cost model was institutionalised several years ago, problems concerning the collection and quantification of cost components are not seen as a hinder. On the other hand, literature stresses that this is a common issue as well as the restructuring necessary for materialising the model (Feller, 2008; Young et al., 2009).

6.5.1.1.3 Application

Volvo Cars uses the Landed cost model exclusively for supplier selection. Literature on the other hand suggests that another application is supplier evaluation. Since Volvo Cars uses their Should-cost model for that purpose, there is no need for Volvo Cars to extend the Landed cost model further. There are likely benefits with both setups, using either one cost model or multiple. It is safe to say that, when having several purchasing cost models, greater administrative work is required. However, using one model for several purposes might yield unnecessary complexity and obstruct procedures. If an extension of

the application does not generate further cost components to the purchasing cost model, it is most likely beneficial to group them.

6.5.1.1.4 Success Factors

There is a clear difference in focus when comparing Volvo Cars to the current academic research. Volvo Cars emphasise the human dimension, which involves success factors such as application handiness, understanding and training. In addition, clear policies and procedures arising from the Global Sourcing Process are essential for further success. These dimensions are not covered by literature where aspects concerning the model design are stressed. Balancing breadth with usability, gather data continuously and involving all parts of the company are key success factors according to academic research (Feller, 2008; Young et al., 2009). This was most likely critical for the implementation at Volvo Cars at the time when the purchasing cost model was new. Thus, the aspects mentioned by Volvo Cars can be seen as long-term success factors.

6.5.1.1.5 Contextual Aspects

In Volvo Cars' case, there are clear contextual aspects arising from the industry standard. Supplier relation strategies are essential in the sense that close collaboration with suppliers is commonly utilised in the automotive industry. Hence, having tools to determine their performance and finding opportunities to further develop and reduce costs is central. Also, top-management support was identified to affect the way of working. The Global Sourcing Process bridges the expectations from managers with the strategic purchasing work through the sourcing committee established at Volvo Cars. Further, Volvo Cars also mentions cross-functional orientation and centralisation when discussing their purchasing function in overall. These aspects are also discussed in academics today. In addition, the cultural effect and the resistance to change are stressed when implementation issues are highlighted in literature (Feller, 2008).

6.5.1.2 *Should-cost Model*

The Should-cost model at Volvo Cars has been compared to Cost structure analysis in our theoretical framework and all parameters are gathered in Table 27 below. As seen in the table regarding cost components the model at Volvo Cars covers everything from the bill of material to the profit added on top. As discussed before, this structure is both used for breakdown of the selling price and build up of component price, where the latter naturally is more focused on the bill of material only. This goes quite well in line with what theory discusses where the component labour cost however is included in Volvo Cars' cost of manufacturing. Although, as seen in the table the components S, G&A, R&D and the cost of the learning curve are not considered at Volvo Cars.

Table 27 A comparison between Volvo Cars' Should-cost model and theory

Characteristics	Should-cost at Volvo Cars	Cost structure analysis in theory
Cost components	<ul style="list-style-type: none"> • Bill of material • Cost of manufacturing • Overhead • Profit 	<ul style="list-style-type: none"> • Cost of materials • Manufacturing • Labour cost • Overhead • S, G&A costs • R&D • Learning curve • Profit
Benefits	<ul style="list-style-type: none"> • Includes all costs • Credibility to suppliers 	<ul style="list-style-type: none"> • Clear targets • Visualise reduction's

	<ul style="list-style-type: none"> • Enables problem identification • Enables greater understanding of suppliers' cost structure 	<p>contribution to overall goal</p> <ul style="list-style-type: none"> • Ability to document purchasing's contribution • Facilitate improvements • Increase understanding • Involve suppliers • Support evaluation
Drawback & barriers	<ul style="list-style-type: none"> • Biased view • Administrative work required 	<ul style="list-style-type: none"> • Asymmetric relation towards suppliers • Narrow focus
Application	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Supplier development 	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Supplier development
Success factors	<ul style="list-style-type: none"> • A system that is commonly know in the industry • Understanding • Training 	<ul style="list-style-type: none"> • Top-management support • Cross-functional orientation • Incentives for employees • Clear targets • Cost monitoring and control • Pilot project • Clear implementation plan
Contextual aspects	<ul style="list-style-type: none"> • Supplier relation strategies • Top-management support • Cross-functional orientation 	<ul style="list-style-type: none"> • Resistance to change • Cross-functional orientation

6.5.1.2.1 Benefits

As seen in Table 27, there are several benefits of using a Should-cost model according to Volvo Cars. We see that the use of such a model provides a good break down of costs and also credibility to suppliers if managed correctly. Since Volvo Cars is having a supportive function called Cost-estimating, specialised in determining these calculations, great understanding is shown of the suppliers' business and overall structure. According to Liker and Choi (2004), understanding your suppliers is necessary to further manage supplier development. This enables activities aiming at developing and improving the suppliers' processes in collaboration and eventually reduces the overall cost, which is favourable for both parties. Another benefit identified by Volvo Cars is the possibility to identify problem areas, which can be improved. This is highly related to the previous objective of understanding your suppliers business.

Looking at the differences between Volvo Cars and theory both mention the increased understanding of the suppliers' cost structures and how this can facilitate problem identification and thus improvements (Ellram, 2002). However, theory puts more focus on how a cost structure analysis can visualise and document purchasing's contribution to company goals (Newman & McKeller, 1995). This is most likely related to purchasing's position in the organisation and on what KPIs they are measured. Nevertheless we will not go deeper into that since it is out of our scope.

6.5.1.2.2 Drawbacks & Barriers

Volvo has also identified certain drawbacks of using the Should-cost model. First, the calculations performed in-house are still subjective and based on Volvo's view. This view is therefore not necessarily shared by their suppliers, which means that conflicts might occur. However, the different views of what components should cost will most likely be an issue in the future and one could argue that it should be highlighted as early as possible. Also, the administrative work required can also be seen as a drawback.

The biased view, which Volvo Cars sees as a drawback is also found in literature where they mean that the Cost structure analysis is unfair and created from the buyer's perspective (Newman & McKeller, 1995). Shank and Fisher (1999) also discuss the narrowness of the model since it is only used in the early stage of the product life-cycle which is not mentioned by Volvo Cars.

6.5.1.2.3 Application

Regarding application, the Should-cost model at Volvo Cars is applied for supplier selection, evaluation and development. First, the model facilitates the activity of assessing quotes in the sourcing process. By having an estimate of what components should cost, purchasers can more effectively assess the price and the cost structure provided by the potential suppliers. Van Weele (2010) describes this process within the supplier selection phase. Later, the model can be used when evaluating current suppliers and also developing their performance. The model is a good basis for improvement identification and can also be used for cost optimization when assessing different manufacturing alternatives at different production sites. The use of the Should-cost model is diverse and highly important but it does not specifically target the issues of this master thesis. Regarding the comparison with literature the same applications are discussed.

6.5.1.2.4 Success Factors

A general success factor for the Should-cost model is understanding. Similar to the use of Landed cost, Volvo Cars advocates the human dimensions and its importance to manage the models in everyday business. Also, related to their Should-cost model, Volvo Cars decided to use a software program, which is commonly recognized in the industry and eases the communications with suppliers.

Literature discusses the need for incentives to motivate employees to work with Cost structure analysis (Moden & Hamada, 1991). Further, the actual implementation was not discussed to a more detailed extent than that training is needed while it in literature is covered in terms of implementation plans etc. (Ansari et al., 2006). These statements are not supported by Volvo Cars and might be due to their history of working with strategic purchasing and a culture that encourages cost breakdowns.

6.5.1.2.5 Contextual Aspects

The contextual aspects concerning the Should-cost model are similar to the ones presented earlier in the Landed cost section. In summary, the contextual aspects derived from the industry characteristics are the most significant aspects. Here, supplier relation strategy seems to have affected the development of purchasing cost models. This is evident when considering the Should-cost model, which is closely related to the supplier side.

Resistance to change is not mentioned by Volvo Cars and as in many other cases this is likely related to their history of working with purchasing and their high level of purchasing sophistication.

6.5.2 Summary

When relating the previous findings to the research model (Figure 36) presented in the theoretical framework, the contextual aspects: culture, resistance to change and availability of data are not highlighted by Volvo Cars. Instead, supplier relation strategies, top-management support and cross-functional orientation are discussed. These aspects are strongly related to the industry Volvo Cars operates within but also to the purchasing sophistication at Volvo Cars. According to Lidén, the purchasing function is working cross-functionally, especially with R&D, Quality and Manufacturing. In addition, the close collaboration inter-organisationally is also evident. Naturally, this pervades the design of the purchasing cost models.

One explanation to this could be that Volvo Cars has worked with this mindset and purchasing cost models for a long time. One could argue that these activities are rather mature and that contextual aspects such as culture, resistance to change and availability of data are strongly related to the initiation phase of purchasing cost models.

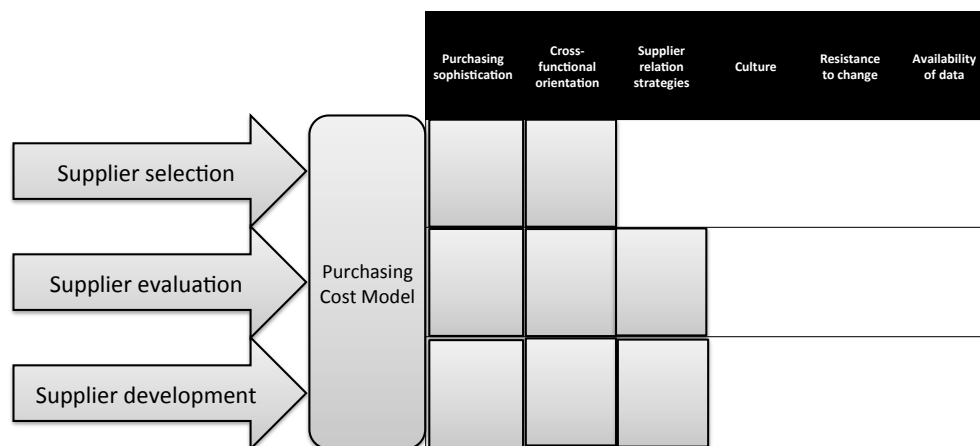


Figure 36 Volvo Cars' contextual aspects in the relation to the application

As seen in the figure, the result of the research model for Volvo Cars differs a lot from the literature where the point of gravity is more to the right.

One thing that is a common denominator where Volvo Cars differs from what theory says is their history of working strategically with purchasing and their high level of purchasing sophistication. This is highly related to the car industry where margins are low and costs are high, which means strategic and well developed purchasing can yield results.

6.6 Cross-case Analysis

This cross-case analysis is based on the empirical research and individual analysis performed on each of the following companies:

- IKEA
- Lantmännen
- Siemens Turbomachinery
- TeleCompany
- Volvo Cars

The empirical research was targeting the purchasing within each company specifically. This was later compared to our literature through pattern matching. Now, an analysis will be executed in order to find patterns across the five cases. The analysis aims to answer the research questions provided in the introduction of this master thesis. The questions are also stated below:

- RQ₂ – What contextual aspects within the corporate environment affect how companies institutionalise and sustain a purchasing cost model?
- RQ₃ – What are the benefits and drawbacks of different purchasing cost models and how are these affecting the company?
- RQ₄ – How is the choice of purchasing cost model affected by its application?

6.6.1 Contextual Aspects (RQ₂)

There are interesting findings when investigating the contextual aspects of our case sample. There are several aspects reappearing in the different cases such as corporate culture, cross-functional orientation, supplier relation strategies and top-management support. Consequently, there are similarities in the perception by the companies when discussing purchasing cost models. In addition, after analysing where the companies are positioned in the development model, in terms of supplier sophistication, the case companies are shown to be well-developed. There is a range between internal integration and value chain integration but in overall, the companies' purchasing functions are developed. A detailed description can be seen in Table 28. These results were rather expected since the case sample was chosen in order to find five well-developed purchasing departments. It is also shown that these companies all have purchasing cost models to various extents. However, given our sample it is not possible to pinpoint certain purchasing cost models to specific stages in the development model.

Several aspects identified by our literature review have also shown to be affecting the real-life settings of purchasing. For instance, Ellram (1993) suggested that culture had a major impact on the success of TCO since this was more than a tool but rather a philosophy. Also, Young et al. (2009) highlighted the cross-functional orientation as an important aspect of Landed cost. In addition, the top-management support is also seen as an enabler for managing the work with purchasing cost models successfully.

Moreover, we find no evidence that specific contextual aspects can be related to specific applications of the purchasing cost model. According to our research, these aspects are of a general character for the management of purchasing cost models and related to the setup and procedures of everyday business. It is difficult to determine if we do not

possess sufficient data to investigate this phenomenon or simply if contextual aspects and application is disconnected from each other.

Table 28 The companies' purchasing development, contextual aspects and purchasing cost models

Company	Purchasing Development	Contextual Aspects	Purchasing Cost Model
IKEA	External integration / Value chain integration	<ul style="list-style-type: none"> • Corporate culture • Cross-functional orientation • Supplier relation strategies • Company size and available resources 	<ul style="list-style-type: none"> • Landed cost • Supporting models
Lantmännen	External integration	<ul style="list-style-type: none"> • Corporate culture • Supplier relations strategies • Top management support • Cross-functional orientation 	<ul style="list-style-type: none"> • TCO
Siemens Industrial Turbomachinery	External integration	<ul style="list-style-type: none"> • Industry characteristics • Supplier relation strategies • Cross-functional orientation • Corporate culture 	<ul style="list-style-type: none"> • Life-cycle costing
TeleCompany	Internal integration / External integration	<ul style="list-style-type: none"> • Corporate culture • Cross-functional orientation • Supplier relation strategies • Company size and available resources 	<ul style="list-style-type: none"> • Landed cost • Cost structure analysis
Volvo Cars	External integration	<ul style="list-style-type: none"> • Supplier relation strategies • Top-management support • Cross-functional orientation • Company size and available resources 	<ul style="list-style-type: none"> • Landed cost • Cost structure analysis

To be able to further relate contextual aspects to specific purchasing cost models, Table 29 has been developed. Here, we compare the purchasing cost models identified by the case sample with the most frequent contextual aspects reappearing in this study. To clarify, top-management support is an aspect incorporated in the broader term, organisational structure. Also, corporate culture has evolved into the term cost-driven culture.

For those contextual aspects that have more impact on certain purchasing cost models, a relative comparison has been conducted (Figure 37; Figure 38; Figure 39; Figure 40; Figure 41). For the remaining contextual aspects, it is simply not possible to draw any conclusion on the relative impact between purchasing cost models.

Purchasing Cost Model	Company utilising the model and theory	Industry competitiveness	Cross-functional Orientation	Organisational Structure	Cost-driven culture	Supplier relation strategies	Availability of data and enabling software	Company size and available resources
Cost structure analysis	Volvo Cars	X	X	X		X		X
	TeleCompany		X			X	X	X
	Theory		X					
Landed cost model	Volvo Cars	X	X	X		X		X
	TeleCompany		X			X	X	X
	IKEA		X	X	X	X		X
Life-cycle costing	Theory		X		X	X		
	Siemens Turbomachinery	X	X	X		X		
Total Cost of Ownership	Theory							X
	Lantmännen		X	X		X		
	Theory				X		X	

Table 29 The contextual aspects in relation to the purchasing cost models

6.6.1.1 Industry competitiveness

We have identified additional contextual aspect, which have not been described or discussed in our literature review. First, both Volvo Cars and Siemens highlighted the market or industry that a company operates within (Table 29). Depending on how intense the competition is within an industry, the more focus and emphasis is put on purchasing in general. This is also true for the work with purchasing cost models. As competition intensifies and margins are squeezed, the more important it is for companies to manage cost effectively. In this case, purchasing cost models are a highly useful tool in order to provide a basis for decision-making and to visualise the cost structure and where improvements will yield the most savings. Industry competitiveness affect purchasing cost models in the sense that incentive to manage cost reductions arise in order to maintain the market share. Thus, it is an external driver for working with purchasing cost models.

6.6.1.2 Organisational Structure

Further, the organisational structure within a company has shown to impact the work with purchasing cost models. IKEA, Lantmännen, Siemens and Volvo Cars all highlight that having a formalised structure is an important aspect. At Volvo Cars, purchasing has established what they call the Global Sourcing Process, which is a structured and standardised procedure of sourcing. This process has enabled an institutionalisation of the landed cost model since this is required for all sourcing decisions. Also, incorporated in this process is a purchasing committee, which for example approves sourcing proposals. This structure provides a bridge between purchasers and top-management with clear directives and expectations. Lantmännen has also shown to have an formalised organisational structure enabling purchasing cost models. When implementing TCO, Lantmännen utilised their corporate purchasing function and a group called Supply Chain Excellence who carried out the implementation. This structure enabled the companies within Lantmännen to adapt to the new mindset and work while being supported by this group. Implementation in combination with training and clear directives from top-management was driving the institutionalisation of TCO. Since literature often highlights the difficulties of managing TCO, Lantmännen's structure and procedure are evidence that this is possible in practice. Siemens also stresses the importance of having a formalised organisational structure where the purchasing cost model is sustained. The calculations provided by the purchasing cost model must be expected and requested by managers; otherwise compliance will not be obtained. Hence, along the hierarchy of purchasing within a company, the purchasing cost model must be emphasised as an official tool. Lastly, IKEA highlights the importance of having cross-functional teams for purchasing decisions. At IKEA, development teams exist consisting of designers, product developers, logisticians, purchasers and engineers among others. This structure enables purchasing to be involved early in sourcing decisions but also the possibility to use purchasing cost models early and finding appropriate data across the company. Shank & Fisher (1999) claims that once a product has left the design phase, 80 % of the costs are fixed. Thus, if managing cost reductions effectively, the activities prior and during the design phase should be targeted. However, this requires that purchasing must be involved early in the process of product development.

Given our empirical study, it seems like organisational structure is an essential contextual aspects for purchasing cost models but not a prerequisite. When having a formalised organisational structure and an outspoken procedure in which the purchasing cost model is incorporated, compliance will increase. Thus, the model will be used to its full

potential. Otherwise, the possibility that the costs of maintaining the purchasing cost model will exceed the benefits.

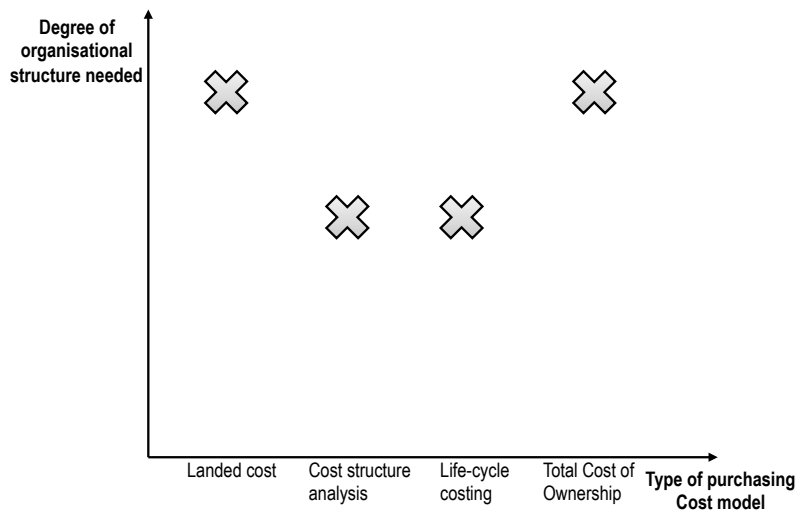


Figure 37 A relative comparison of organisational structure

In Figure 37, a relative comparison between the purchasing cost models has been developed in terms organisational structure. It can be seen that both TCO and Landed cost require a higher degree of organisational structure compared to Cost structure analysis and Life-cycle costing. This proposition is derived from the empirical research where IKEA, Lantmännen and Volvo Cars communicated their procedures and structures. These three companies use Landed cost and TCO. In Cost structure analysis and Life-cycle costing, there are no evidence in our research that these models require equal degree of organisational structure. However, for Life-cycle costing, one can suspect that this might not be entirely true due to the similarities with TCO.

6.6.1.3 Cost-driven Culture

Moreover, having a cost-driven culture has been identified as a driver for purchasing cost models. This was evident at IKEA where the term democratic design has been rooted for a long time. In this term, low price is emphasised and in order to manage this, cost focus is essential. By having this paradigm influencing all activities in a company, it is natural that purchasing is recognised across the business and that cost reductions are central for the success. As an implication, working with purchasing cost models does not generate any reluctance by employees and compliance is high. Further, TeleCompany recognised that their organisational-wide focus on quality was many times at the expense of cost awareness. Our literature has also covered the culture but to a limited extent. Authors have mentioned the importance of corporate culture when managing TCO and Landed cost (Ellram, 1993; Young et al., 2009). However, they do not mention what type of culture that is enhancing purchasing cost models. The findings in our empirical research indicate that a cost-driven culture will most likely recognise the importance of purchasing cost models and allocate sufficient resources for the model to function. In addition, when having a culture focusing on a contradictory objective such as quality, the risk is greater that purchasing cost models will be less prioritised.

The relative comparison between the different purchasing cost models (Figure 38) suggests that TCO and Landed cost requires larger degree of a cost-driven culture. This is because theory claims that the organisational culture is important for TCO (Ellram, 1993) and IKEA highlights their culture, which is pervaded by a cost focus. Remaining

purchasing cost models show no signs that a cost-driven culture is necessary at the studied companies.

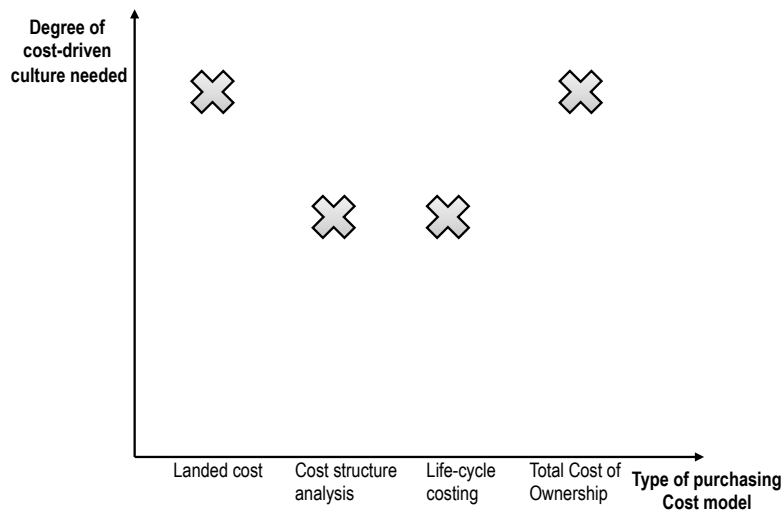


Figure 38 A relative comparison of cost driven culture

6.6.1.4 Availability of Data

Also, the availability of data and supporting software has been investigated across the cases. Some companies indicate that this can be an issue for purchasing cost models. However, other companies claim that this is no obstacle. We believe that if companies are utilising cross-functional orientation and communicate the cost models across the business, data will not be a problem. Often, data exists but purchasing does not always know how to collect it. IKEA has solved this issue by creating an internal simulation tool used for landed cost calculation. In this tool, a database of all required data is incorporated and updated frequently by employees having this as a responsibility. Consequently, purchasing does not have to allocate time for searching and collecting data but rather focusing on the calculations and its implication. Availability of data and supporting software can be seen as a threshold for purchasing cost model work. Consequently, this will impact the results negatively even though the information exists.

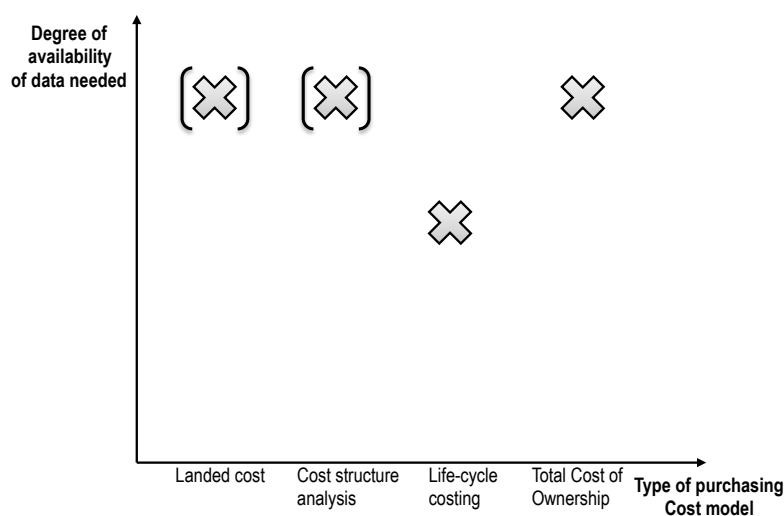


Figure 39 A relative comparison of availability of data required

The relative comparison between the purchasing cost models is somewhat contradictory for the availability of data, this is described with brackets in figure (Figure 39). Theory confirms that the availability of data is critical for TCO, this is not highlighted by Lantmännen who is managing an equal model. Also TeleCompany identifies difficulties in relation to Landed cost and Cost structure analysis. However, both IKEA and Volvo Cars claim that availability of data is not an issue for them. Consequently, there are differences in the perception among the case sample. A possible explanation is that other variables affect the degree of available data. Both IKEA and Volvo Cars are large companies with extensive resources available which can be a factor affecting the result.

6.6.1.5 Supplier Relation Strategies

Supplier relation strategies was identified during the literature research as a possible contextual aspect affecting the work with purchasing cost models. This has later been confirmed during the empirical research. All companies have well-developed relations with their suppliers. Often, suppliers are segmented according to strategic, preferred and approved suppliers. All of the supplier types do not necessarily engage in collaborative activities but all the case companies deploy deeper relations with some. Joint product development, sharing innovations and reducing costs in collaboration are some activities that are being carried out by the case companies. Here, purchasing cost models are considered to enable the communication. It is also evident that a purchasing cost model not solely enables already existing relations, it can also trigger development of new supplier relations since it can act as a communicative tool. Several case companies indicate that suppliers are often positive to the use of purchasing cost models. The results from these models might not always reflect reality as suppliers see it. However, the tool enables discussions and triggers reflection of current setups. All companies in the empirical research identify supplier relation strategies as an important contextual aspect. This seems like a fundamental part of the work with purchasing cost models. This is because data sometimes needs to be extracted from suppliers but also since improvement areas, identified by the purchasing cost model, need to be corrected in collaboration with suppliers.

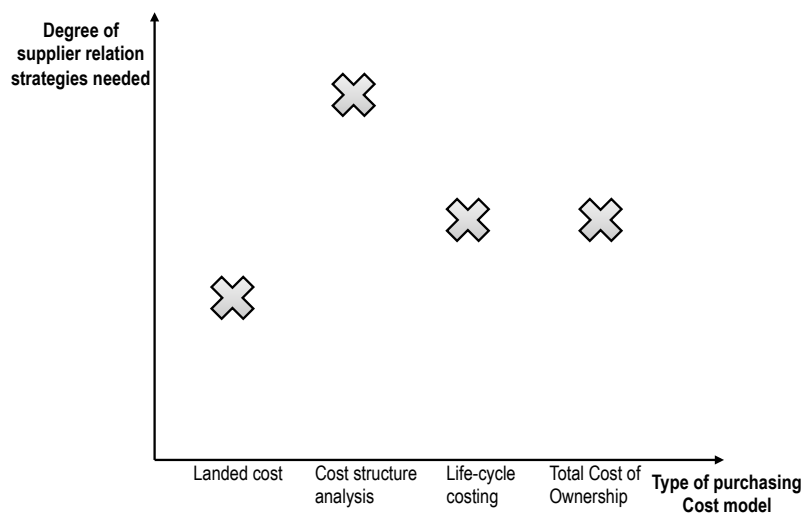


Figure 40 A relative comparison of supplier relation strategies

The relative difference, of supplier relation strategies required, between the purchasing cost models is described in Figure 40. As presented, Cost structure analysis is dependent on suppliers to greater extent compared to the remaining models. When using Cost structure analysis such as Should-cost analysis for benchmarking quotes from different

suppliers, a degree of transparency is required. Since a comparison is performed on the components, which compose the price, suppliers need to have an open-book procedure. For the remaining models, most of the cost components are derived in-house. However, to be able to improve aspects such as product quality, suppliers must be involved. Consequently, the Landed cost model, which is focused on the transactional stage, has the least dependency on supplier relation strategies.

6.6.1.6 Cross-functional Orientation

Another contextual aspect identified by all companies in the case sample as well as the literature review is cross-functional orientation. To be able to reach significant cost reductions, departments within a company need to cooperate. For instance, purchasing needs to be involved early in product development in order to communicate important sourcing information before the product design is set. Also, purchasing needs to be aware of concerns related to the refinement of the goods that will be contracted to suppliers.

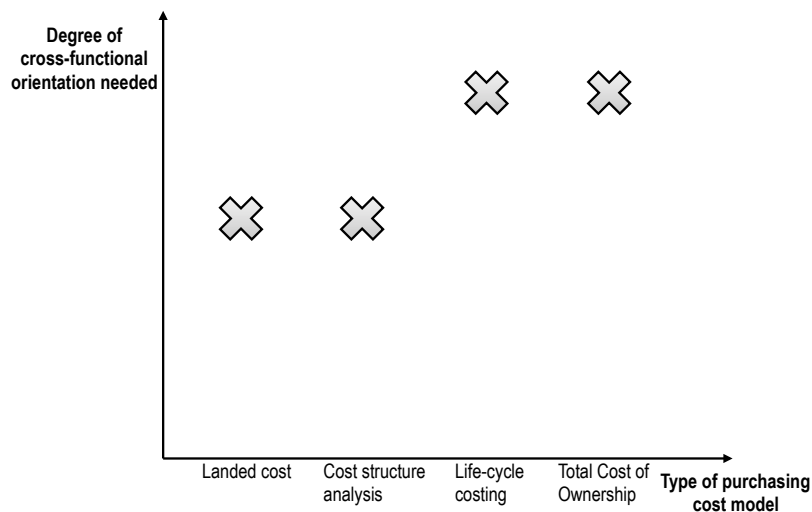


Figure 41 A relative comparison of Cross-functional orientation

As seen in Figure 41, TCO and Life-cycle costing are more dependent on cross-functional integration within a company. This is because these two models are more extensive compared to the Landed cost model and incorporates both the pre-transactional stage as well as the post-transactional stage in addition to the transactional stage. Cost structure analysis is more concentrated to fewer departments. At Volvo, a separate department managed the Should-cost calculations. However, it is not possible to determine the difference in impact of cross-functional orientation between Landed cost and Cost structure analysis.

6.6.1.7 Company Size and Available Resources

A contextual aspect that was identified at some of the case companies is the size of the company and the available resources related to this. Larger companies tend to have more functions supporting purchasing, which means purchasing can focus on the calculations of the purchasing cost model and not putting effort in gathering data.

In specific, the larger companies, Volvo Cars, TeleCompany and IKEA operate a Landed cost model, either solely or in combination with Cost structure analysis. This goes well in line with the contextual aspect Cross-functional orientation, which is often present at larger companies.

6.6.1.8 Conceptualisation

The contextual aspects described in the previous section have been conceptualised in Figure 42. Further, a segmentation of the aspects has also been developed according to Figure 43.



Figure 42 A conceptualisation of contextual aspects affecting the purchasing cost model

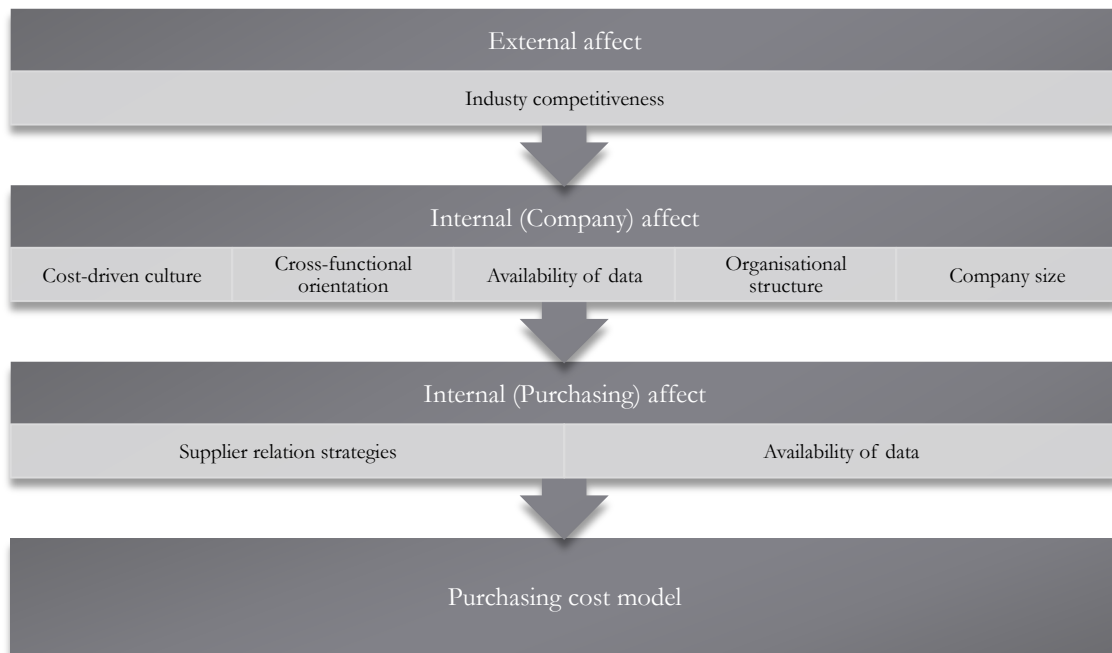


Figure 43 Segmentation of contextual aspects

The segmentation indicates which aspects that can be enhanced internally and drive the institutionalisation to sustain a purchasing cost model. Here we have separated internal - company from internal - purchasing since aspects such as supplier relation strategies and availability of data to some extent can be improved by purchasing themselves. However, the aspects cost-driven culture, cross-functional orientation and organisational structure can only be improved and adjusted if the entire company has recognised this as something to strive for according to our research. Consequently, these aspects are more difficult to pursue. Availability of data occurs twice in Figure 43 since some of the data can be collected from inside the purchasing department whereas other data comes from other departments of a company. Creating a cost-driven culture will require prioritisation and recognition by top-management among other functions for a long time. There is also an external aspect, industry competitiveness, which is a strong driver for cost awareness and the work with purchasing cost models. Here, the automotive industry is a good example where costs are essential in order for companies to survive. Evidence from our research indicates that several industries show signs of transcending towards similar characteristics due to the intensified global competition.

The contextual aspects driving the institutionalisation and maintenance of purchasing cost models is similar to drivers of purchasing development according to van Weele (2010). In connection to the development model, van Weele (2010) presents five drivers, which are business context, company strategy, systems development, top management commitment and functional leadership. These are similar to the findings in this master thesis. Also, when we have evaluated the position of the case companies in the development model we can establish that all companies are strong in terms of their purchasing function. A detailed positioning map is visualised in Figure 44. As previously mentioned, this is no surprise since the case sample was chosen with the objective to find highly developed purchasing departments.

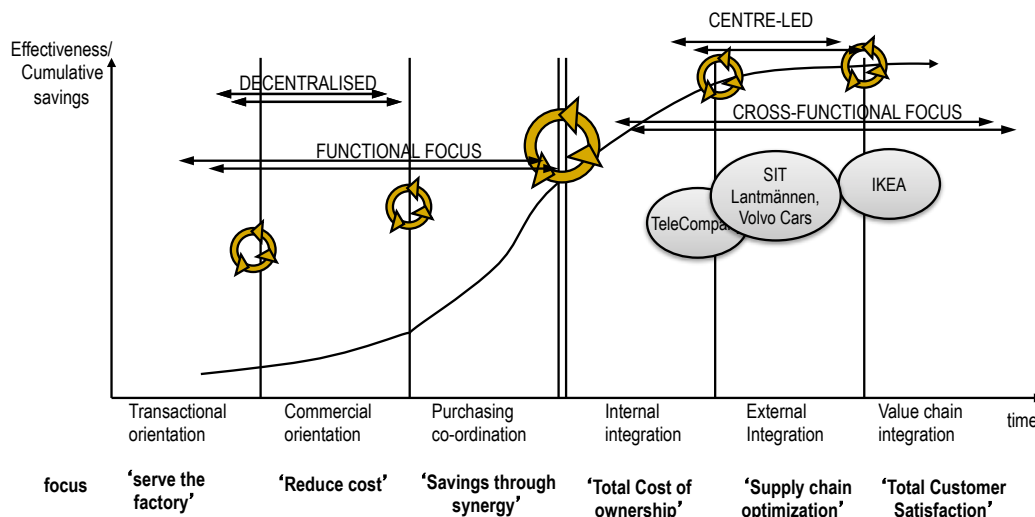


Figure 44 The case companies in van Weele's (2010) Development model

6.6.2 Benefits and Drawbacks (RQ₃)

The benefits and drawbacks identified by the studied companies can be seen in Table 30. Some benefits and drawbacks are specifically related to a specific purchasing cost model but some are of a more general character. These general benefits and drawbacks are likely to occur when a company implements and sustains a purchasing cost model.

Table 30 Benefits and drawbacks for the purchasing cost models

Purchasing cost model	Company	Benefits	Drawbacks
Cost structure analysis	TeleCompany	<ul style="list-style-type: none"> • Encourages transparency • Identifies improvement areas 	<ul style="list-style-type: none"> • Does not necessarily reflect the real cost structure
	Volvo Cars	<ul style="list-style-type: none"> • Includes all costs • Credibility to suppliers • Enables problem identification • Enables greater understanding of suppliers' cost structure 	<ul style="list-style-type: none"> • Biased view • Administrative work required
Landed cost model	IKEA	<ul style="list-style-type: none"> • Facilitate decision-making • Easy to use • Minor time allocation needed 	<ul style="list-style-type: none"> • Does not perfectly reflect reality • Risk of putting too much focus on numbers
	TeleCompany	<ul style="list-style-type: none"> • Considers more than price only • Good negotiation basis • Identifies improvement areas 	<ul style="list-style-type: none"> • Extra administration • Too complex • Availability of good data
	Volvo Cars	<ul style="list-style-type: none"> • Close relationship to KPIs • Transparency in decision-making • Based on factual calculations 	<ul style="list-style-type: none"> • Time-consuming • Administrative work required
Life-cycle costing	Siemens Industrial Turbomachinery	<ul style="list-style-type: none"> • Considers more than price only • Good basis for negotiations • Creates transparency • Reduced supplier management risks 	<ul style="list-style-type: none"> • Does not reflect reality • Instantaneous picture • Time consuming
Total Cost of Ownership	Lantmännen	<ul style="list-style-type: none"> • Understanding • Identify improvements 	<ul style="list-style-type: none"> • Time-consuming • Availability of information

6.6.2.1 Specific Benefits and Drawbacks for purchasing cost models

6.6.2.1.1 Cost structure Analysis

The benefits identified with Cost structure analysis are highly related to transparency and the identification and understanding of problem areas this involves. Understanding of the cost structure is of high importance in the technology intensive industry in which both TeleCompany and Volvo Cars operate within. This is therefore most likely a common denominator for the institutionalised Cost structure analysis in these companies. Regarding drawbacks, the companies argue that it might not reflect reality and that the view can be biased seen from the user's perspective. Further, it requires a lot of administrative work.

6.6.2.1.2 Landed Cost

Regarding the benefits with a Landed cost model, a common denominator for the three companies, IKEA, TeleCompany and Volvo Cars, is the facilitation of decision-making and that it is a good basis in negotiations. Moreover, since the purchasing cost model provides factual results based on data from reality, the model prevents ad hoc decision-making. This was highlighted by Volvo Cars that has incorporated a Landed cost in their global sourcing process. However, all companies do not see the Landed cost model as a good reflection of reality and IKEA specifically means that there is a risk of relying to heavily on numbers. Another drawback identified by TeleCompany and Volvo Cars is the time it takes to manage such a model where data gathering is a large time consumer. The reason IKEA does not state this might be since this is taken care of outside the purchasing department.

6.6.2.1.3 Life-cycle Costing

Life-cycle costing is only utilised by SIT and thus a comparison between the different cases is not possible. However, their perception is similar to the perception of the companies using the Landed cost model. SIT sees the benefits with the consideration beyond price and how this creates a good basis for negotiations. Also SIT agrees with the fact that using such a purchasing cost model is time consuming and that the result is not always reflecting reality. This similar perception might be related to the size of the companies since SIT in fact is a part of the large Siemens Corporation.

6.6.2.1.4 Total Cost of Ownership

Moreover, the TCO model is only used by one company, Lantmännen, wherefore no in-between company comparison is made. However, the benefits and drawbacks involved with the TCO according to Lantmännen are aligned with what the other companies mentioned. Lantmännen means that the model creates understanding and that the overall view is useful for identifying possibilities for improvement. Regarding drawbacks, they find TCO modelling time-consuming just as the other companies do. They also see the availability and gathering of information as a drawback just as TeleCompany and Volvo Cars do with their Landed cost models.

6.6.2.2 General Benefits and Drawbacks

There are benefits and drawbacks commonly observed among our case sample. First, working with purchasing cost models is time-consuming. This perception is shared among the case companies with one exception, IKEA. IKEA claims that their cost simulation tool is easy to use and to calculate. This model is also significantly different from the other companies' models. At IKEA the tool embodies an extensive database withholding all the essential information. Thus, the purchaser only needs to care about the input parameters. Consequently, the availability of data is not considered to be an

issue either. For the other companies, collecting data is seen as a difficulty when working with purchasing cost models. In addition, manual work is required for collecting, inserting and calculating the cost. Depending on the type of purchasing cost model, complexity can be an issue. As for Lantmännen where a TCO is utilised, complexity is seen as a barrier when calculating the total cost across the supply chain. Due to this extensiveness, the model is only updated on a yearly basis.

Volvo also mentions that suppliers might not approve the results from a Should-cost analysis. They can have a different view of reality and the perception can be subjective. However, having the purchasing cost model as a basis for communication is seen as positive by the case companies.

Purchasing cost models often give an instantaneous view of reality since it incorporates variables such as currencies and freight tariffs that vary over time. Siemens highlights this issue and says that models should be calculated as close to the purchase as possible. This might be related to Siemen's global appearance, which means that changes in currency can have a major impact.

Cross-functional orientation can be seen as both a benefit as well as a drawback. If a company does not have a cross-functional mindset, the collection of data can be difficult. To calculate a total cost, data has to be collected from several departments and continuous communication is needed in order to be successful. However, if there is a cross-functional orientation within a company, new cost components might be identified through communication and collaboration between functions. Purchasing cost models are also facilitating decision-making since models provide relevant information besides the purchase price.

Further, a greater understanding of the cost structure of both the company in question but also its suppliers is possible to gain through a purchasing cost model. Especially when different departments are responsible for driving different costs. In this case, by merging all cost components into one model it can visualise the total cost and the results of certain activities. Also, transparency in purchasing processes can be gained by documenting and tracing costs throughout the business. Thus, procedures can be questioned and analysed based on the information provided.

The benefits and drawbacks of general character have been segmented according to input oriented, realisation oriented and output oriented (Table 31). Since these are related to different stages of the process of managing purchasing cost models, a conceptualisation can provide greater understanding. Different steps in the work with a purchasing cost model will generate different challenges and opportunities, Table 31 visualises these aspects and can be used in a preventive purpose. Thus, the user will know what to expect to greater extent.

Table 31 Segmentation of benefits and drawbacks

Input oriented		Realisation oriented		Output oriented	
Benefits	Drawbacks	Benefits	Drawbacks	Benefit	Drawbacks
<ul style="list-style-type: none"> • Input parameters are factual • Considers more than price 	<ul style="list-style-type: none"> • Availability of data • Often manual work required 	<ul style="list-style-type: none"> • Understanding of cost structure • Encourages Transparency • Cross-functional orientation 	<ul style="list-style-type: none"> • Time-consuming • Admin. Work required • Complexity • Cross-functional orientation 	<ul style="list-style-type: none"> • Factual results • Facilitate decision-making • Visualise improvement potential • Good basis for negotiation • Reduced supplier management risk 	<ul style="list-style-type: none"> • Company-specific view • Instantaneous picture of reality

6.6.3 Application (RQ₄)

Several companies in the case study use more than one purchasing cost model. TeleCompany, IKEA and Volvo Cars utilise one type of Cost structure analysis in combination with a Landed cost model. In this setup, Cost-engineering such as Should-cost and Cost-breakdown, is used to determine the price of a product or component. Later, the Landed cost model is used to take into account other components driving the total cost for a transaction. Depending on company, the Landed cost model ranges from only including the transactional stage to also incorporate inventory and in-transit inventory management. Lantmännen on the other hand uses a TCO model that covers the entire supply chain. This setup is slightly different from previous mentioned models since their TCO aims to visualise the overall cost structure and later act as a basis for improvement potential. However, it is not specifically used for sourcing decisions.

In Table 32, each purchasing cost model is presented as well as the applications it serves. Volvo Cars, TeleCompany and IKEA use a Landed cost model. It is used somewhat differently but in general it could be used for supplier selection and supplier development. Several companies also use one type of Cost structure analysis such as Cost-engineering, Should-cost analysis etc. This is also used differently depending on company. Volvo Cars uses their Should-cost model for all three applications whereas TeleCompany only uses it for supplier selection. Consequently, it has the potential to serve all three application areas.

Siemens has a modification of Life-cycle costing taking into account post-transactional cost components such as quality. This model can be seen as an extension of Landed cost for those products where the cost of its life-time is relevant. Siemens uses this supplier selection to facilitate e-bidding.

Table 32 The relation between applications and the purchasing cost models

Purchasing cost model	Company	Applications
Cost structure analysis	TeleCompany	<ul style="list-style-type: none"> • Supplier selection
	Volvo Cars	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Supplier development
Landed cost model	IKEA	<ul style="list-style-type: none"> • Supplier selection
	TeleCompany	<ul style="list-style-type: none"> • Supplier selection • Supplier development
	Volvo Cars	<ul style="list-style-type: none"> • Supplier selection
Life-cycle costing	SIT	<ul style="list-style-type: none"> • Supplier selection
TCO	Lantmännen	<ul style="list-style-type: none"> • Supply chain decision-making

As seen above, purchasing cost models can be used differently but there is some clear evidence. First, one type of Cost structure analysis is generally used for companies that operates production and purchase technology intensive or complex components other than raw materials or similar. Next, a purchasing cost model to determine the total cost, with point of gravity on the transaction stage, is often in place. Later, if the company offers maintenance and services in relation to the product offer, a Life-cycle perspective could be favourable. However, companies such as IKEA has separate models in place to determine the post-transactional quality. TCO as we have encountered does not specifically target a certain application but is more supporting continuous improvement in the supply chain.

It is also important to highlight that the case companies may use additional purchasing cost models to those listed in Table 32. During interviews we focused on one or a few purchasing cost models in order to gain a deeper understanding. Also, some companies interpret the meaning of purchasing cost models differently with the result of excluding some tools.

Purchasing cost models, as we have defined and investigated them, are predominantly used for supplier selection. To some extent, supplier evaluation and supplier development have appeared during this research. Hence, the models have potential to serve as more than just supplier selection. It is also important to have in mind that a limited case sample has been investigated in this research. More extensive investigations might result differently.

6.7 Findings

There are both similarities and differences between literature and practice. All models identified in practice do exist in literature where they are described properly. However, as we did recognise on beforehand, the contextual aspects affecting the models were not investigated or described sufficiently. Also, the emphasis in literature is somewhat different from reality, at least for the companies studied in this research. Companies tend to use as simple models as possible. Although the studied companies are shown to operate well-developed purchasing departments, most of them utilise less complex setups of purchasing cost models. We believe that even the least complex purchasing cost models can be difficult to manage in practice, not because of the calculations or fundamentals but rather due to the external affects. Many times, the initiative to implement a purchasing cost model comes from inside the purchasing department. However, we have identified, in our research that several contextual aspects affecting the

success are derived from outside the purchasing department. We believe that in order to be successful in operating purchasing cost models, the entire company should recognise and approve this transition of everyday business.

This research confirms that cost management and the use of purchasing cost models are fields, which have a strong connection to how companies operate their purchasing departments. More specific, companies operating in industries, exposed for intense competition, have strong incentives to institutionalise and sustain purchasing cost models. Current literature covers these fields but with a slightly different focus. Multi-criteria models are emphasised and purchasing cost models are of a more theoretical character compared to practice, given the findings in our research.

The purchasing cost models we have studied in this research is mainly used for supplier selection and sometimes supplier evaluation and development. The possibility of extending the model from supplier selection to evaluation and development is both shown in literature and practice. However, companies tend to have additional models for these purposes.

7 Construction of Purchasing Cost Model

This chapter will in detail describe the process of developing a purchasing cost model at Tetra Pak Packaging Solutions CC&SPM. First, the results from interviews are presented with the focus of identifying the essential contextual aspects within the company and to determine the correct application of the model. The desired cost components to incorporate are also identified along with success factors. Further, this is analysed and the corporate environment is determined. Later, the workshop held to share the findings with the focus group at the company and to confirm the range of the purchasing cost model is described. Finally, the building of the model is presented followed by our testing.

7.1 Interviews

In this section the results from both the initial and the complementary interviews are presented and thereafter analysed.

7.1.1 Cost Components

The initial interview round was successful and we gained essential knowledge about cost components important for the building. First, the requested cost components are rather similar. In this section, we have summarised what the majority of the interviewees highlight and for a view of each person's specific requests we refer to Table 33. Most of the mentioned cost components are related to the transactional stage and these are:

- Purchase price
- Transportation costs
- In-transit inventory
- Packaging
- Set-up costs
- Order handling
- Cost of incoming inspections
- Customs and duties
- Payment terms
- Lead-time

Further, pre-transactional cost components such as the cost of maintaining a supplier or an article in the system were mentioned by some of the initial interviewees. These were highlighted as important cost components since they illustrate the need for an overall reduction of number of suppliers and articles. By incorporating this in the purchasing cost model, an incentive could be established and stressed through the representation.

As for the post-transactional phase, after-sales quality problems was mentioned as an essential cost component. This is represented by customer claims, which are costly for Tetra Pak. In this phase, technical cost reductions and cost savings due to reduced time for assembly were also mentioned. Another cost component mentioned is the cost of holding inventory and the interviewees indicated that this is related to the lead-time, which is also mentioned in the transactional phase above. A summary of cost components mentioned in the initial interviews can be seen in Table 33 below.

Table 33 Cost components mentioned by the initial interviewees

Cost components	Project Manager, Business Development TS	Supplier Manager	Supplier Manager	Project Manager and Commercial Development	Senior Component Manager
Purchase price	x	x	x	x	
Payment terms		x	x	x	
Transportation	x	x	x	x	
Customs duties		x			
In-transit inventory			x		
Order handling	x				
Packaging	x				
Setup costs	x				
Lead-time	x	x			x
Warehousing		x			
Cost of article number	x	x			x
Cost of supplier	x	x	x		x
Technical cost reductions	x			x	
Reduced time for assembly	x			x	

The focus of the complementary interviews was to find cost components that were not already mentioned during the initial interviews as well as finding a way to measure these. A summary of the additional cost components mentioned is found in Table 34 below.

Table 34 Additional cost components mentioned by the complementary interviewees

Cost components	Manager SCO, Distribution Equipment	Supply Manager, Transport & Travel	Supplier Development Engineer, Total Quality	Supply Chain Officer, TS	Manager Program Purchasing	Business Controller TS
Buffer stocks	x					
Transportation		x				
Claims			x			
Shortage Cost				x		
Warehousing					x	
Risk of scrap						x
Cost of deliveries						x
Currency						x

As seen in Table 34, the complementary interviewees covered a few new cost components and below the most interesting parts are elaborated upon and discussed. A representative from production (personal communication, 8 April 2015) mentioned the buffer stocks that suppliers hold due to insufficient forecasting. The suppliers own these buffer stocks but Tetra Pak is charged for this expense when purchasing the components and thus, it could be interesting to measure in a purchasing cost model.

Moreover, representatives from both Total Quality and Technical Service were interviewed with the objective to find additional cost components driving their costs. According to the quality manager, the cost of a claim could be generalised according to already performed studies and the claim statistics related to each article could be retrieved from the system wherefore this was requested (personal communication, 13 April 2015). Further, a Business Controller from Technical Service denoted the cost of scrapped articles, the cost of managing several deliveries and the impact of currency changes as interesting parameters to investigate and potentially include in the model.

7.1.2 Application

The desired application of the model is diverse where some interviewees requested a total cost perspective whereas others focus specifically on supplier selection and evaluation. Also, category evaluation with products in focus is of interest as well as determining both the internal and external savings. We refer to Appendix II for a better view of what each interviewee requires in terms of application.

Further, it was mentioned that suppliers have a desire of getting appreciated for cost saving efforts that are not directly related to price reductions. Our interviewees mean that an application of this character could help to visualise cost reductions such as lead-time improvements and new payment terms, which before have been outside the core focus.

7.1.3 Success Factors

As for the success factors identified by the interviewees, simplicity and usability are key aspects. Related to this, the ability of illustrative graphics and the possibility of sensitivity analysis to validate results are requested. Also, the opportunity to adjust the model for certain purchases is desirable.

Further, the interviewees put focus on the collaboration between different departments and see this as a critical success factor. In specific, they emphasise the need for a closer relationship between Commercial components purchasing, Module purchasing and Program purchasing, which could be facilitated by a purchasing cost model.

7.1.4 Contextual Aspects

It is evident that some issues exist concerning the purchasing work at Tetra Pak. According to representatives from both CC&SPM, Program Purchasing and Technical Service, there is a silo phenomenon present where more cross-functional orientation is desired but not currently in place. The lack of collaboration both internally and externally is identified, but they actively work to reduce these issues. The ambition is to improve the purchasing procedures and involve purchasing earlier in sourcing decisions. In addition, the relations towards suppliers are seen as good, especially for strategic and preferred suppliers. However, the wish to include suppliers in product development is significant but not managed sufficiently at the moment.

In addition, since Tetra Pak Packaging Solutions CC&SPM has not previously been working with purchasing cost models, the availability of data and supporting systems is somewhat unclear. Data can be extracted from both Business Warehouse (BW) and QlikView and according to the interviewees; there is a lot of available data. However, data concerning how lead-time affects inventory levels is an example of information that is not yet available.

Further, the employees within Tetra Pak Packaging Solutions CC&SPM are considered to be open-minded to new procedures and tools. However, in order to gain acceptance, the model must be approved by the business controller in terms of having an accurate cost description.

7.1.5 Analysis of Interviews

Even though the focus of the interviews mainly was to get input for the following workshop and later the building of the model, a short analysis of each section has been conducted.

7.1.5.1 Analysis of Cost Components

Many of the cost components mentioned in Table 33 are aligned with what our literature research suggests concerning Landed cost models. However, some interviewees mention cost components that are not directly related to a purchasing cost model but can be incorporated if choosing a model of a more holistic character. To summarise, the cost components requested by the focus group are concentrated to the transactional stage with some exceptions.

Difficulties arise because there are two internal customers ordering. Components are ordered both by Technical Service (Spare parts) and Production (Filling machines). Consequently, there are two flows needed to be scrutinised to find the important cost drivers. However, the production flow lacks transparency, especially regarding module and component suppliers. Thus, we do not incorporate this in the present purchasing cost model but we leave this as an opportunity for future development.

There are cost components mentioned that were excluded at an early stage. First, technical cost reductions and reduced time for assembly were excluded due to the complexity of getting good measures to include in our model. Also, there is a Cost Structure team already working with this type of cost breakdowns of a more detailed character.

Further, the manager from production mentioned the buffer stocks that are held by suppliers due to insufficient forecasts. Due to very low transparency from suppliers delivering directly to production, this becomes difficult to measure for each component. Thus, no further investigations were made and it was excluded in the model.

Other cost components that were excluded are the cost of shortage, cost of scrapped articles and the cost of managing several deliveries. The first two due to lack of data and the third since our model focuses on the costs of one piece. However, Economic Order Quantity (EOQ) and suppliers' minimum order quantity consider this aspects. Furthermore, the impact of currency changes was mentioned as something to consider in the model. Of course, due to the global nature of Tetra Pak, this would have been interesting to measure. Unfortunately we did not possess sufficient data to analyse this. However, this dimension is proposed to Tetra Pak for future development. These exclusions indicate a lack of data, which is contradictory to how the interviewees perceive it. However, the data available is seen as thorough even though it does not cover all areas of interest.

All other cost components as well as our insights were put up for discussion during the following workshop, which is described later.

7.1.5.2 Analysis of Application

The interviewees' opinion regarding the application of the model differs slightly. The majority requests supplier evaluation where many costs of a purchase are considered and visualised. This could also highlight cost saving efforts made by the supplier. This area was further discussed during Workshop 1.

7.1.5.3 Analysis of Success Factors

The presented success factors are not further analysed but are part of the evaluation of the model in Workshop 2 where the purchasing cost model was tested. The evaluation sheet can be found in Appendix V.

7.1.5.4 Analysis of Contextual Aspects

From the interviews, we have gained findings concerning the corporate environment at Tetra Pak Packaging Solutions CC&SPM. By comparing these findings to the results from the interview study, we can determine which purchasing cost model that best fits this construction. The conceptual framework developed in the empirical study (Figure 45), describes what contextual aspects that affect the institutionalisation and how to maintain a purchasing cost model.

Since Tetra Pak for many years has been profitable without any burning platform to carry out cost reductions initiatives, there is no clear cost-driven culture. In recent years, the cost awareness has been introduced but the former culture still pervades everyday work. Hence, there is no company-wide incentive to institutionalise such a purchasing cost model. Equally, industry competitiveness has historically not been that intense to Tetra Pak. However, the industry shows signs of becoming less profitable with new low-price competitors. This situation, as presented before, has triggered cost reduction objectives.

Further, the purchasing sophistication is not as developed in comparison to the case sample in our empirical study. As mentioned, they indicate that there is a silo phenomenon where cross-functional orientation and a clearer organisational structure could be beneficial. Moreover, supplier relations are seen as good but this area could also be improved for the future.

Regarding availability of data, the interviewees mean that there, apart from how lead-time affects inventory levels, is a lot of available data



Figure 45 A conceptualisation of contextual aspects affecting the purchasing cost model

Below, a comparison of the relative impact of contextual aspects between different purchasing cost models is established (Figure 46). To put the contextual aspects at Tetra Pak Packaging solutions CC&SPM into context, for the different purchasing cost models, we have used a line on the Y-axis. This helped us to identify which model that fits them the best according to the measured contextual aspects.

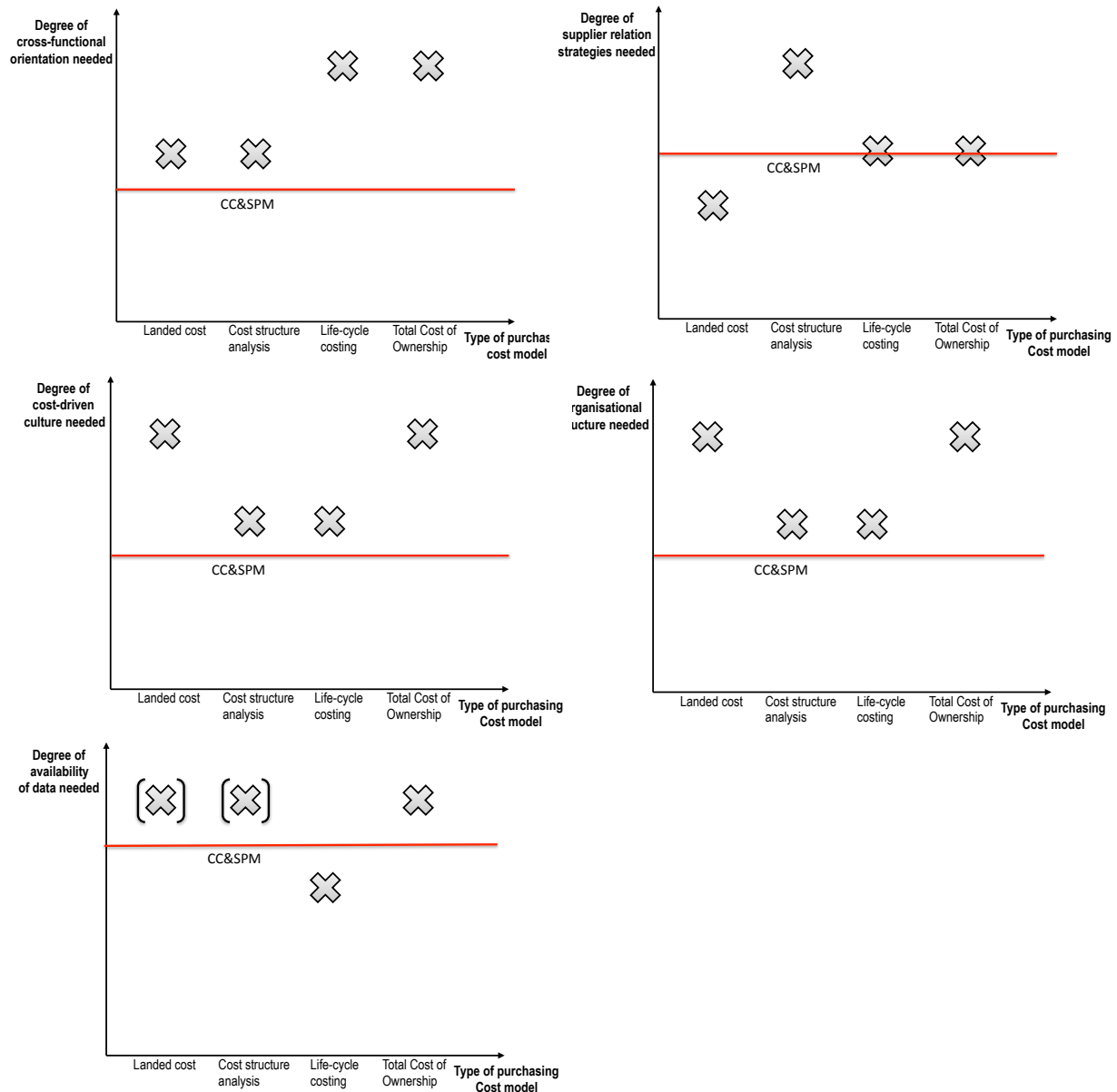


Figure 46 A relative comparison of contextual aspects and Tetra Pak's position

For cross-functional orientation, which Tetra Pak Packaging Solutions CC&SPM has to improve, the closest match is with Landed cost and Cost structure analysis. Also, since the Landed cost is mainly focusing on the transactional stage, cross-functional orientation is not required to the same extent as TCO and Life-cycle costing.

Regarding Supplier relation strategies, it can be seen that the closest match is with Life-cycle costing and TCO. However, since the Landed cost model requires a lower level of Supplier relation strategies it could still fit into the context at Tetra Pak Packaging Solutions CC&SPM.

As for organisational structure and cost-driven culture, it can be seen that Tetra Pak Packaging Solutions CC&SPM has the closest match with Cost structure analysis and Life-cycle costing meanwhile the two other models require a higher degree. However, the empirical study indicates that these are enablers rather than prerequisites to operate such models.

Last, we have analysed the degree of availability of data needed. As seen, all models except Life-cycle costing requires a high degree of availability of data, which is matching the availability of data at Tetra Pak Packaging Solutions CC&SPM. Consequently, according to Figure 46 and the contextual aspects at Tetra Pak Packaging Solutions CC&SPM, a Landed cost model should be suitable for them to build from. As seen, the contextual aspects for Life-cycle costing is also close to Tetra Pak Packaging Solutions CC&SPMs contextual aspects. However, since their starting point is a state with no purchasing cost model in place, Landed cost is a good start that in the future can be extended to have more characteristics of Life-cycle costing.

7.2 Workshop 1

In this section the results from Workshop 1 are presented. For a more detailed description of the procedure we refer to Appendix IV.

7.2.1 Cost Components

7.2.1.1 Brainstorming regarding cost components

In a brainstorming session, the participants filled out three blank columns symbolising the three transactional phases with cost components. As seen in the results below (Table 35), there are multiple cost components in each of the three phases. Some costs are easy to determine, such as price or set up costs, while some are more difficult, such as lack for forecast or environmental impact.

Table 35 Cost components identified during brainstorming

Pre-transactional	Transactional	Post-transactional
<ul style="list-style-type: none"> • Capability test • Design of product • Field test • Component documentation • Component correctly specified • Preparation • Quotation work • Adding a component • Having a component in system • Adding a supplier • Having a supplier in system • Lack of forecast • Country specific costs 	<ul style="list-style-type: none"> • Price • Transport • Quantity • Set up costs • Inventory • Currency changes • Material weight • Standard or special component • Inbound quality control • Certificates • Packaging • Handling • Margins 	<ul style="list-style-type: none"> • Assembly of modules • Quality controls • Scrapping (buffer inventory, spare parts) • Lead-time • Inventory • Environmental (future demands) • Obsolescence (Life-cycle mgmt.) • Service intervals • Energy efficiency • Waste

7.2.1.2 Definition and classification of cost components

In this section the cost components from the brainstorming were compared to our prepared cost components, which were based on the interviews together with the literature review and interview study. After discussion, some components were added and the selection was classified according to below:

- Green (G): Cost components to include initially
- Yellow (Y): Cost components to include when information is available
- Red (R): Cost components not to include

The results from this part are found Table 36 below. In addition to our prepared cost components, no cost components were added to the transactional phase and for the pre-transactional phase only the last, validation/verification was added. As for the post-transactional phase, the last seven cost components were added.

Table 36 Classification of cost components

Pre-transaction		Transaction		Post-transaction	
G	Adding a supplier	G	Price	Y	Lead-time reduction (tied up capital)
G	Change of supplier	Y	Transport (incl. customs)	Y	Quality problems/claims
G	Having a supplier in system	G	Payment terms	R	Goodwill/reputation
G	Adding a component	G	Inbound quality investigation	R	Reversed logistics
G	Having a component in system	Y	Handling/packaging	Y	Inventory management
Y	Validation/verification	G	In-transit inventory	Y	Service intervals
		G	Set up costs	Y	Assembly
		G	Order cost (min order qty, fixed order qty & rounding value)	Y	Energy efficiency
				Y	Life-cycle management
				Y	Standard/specialisation
				Y	Testing
				Y	Documentation

7.2.2 Application

In this part, three rather specific applications, based on the interview results, were presented to the workshop participants:

- To quantify other cost saving efforts besides price
- Challenge module supplier's purchasing outside Tetra Pak contracts (non-compliance)
- Demonstrate the need for a cross-functional integration to realize 20 % savings (according to internal goals)

All participants agreed that the first application was the most essential whereas the other two could be implications of the institutionalisation of a purchasing cost model.

Further, the group requested an article number based model meaning that parameters related to a certain article could be changed and compared. Related to this, the group requested the possibility to compare different alternatives side by side. For example, in negotiations about a certain article the supplier might either be able to offer a price reduction of X % or a shortened lead-time by Y days.

7.2.3 Analysis of Workshop 1

7.2.3.1 *Analysis of Cost Components*

As seen when comparing Table 35 with Table 36, the amount of cost components were narrowed down to a more reasonable number after discussions. Also, it was interesting that the final selection of cost components did not differ that much from what we had prepared based from the interviews. However, the fact that two of our prepared cost components, goodwill/reputation and reversed logistics, were marked as red (cost components not to include) was quite expected since those came from the literature review and not the initial interviews.

7.2.3.2 *Analysis of Application*

Since the interviews showed that the interviewees were looking for a more specific application than supplier selection, supplier evaluation or supplier development, we reformulated the application area according to their request.

As seen above, the workshop participants primarily decided that the best application of the model was to quantify other cost saving efforts besides price, which according to us touches upon all three application areas from the original classification.

7.3 Building the Model

This section discusses the model, which will generate a greater understanding of the developed purchasing cost model. First, the overall structure is presented which is followed by a description of the cost components and how they are calculated.

7.3.1 Guidelines

In the first sheet of the model, we have developed guidelines for the user. In addition, instructions for how to update the underlying data sheets are incorporated. These are suggested to be updated on a yearly basis. The system input data in our model covers the whole year of 2014. The guidelines can be found in Appendix VIII.

7.3.2 Overall Structure

Microsoft Excel was chosen as the most appropriate software to build the model in. Due to the nature of the chosen application, there was a need to alternate several parameters and therefore Excel was the best choice. Also, as Microsoft Excel is a commonly used program, it will be easy for the user to conform to.

The request of having an article-based model required a solution where relevant data for the entered article number is gathered from the system. This was enabled by extracting all data required for all article numbers to an Excel sheet that is arranged as a backup sheet.

The request to be able to compare alternatives side by side has been solved with three columns where the user can alter parameters for each of the alternatives. If the user, in this case typically a Supplier Manager, enters data into two different alternatives, the difference it makes to the Landed cost is visualised at the bottom line. For greater understanding and visibility, the bottom line is broken down into the following costs categories according to a request from a Business Controller:

- Financial
- Transport
- Direct
- Organisational

All data entries are made on a calculation sheet where all cells that are possible to alternate are marked with yellow to give the user a good overview. The calculations are performed top-down starting with article and supplier specific data followed by cost components included in the three transactional phases.

The above mentioned guidelines sheet and calculation sheet are followed by a graph sheet and backup sheets with data. These sheets have to be updated on a yearly basis in order for the model to be up to date and work properly. The backup sheets are organised and coloured as below:

- Input parameters (Green)
- Article Data (Red)
- Supplier Data (Blue)
- Inbound Discrepancies Data (Orange)
- Claim Data (Purple)

The colour code is introduced to better relate the sheets to the guidelines.

7.3.3 Cost Components in Model

This section describes the cost components included in the model and how they are calculated. As mentioned, the model covers Ellram's (1993) three transactional phases and follows the outline below. Also, all costs are calculated per piece.

$$\text{Landed Cost} = \text{pre transactional costs} + \text{transactional costs} \\ + \text{post transactional costs} + \text{other costs}$$

Pre transactional costs

$$= \text{cost of this supplier in system} \\ + \text{cost of this article in system} + \text{cost of changing supplier}$$

Transactional costs

$$= \text{price} + \text{cost of payment term} + \text{cost of order qty} \\ + \text{transport cost} + \text{IQI cost}$$

$$\text{Post transactional costs} = \text{inventory cost} + \text{cost of claims}$$

7.3.3.1 Pre-transactional Phase

7.3.3.1.1 Supplier in System

The mark-up cost of maintaining a supplier in the system is divided by the number of forecasted units for this supplier according to below. If a new supplier is contracted, the additional forecasted article volume is added to the supplier volume.

$$\text{Cost of this supplier in system} = \frac{\text{Cost of a supplier in system}}{\text{Forecasted volume for supplier} + \text{additional volume}}$$

7.3.3.1.2 Article in System

The mark-up cost of maintaining an article in the system is divided by the number of forecasted units for the specific article to get the cost per piece according to below.

$$\text{Cost of this article in system} = \frac{\text{Cost of article in system}}{\text{Forecasted volume for article}}$$

7.3.3.1.3 Changing supplier in system

There is a cost involved with changing supplier. This mark-up cost is in our model divided by the forecasted volume for the new supplier.

$$\text{Cost of changing supplier in system} = \frac{\text{Changing cost}}{\text{Forecasted volume for new supplier}}$$

7.3.3.2 Transactional Phase

7.3.3.2.1 Price

The price for the article is retrieved from a backup sheet with article data. If another price is to be negotiated, the user can enter this. The currency for the price must be in Euro since all other calculations are performed in Euros.

7.3.3.2.2 Payment Terms

The most common payment term is 30 days and therefore this is set as a base value. All contracts with more than 30 days will, in our model, result in a minus value (saving) in the total cost and for less than 30 days contracts; it is the other way around.

$$\text{Cost of payment term} = (30 - \text{Number of days in contract}) * \text{price} * \text{Daily IRR}^3$$

7.3.3.2.3 Order Quantity

When the Economic Order Quantity (EOQ), meaning the order quantity that minimizes total inventory holding costs and ordering costs, is lower than the supplier's minimum order quantity, the extra pieces that have to be ordered will result in an extra cost of tied up capital. This is calculated by multiplying the difference in quantity with the time it takes to consume the extra parts according to forecast and how much cost of tied up capital that will be generated during this time.

$$\text{Cost of order qty} = (\text{Min order qty} - \text{EOQ}) * \text{Daily Forecast} * \text{Price} * \text{Daily IRR}$$

7.3.3.2.4 Transport

Whether the transport cost should be included or not is of course dependent on the Incoterms in the contract. Therefore the Incoterm for the supplier is retrieved from the supplier data backup sheet and if it corresponds to FCA or EXW, the cost of transportation will be part of the summation. This cost involves carrier cost, which depends on the location of departure and arrival, in-transit costs, customs duties and additional transportation packaging that are all retrieved from backup sheets. In the carrier cost calculations, 25 % mark-up is added on top of the article weight, which represents an average rate for packaging etc.

$$\text{Transport cost} = \text{Carrier cost} + \text{in transit cost} + \text{customs duties} + \text{packaging}$$

$$\text{Carrier cost} = \text{Avg cost per kg for shipping from this supplier} * (\text{article weight} + 25 \%)$$

$$\text{In transit cost} = \text{Days in transit} * \text{product value} * \text{Daily IRR}$$

³ Internal rate of return

7.3.3.2.5 Inbound Quality Investigation

From a backup sheet, statistics regarding the inbound quality investigation (IQI) is retrieved. In the model, the supplier's share of total discrepancies is presented as a percentage, which is then multiplied with this article's contribution of the supplier's total deliveries. This gives a mark-up percentage for this article's contribution to the total cost of having an inbound quality investigation department. By retrieving this number from another backup sheet, the actual cost of inbound quality investigation of this specific article is determined.

$$IQI \text{ cost for this article} = \text{Supplier performance} * \text{Article share} * \text{Cost of IQI}$$

$$\text{Supplier performance} = \frac{\text{No of discrepancies for this supplier}}{\text{Total no of discrepancies}}$$

$$\text{Article share} = \frac{\text{Forecast for this article}}{\text{Forecast for this supplier}}$$

7.3.3.3 Post-transactional Phase

7.3.3.3.1 Inventory

The lead-time is either retrieved from a backup sheet or entered by the user. The difference in days between the new and the current lead-time is multiplied by demand during lead-time per day. This is later multiplied with the component price and IRR. Costs such as insurance and warehousing are not considered. In the model, a shorter lead-time will generate a minus cost, which reduces the total cost. For this cost component, we only address turnover stock and not the safety stock since this is too complex to incorporate in the model since the formulas are hidden in the ERP system.

$$\text{Inventory cost} = (\text{New lead time} - \text{current lead time}) * D(LT) * \text{price} * \text{IRR}$$

$$D(LT) = \text{Demand during lead time}$$

7.3.3.3.2 Claims

This part determines the cost of claims tied to a certain article number. The average cost of a claim comes from an internal study and is multiplied by the number of claims for the article in question during the last year. This is then divided by the forecast for this article.

$$\text{Cost of claims} = \frac{\text{Avg cost of claim} * \text{No claims for this article}}{\text{Forecast for this article}}$$


7.3.4 The Landed Cost Model

The developed purchasing cost model is referred to as a Landed cost model and is visualised in Figure 47, Figure 48 and Figure 49 below. As seen, article number and description as well as supplier ID and name are left blank since these are related to confidential information. For more information regarding how to use the model, see Appendix VIII.

In this visualisation, we have compared the same article number but sourced to two different suppliers, which in this case generates a different price, lead-time,

transportation cost and system cost. Of course, more parameters could be altered in other comparisons.

Landed Cost Model



Input data	Article no	Description	Weight [Kg]
Alternative 1			0,09
Alternative 2			0,09
Alternative 3		#N/A	#N/A
Order quantity data	Alternative 1	Alternative 2	Alternative 3
EOQ from system	2520	2520	#N/A
Other order qty?	No	No	No
Enter new order qty			
Order qty for calculations	2520	2520	#N/A
Supplier data	Alternative 1	Alternative 2	Alternative 3
Preferred supplier ID			#N/A
Preferred supplier name			#N/A
Other supplier?	No	Yes	No
Other supplier in system			
Chosen supplier			
Name			#N/A
ID			#N/A
Inco term location	SELLERS PREMISES GÖTEBORG		#N/A
Total amount of units for chosen supplier	165230	567241	#N/A
Pre-transaction	Alternative 1	Alternative 2	Alternative 3
Cost of having a supplier for this article number / forecasted pc	0,02 €	0,00 €	#N/A
Cost of article number / forecasted pc	0,02 €	0,02 €	#N/A
Cost of changing supplier / forecasted pc	- €	0,09 €	#N/A
Pre transaction costs	0,04 €	0,12 €	#N/A

Figure 47 Input data and the pre-transactional phase of the model

Transaction	Alternative 1	Alternative 2	Alternative 3
<i>Price</i>			
Price from system	28,80 €	28,80 €	#N/A
Other price?	No	Yes	No
New negotiated price		25,5	
Price for calculations	28,80 €	25,50 €	#N/A
<i>Payment terms</i>			
Payment terms from system	A30	A30	#N/A
Payment Terms in Days	30	30	#N/A
Other payment term?	No	Yes	No
New Payment Term in Days		60	
Cost of payment term	- €	0,20 €	#N/A
<i>Order quantity</i>			
Order qty	2520	2520	#N/A
Min order qty from supplier	2520	2520	#N/A
Cost of order qty	- €	0	#N/A
<i>Set up costs</i>			
Set up cost per order in system	- €	- €	#N/A
Other set up cost?	No	No	No
Insert new set up cost			
Set up cost per piece	- €	- €	#N/A
<i>Transport</i>			
Incoterm from system	FCA	FCA	#N/A
Pre Packaging	0	0	#N/A
No of days in transit	2	2	#N/A
In transit cost	0,02 €	0,01 €	#N/A
Delivery from outside EU?	No	No	No
Customs Duties	- €	- €	#N/A
Carrier cost	0,11 €	0,33 €	#N/A
Transport cost	0,13 €	0,34 €	#N/A
<i>Inbound quality investigation</i>			
Supplier's share of total discrepancies	0,24%	0,79%	#N/A
Article's share of supplier's total deliveries	22,39%	6,52%	#N/A
Cost of article's inbound quality investigation	101,15 €	95,76 €	#N/A
Cost of inbound quality investigation	0,002	0,002 €	#N/A
Transaction costs	28,93 €	25,65 €	#N/A

Figure 48 The transactional phase of the model

Post-transaction	Alternative 1	Alternative 2	Alternative 3
<i>Inventory</i>			
Lead time from system	70	70	#N/A
Other lead time?	No	Yes	No
New negotiated lead time		50	
Cost of tied up capital (Difference)	- €	0,21 €	- €
Warehousing cost (Difference)			
Inventory costs	- €	0,21 €	- €
<i>Claims</i>			
Cost of claim	0,02 €	0,02 €	- €
Post-transaction costs	0,02 €	0,19 €	- €
<i>Other costs</i>			
Other cost 1			
Other cost 2			
Other cost 3			
Other costs	- €	- €	- €
Total Cost	28,99 €	25,58 €	#N/A
<i>Cost breakdown</i>			
Financial	- €	0,41 €	#N/A
Transport	0,13 €	0,34 €	#N/A
Direct	28,82 €	25,52 €	#N/A
System cost	0,04 €	0,12 €	#N/A
Other costs	- €	- €	- €

Figure 49 The post-transactional phase, Total cost and Cost breakdown of the model

Due to confidentiality, the backup sheets cannot be presented in this thesis. Furthermore, to create the backup sheets, consisting of data, we have had to clean the received files. Typing errors, formatting and table layout among others have had to be checked and adjusted. Also, we have had to combine several reports where all data could not be found in one. This work might be necessary in future updates if the data reports do no improve.

7.4 Workshop 2

In this section, the results from Workshop 2 are presented. The workshop was held with a few participants but the evaluation sheet was later sent out to all Supplier Mangers at the department of CC&SPM. The results presented below are based on the answers from the evaluation sheet (Appendix V). In Table 37, the number of answers for each score 1-4 has been filled in. The number of respondents was seven and where the numbers do not sum up to seven, the answers have been left out from some of the respondents. Below, the answers for each of the categories Usability, Content, Input and Output are discussed. All evaluation criterion are not discussed since focus is put on those areas where we have identified deviations. Below, a description of the rating 1-4 is presented.

1. The model does not fulfil the expectations
2. The model somewhat fulfils the expectations
3. The model fulfils the expectations
4. The model fulfils the expectations and performs beyond

Table 37 The Evaluation sheet with scores from testing filled in

Evaluation Criteria	Score 1 – 4			
	1	2	3	4
Usability				
The model is easy to understand and illustrative			6	1
The model is not time-consuming		2	4	1
The model will facilitate communication internally (with other departments) and externally (with suppliers)		1	4	1
The instructions are sufficient in order to understand the model		1	4	2
The design mitigates the risk of errors		3	3	1
The model will be easy to incorporate in daily business		2	4	1
The model can be understood by employees outside the purchasing department		4	1	2
Content				
The model is broad and covers the areas of interest for sourcing decisions		2	4	1
The model incorporates the most important cost drivers		2	4	1
The stages pre-transactional, transactional and post-transactional embodies the correct cost components			6	
The model enables modifications			5	2
The data sheets in the model will be easy to update on a yearly basis			5	1
The model will serve the application to which it was intended to fulfil		1	5	1
Input				
The required input to the model is accessible for the user			6	1
The units of input are clear			6	1
Output				
The model is enough detailed			5	2

Estimations are performed correctly		2	4	
The results are good indications for decision-making		2	1	4
The results are factual and cannot be interpreted differently		2	5	
The model enables sensitivity analysis (outcome of different scenarios)		2	3	2

7.4.1 Usability

As seen from the results, the model fulfils the expectations regarding understanding for the Supplier Manager and we can also conclude that the model will facilitate both internal and external communication. However, the scores indicate that the model is more difficult to understand for employees outside the purchasing department. This is most likely since the Supplier Managers deal with the cost components on a daily basis whereas other departments do not see them as often. To bridge this difficulty we could have involved more people from other departments in the actual development of the model and it could also have been interesting to test the model with these people. If our work is to be repeated this is a recommendation. However, introducing the purchasing cost model with a brief introduction can solve this minor issue.

Further, the scores were not as high for 'The design mitigates the risk of errors'. Since the model is based in Microsoft Excel, all cells and formulas can be changed by mistake, which will generate errors that affect the end result. Choosing another software was not considered since Excel is a common software to use at Tetra Pak Packaging Solutions and was requested.

Some respondents see the model as difficult to incorporate in daily business, which might be related to the fact that a few also consider it as time consuming. According to the success factors earlier identified, a time consuming model will most likely not be accepted. This is highly dependent on the cases that are tested and if it should be scaled up to several, maybe hundred of articles, the model in this layout will require time allocations. However, other respondents gave a higher score on this evaluation criteria. Again, a brief introduction could have solved this issue.

7.4.2 Content

Regarding Content, the model fulfils the respondents' expectations for most evaluation criteria. However, some scores indicate that the model does not incorporate the most important cost drivers and the areas of interest for sourcing decisions. Some Supplier Managers have along the way mentioned soft aspects to consider in sourcing decisions. These translate into intangible cost components that have not been included in our model. This is because the Business Controller did not accept rough estimations. This might however depend on the typical cases tested by the Supplier Managers since they are responsible for different suppliers and consequently have a different negotiation approaches.

7.4.3 Input

For both Input evaluation criteria, the model fulfils the respondents' expectations. When developing the model, great focus was put on keeping the number of data entries low. Further, the guidelines might have helped the user to really understand the units of input for each entry.

7.4.4 Output

Some respondents do not see the estimations in the model as correctly done. There have been areas where rough estimations have been made and these are to be investigated

further by Tetra Pak Packaging Solutions CC&SPM in the near future. Also, the results are not seen as factual by everyone and as indications for decision-making, the scores differ from performing beyond expectations and just somewhat fulfilling the expectations. The same goes for the ability to perform sensitivity analysis and again, we argue that this is highly dependent on the case tested by the Supplier Manager.

7.4.5 Overall Result

Overall the grades were good with a majority of the scores in column 3, which means that the expectations were fulfilled. It was also delightful that no scores ended up in the first column, which would have meant that our model was out of scope. This brings credibility to our work and indicates that the model will come to good use at Tetra Pak Packaging Solutions CC&SPM.

8 Conclusion & Contribution

This chapter embodies concluding remarks of this research, for theory, empirical research and the construction at Tetra Pak Packaging Solutions CC&SPM. In addition, our contribution to both academic research and Tetra Pak will be presented. Lastly, propositions for future research within this field will be suggested.

8.1 Conclusion

Throughout this research, an objective has been to adhere to the previously stated purpose of the master's thesis in order to provide consistency and a clear theme. This purpose is described below.

The purpose of this study is to explore the purchasing cost management field both in theory and in practice in order to propose, develop and test a purchasing cost model at Tetra Pak Packaging Solutions.

The need of having a purchasing cost model institutionalised and maintained within a purchasing department is significant. It is shown; both in literature as well as in practice that such models are frequently used by companies that recognise the importance of purchasing and how it impacts the bottom line. Having said that, difficulties still emerge when introducing a purchasing cost model. There are numerous obstacles identified throughout this study, some of them more difficult to handle than others. However, these difficulties can be mitigated by establishing a clear structure in addition to the purchasing cost model. The conceptual framework presented in the cross-case analysis (Figure 50) can be useful when managing a purchasing cost model in terms of creating awareness of present contextual aspects. For instance, by incorporating the model in a clear sourcing process with support from top-management, compliance and acceptance will most likely be gained. In addition, when having cross-functional orientation in place and developed relations with suppliers, the performance of the purchasing cost model will increase.

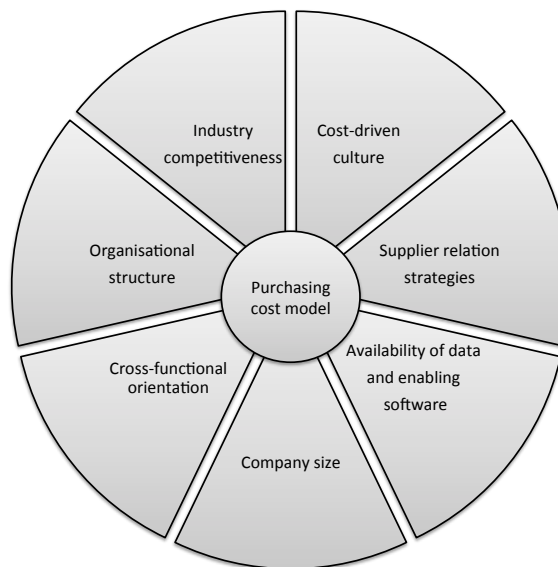


Figure 50 Conceptual framework - Contextual aspects

Regarding the construction at Tetra Pak Packaging Solutions CC&SPM, the information gained in previous chapters was used to facilitate the development. By having this information, certain obstacles could be avoided and recommendations were to be developed in addition to the model. Also, the model was tested based on the success factors identified by theory, the interview study and CC&SPM themselves. Although we had the previous research as support for the construction, some difficulties could not be avoided. To deal with multiple opinions of what to include, and in some cases contradictory suggestions, was difficult. Thus, developing a model that fulfils everyone's expectations is not possible. Also, as we anticipated, the data gathering was difficult at times. We discovered, as expected, that communication across departments within Tetra Pak was necessary in order to gather the information necessary.

Furthermore, the research questions have been answered throughout the report. To summarise, the results are presented below.

8.1.1 RQ₁ – What purchasing cost model is suitable for Tetra Pak Packaging Solutions CC&SPM with respect to their corporate environment?

For the construction at Tetra Pak Packaging Solutions CC&SPM, we decided to develop an extended Landed cost model. The model was extended in the sense that pre-transactional costs such as cost of maintaining a supplier, cost of maintaining an article and cost of changing suppliers were added to the transactional stage. Also, cost of product quality was incorporated to measure the post-transactional stage to some extent. This model was chosen since Tetra Pak previously has not worked with purchasing cost models for components. The Landed cost model was, according to our research, least complex according to the contextual aspects identified at Tetra Pak. As other models also could have been applied, we decided to use the Landed cost as a starting-point, which can be further developed by Tetra Pak when needed.

8.1.2 RQ₂ – What contextual aspects within the corporate environment affect how companies institutionalise and sustain a purchasing cost model?

The contextual aspects identified in this research can be viewed in Figure 50 above. These aspects have arisen from both the literature review but also the interview study. In addition, we have described how these aspects affect the company and the work with purchasing cost models. However, we have not successfully managed to describe how contextual aspects can be directly connected to application areas. Further, the relative difference between contextual aspects affecting certain purchasing cost models has been difficult.

8.1.3 RQ₃ – What are the benefits and drawbacks of different purchasing cost models and how are these affecting the company?

Benefits & drawback have been identified, both unique ones, targeting specific purchasing cost models but also general benefits & drawbacks, which were recognised across the sample of purchasing cost models. The benefits & drawbacks of general character have been classified according to if they concern the input, realisation or the output. This can be viewed in Table 38 below.

Table 38 Benefits & drawbacks of general character

Input oriented		Realisation oriented		Output oriented	
Benefits	Drawbacks	Benefits	Drawbacks	Benefit	Drawbacks
<ul style="list-style-type: none"> • Input parameters are factual • Considers more than price 	<ul style="list-style-type: none"> • Availability of data • Often manual work required 	<ul style="list-style-type: none"> • Understanding of cost structure • Encourages Transparency • Cross-functional orientation 	<ul style="list-style-type: none"> • Time-consuming • Admin. Work required • Complexity • Cross-functional orientation 	<ul style="list-style-type: none"> • Factual results • Facilitate decision-making • Visualise improvement potential • Good basis for negotiation • Reduced supplier management risk 	<ul style="list-style-type: none"> • Company-specific view • Instantaneous picture of reality

8.1.4 RQ₄ – How is the choice of purchasing cost model affected by its application?

We found, according to literature, that most purchasing cost models could be used for supplier selection, evaluation and development. However, the majority of companies interviewed for the interview study use the purchasing cost model for supplier selection (Table 39). As for the remaining application areas, the companies used other models and tools as a complement to the purchasing cost model. Consequently, purchasing cost models described in this research can primarily be used for sourcing decisions in terms of supplier selection and secondarily for supplier evaluation and development. There is no evident differentiation between purchasing cost models studied and the application of these. The exception is TCO, which was used as support for improvements and not directly connected to supplier selection, evaluation nor development.

Table 39 Application areas of purchasing cost models

Purchasing cost model	Company	Applications
Cost structure analysis	TeleCompany	<ul style="list-style-type: none"> • Supplier selection
	Volvo Cars	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Supplier development
Landed cost model	IKEA	<ul style="list-style-type: none"> • Supplier selection
	TeleCompany	<ul style="list-style-type: none"> • Supplier selection • Supplier development
	Volvo Cars	<ul style="list-style-type: none"> • Supplier selection
Life-cycle costing	SIT	<ul style="list-style-type: none"> • Supplier selection
TCO	Lantmännen	<ul style="list-style-type: none"> • Supply chain decision-making

8.2 Contribution

This research had a main focus of developing a purchasing cost model but as discussed throughout the report, the contextual aspects affecting the institutionalisation and maintenance of a purchasing cost model showed to be of great relevance. Consequently, we have been able to document and propose a conceptual model incorporating contextual aspects and from where in the corporate environment these can be adjusted. As mentioned throughout the research, current academic literature has not covered this area sufficiently. This statement is also shared by a number of authors (De Boer et al., 2001; Ellram, 1993; Young et al., 2009). Even though several authors stress that contextual aspects affect the success of working with a purchasing cost model, there is a

lack of research describing what contextual aspects exist and the implications of these. With our research, we have managed to reduce this gap and propose future areas to investigate. The additional contextual aspects we have identified are:

- Industry competitiveness
- Cost-driven culture
- Company size
- Organisational structure
- Availability of data
- Supplier relation strategies

In addition, we have managed to map a set of purchasing cost models, in theory as well as in practice, in terms of cost components, benefits & drawbacks, application, success factors and most importantly, contextual aspects. These dimensions have been compared between what theory suggests and how practitioners view the topic. Moreover, we have managed to clearly document the procedures of building a purchasing cost model, which is tailored for a specific company with its unique characteristics.

Since applications and benefits & drawbacks have been incorporated in our research focus, these have been analysed more thoroughly. Benefits & drawbacks have also been classified as input oriented, realisation oriented and output oriented in order to recognise where the general characteristics can be found (Table 38).

8.3 Future Research & Development

8.3.1 Principal Company

In addition to the provided purchasing cost models, recommendations of how to use the model have been developed. The recommendations are based on how the case sample in the empirical study are working with purchasing cost models in order to make cost savings accessible and what literature suggests within the field. The recommendations should be seen as long-term objectives to strive for if they are aligned with already existing goals.

- Incorporate purchasing earlier in product development. Evidence from previous research indicates that 80 % of the potential cost savings are fixed after the product design is set (Shank & Fisher, 1999)
- Managing handoffs better internally between CC&SPM, Program Purchasing, Designers and Transport & Travel to reach cost savings
- Use the purchasing cost model as a communicative tool with suppliers to find cost reductions in collaboration
- Assign an employee who is responsible for the maintenance of the purchasing cost model and support users
- Define procedures of how to continuously provide correct data reports
- Combine the Landed cost model with Cost-engineering to enable Cost-breakdown, Should-cost and Value analysis
- Incorporate the effect of currencies in the purchasing cost model

8.3.2 Academic Literature

Although we have identified specific contextual aspects concerning purchasing cost models, we suggest that further studies focusing on the context affecting specific application areas can be conducted to gain additional knowledge. For such research, the case study method as a research approach could be beneficial. In order to understand the relationships, one needs to interview not only managers but also employees working with the model in everyday business to gain deeper understanding. Also, the relative difference in terms of how certain purchasing cost models are affected by the identified contextual aspects can be further mapped by extending the case sample and deepen the research focus.

It would also be of interest to further investigate how companies use their purchasing cost model in combination with other tools do determine quality, should-cost among others.

Total Cost of Ownership has pervaded this research in the sense that academic literature describes this model as superior and that Tetra Pak initially requested such a model. As our research progressed, we realised that few companies have institutionalised this model and for those who have, the model is difficult to operate and it is not as agile as others. Therefore, it would be of great interest to investigate the practical usefulness of Total Cost of Ownership. An appropriate research focus could be the following; “Is TCO applicable in a real-life setting and how can it be managed?”

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Appendix I

Interview Guide for Initial interviews

1. What do you think a purchasing cost model should focus on?
2. What cost components should be included in such a model?
3. Which transactional phases should the model cover?
 - a. Pre-transactional
 - b. Transactional
 - c. Post-transactional
4. How can the data related to above cost components be retrieved?
5. How and when should this purchasing cost model be used?
 - a. For initial sourcing decisions
 - b. For supplier development (Such as cost reduction efforts collaboratively with the supplier)
6. Who should utilise the model?
7. What factors (success factors) should be considered when developing a purchasing cost model?
 - a. Have a person or office responsible for the model
 - b. Availability of data
 - c. Use estimations rather than exact numbers
 - d. Usability
 - e. Objective measures
 - f. Involvement of different company functions
 - g. Cross-functional orientation
 - h. Incentives to create compliance
8. What software should be used for the purchasing cost model?
 - a. Microsoft Excel
 - b. QlikView
 - c. Other
9. Are there already any developed models or frameworks that can be used on the development of our model?
10. What departments should be included in our development?
11. Are there any specific persons we should contact?
12. What are the supplier relations like today? Will they accept the information generated by a purchasing cost model?
13. Do you think change takes long time in your organisation?
14. How are new ways of working acknowledged by the employees?
15. To what extent are suppliers involved in the design phase of new machines?
16. How is the cooperation between purchasing and product development?
 - a. When are purchasing involved in development decisions?

Appendix II

Description of Initial Interviews

Interviewee	Cost Components	Application	Success Factors	Contextual Aspects at Tetra Pak
Markus Meijer Project Manager Business Development TS 2015-03-20	<ul style="list-style-type: none"> • Purchase price • Transportation • Order handling • Packaging • Setup costs (Supplier) • Lead-time cost 	<ul style="list-style-type: none"> • Model to consider the total cost of purchasing 		<ul style="list-style-type: none"> • Silo phenomenon • Purchasing in isolation
Emma Dahling Supplier Manager 2015-03-23	<ul style="list-style-type: none"> • Purchase price • Transportation • Payment terms • Customs and duties • Warehousing and handling costs • Lead-time cost • Cost of article number • Cost of supplier 	<ul style="list-style-type: none"> • Supplier selection • Supplier evaluation • Category evaluation 	<ul style="list-style-type: none"> • Simplicity • Usability • Delimitations • Sensitivity analysis • Visualisation of data (Graphics) • Clear directives • Enable modifications 	<ul style="list-style-type: none"> • Supplier relation strategies • Purchasing in isolation • Over-specifications • Reactive
Dennis Roslund Supplier Manager 2015-03-23	<ul style="list-style-type: none"> • Price • Transportation • Payment terms • Cost of suppliers • In-transit inventory 	<ul style="list-style-type: none"> • Direct costs tied to suppliers • Both for TS and production • Internal savings • External savings • Evaluation projects 	<ul style="list-style-type: none"> • Simplicity • Illustrative 	<ul style="list-style-type: none"> • Lack of collaboration with Program Purchasing and Technical Service • Supplier relation strategies • Silo phenomenon
Lina André Project Management and Commercial Development 2015-03-24	<ul style="list-style-type: none"> • Price • Transport • Payment terms • Technical cost reductions • Reduced time for assembly 	<ul style="list-style-type: none"> • Supplier evaluation by capital equipment, commercial components 	<ul style="list-style-type: none"> • Simplicity 	<ul style="list-style-type: none"> • High expectations on suppliers but only evaluated on price • Silo phenomenon • Purchasing introduced late in sourcing decisions • Smoother transition externally • TCO request by suppliers
Per Jönemo Senior Component Category Manager 2015-03-25	<ul style="list-style-type: none"> • Cost of maintaining articles • Cost of maintaining suppliers • Lot-sizes • Lead-time 	<ul style="list-style-type: none"> • Supplier management • Program purchasing 	<ul style="list-style-type: none"> • Interaction between component and module suppliers 	<ul style="list-style-type: none"> • Organisational structure
Fredrik Bengtsson Manager Commercial Component and Purchasing 2015-03-26			<ul style="list-style-type: none"> • Collaboration with program purchasing • Contract coverage • Level of standardisation 	

Appendix III

Description of Complementary Interviews

Interviewee	Issues
<p>Mikael Hammar Manager, SCO CE Distribution Equipment 2015-04-08</p>	<ul style="list-style-type: none"> • Sharing forecasts with suppliers • Long lead-times • Large minimum order quantities • Location of suppliers for production • Insufficient supplier selection • Buffer stocks at suppliers' plants • Obsolescence (Product life-cycle) • Production and purchasing are involved late in product development
<p>Kjell Lindh Supply Manager, Transport & Travel 2015-04-10</p>	<ul style="list-style-type: none"> • Cost of transportation
<p>Sebastian Glimbrand Supplier Development Engineer, Total Quality Department 2015-04-13</p>	<ul style="list-style-type: none"> • Technical issues • Claims (CC accounts for approximately 60%) • Application of components in outer tolerance field generate claims • Difficult to utilise supplier development for commercial components • Module suppliers purchase from TS instead of component suppliers
<p>Erik Birath Supply Chain Officer, Technical Service 2015-04-15</p>	<ul style="list-style-type: none"> • Shortage cost • Tied up capital is not a recognised cost component at Tetra Pak • Reduced lead-times are positive but suppliers must also maintain delivery accuracy
<p>Märta Morand Manager, Program Purchasing, Capital Equipment 2015-04-15</p>	<ul style="list-style-type: none"> • Transportation outside Sweden (China) • Customs and duties (China) • Warehousing costs
<p>Linda Martinsson Business Controller TS Parts, Technical Service 2015-04-21</p>	<ul style="list-style-type: none"> • Risk of scrap • Cost of deliveries • Currency

Appendix IV

Workshop 1

Information	Participants
Workshop 1 – to determine cost components and application 2015-04-08	<ul style="list-style-type: none">• Emma Dahling (Supplier Manager)• Dennis Roslund (Supplier Manager)• Linda André (Project Management and Commercial Development)• Per Jönemo (Senior Component Category Manager)• Fredrik Bengtsson (Manager Commercial Component and Purchasing)

In addition to the initial interviews, a workshop was executed (2015-04-08) together with the focus group. The main objective with this activity was to set the purpose of the model, the cost components included and how to estimate certain costs. By reaching a consensus in the group, we could feel confident to proceed with the development.

After an initial background description including a brief version of our literature research and interview study, the workshop was held in three consecutive parts; defining the purpose of the model, brainstorming regarding cost components and determination of cost components to include and a classification of these.

Defining the Purpose

In the interviews that were held as preparation for the workshop, the interviewees were asked about the purpose of the model. The answers differed but had three recurring denominators that were further discussed in this part of the workshop.

- To quantify other cost saving efforts besides price
- Challenge module supplier's purchasing outside Tetra Pak contracts
- Demonstrate the need for a cross-functional integration to realize 20 % savings

To quantify other cost components besides the selling price has, from the beginning, been desired by Tetra Pak Packaging Solutions (CC&SPM). However, after investigations, there are issues concerning compliance at the module suppliers. These suppliers are supposed to use negotiated contracts by Tetra Pak when ordering from component suppliers. This is not always the case and the purchasing cost model could be used as a communicative tool to emphasise the importance of compliance.

Moreover, the late involvement of purchasing in product development can be an issue since costs are already fixed when the strategic purchasers at CC&SPM are introduced. Hence, the purchasing cost model could also be used internally to communicate the importance of investigating the best possible sourcing alternative in collaboration with strategic purchasers at CC&SPM.

All participants agreed that the first purpose was the most essential whereas the other two could be implications of the institutionalisation of the purchasing cost model.

Brainstorming Regarding Cost Components

For this part of the workshop a whiteboard had been prepared with three blank columns, one for each part of the transactional phases ranging from 'Identification of a need' to 'Delivery to customer' (Figure 51). From this starting point, the group began its brainstorming and different cost components were noted in the relevant column. At this point, no restrictions were defined in order to find all possible cost components.

Definition and Classification of Cost Components

Later, we had prepared another whiteboard that was hidden for the participants. This whiteboard also embodied three columns for the transactional phases and here we had initially included our opinions on which cost components to include (Figure 52). This initiated a discussion resulting in some additional cost components from the brainstorming list. After, we used an iterative process of comparing the two boards in order to decide what cost components to add to the formalised board (Figure 52)

Thereafter, each of these cost components were classified according to below

- Green: Cost components to include initially
- Yellow: Cost components to include when information is available
- Red: Cost components not to include

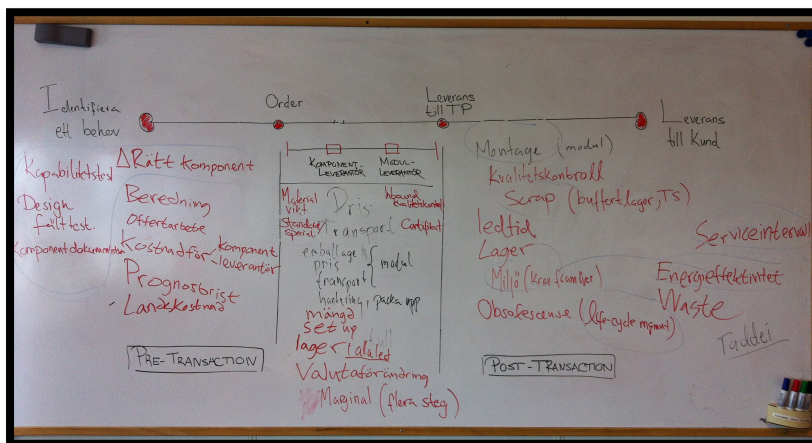


Figure 51 Board 1

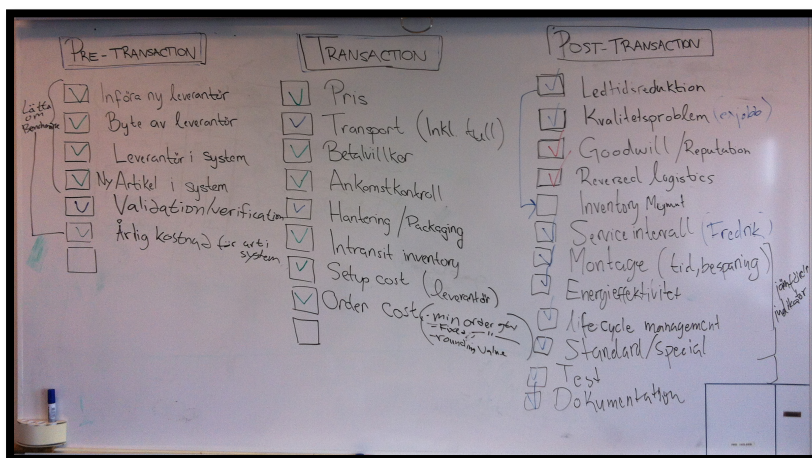


Figure 52 Board 2

Appendix V

Evaluation Sheet Purchasing Cost Model

In order to evaluate the purchasing cost model, an evaluation sheet has been developed. The evaluation is based on success factors identified by theory, the empirical research and most importantly, Tetra Pak Packaging Solutions CC&SPM. The criteria of evaluation are divided into four categories, usability, content, input and output.

Assign each criteria with a score from 1 to 4. A description of what each score represent can be seen below.

1 – The model does not fulfil the expectations
2 – The model somewhat fulfils the expectations
3 – The model fulfils the expectations
4 – The model fulfils the expectations and performs beyond

Evaluation Criteria	Score 1 – 4			
	1	2	3	4
Usability				
The model is easy to understand and illustrative				
The model is not time-consuming				
The model will facilitate communication internally (with other departments) and externally (with suppliers)				
The instructions are sufficient in order to understand the model				
The design mitigates the risk of errors				
The model will be easy to incorporate in daily business				
The model can be understood by employees outside the purchasing department				
Content				
The model is broad and covers the areas of interest for sourcing decisions				
The model incorporates the most important cost drivers				
The stages pre-transactional, transactional and post-transactional embodies the correct cost components				
The model enables modifications				
The data sheets in the model will be easy to update on a yearly basis				
The model will serve the application to which it was intended to fulfil				
Input				
The required input to the model is accessible for the user				
The units of input are clear				
Output				
The model is enough detailed				
Estimations are performed correctly				
The results are good indications for decision-making				
The results are factual and cannot be interpreted differently				
The model enables sensitivity analysis (outcome of different scenarios)				

Appendix VI

Research Protocol

Activity	Time Period	Comment
Research Initiation	15 Jan – 19 Jan	Defining the scope and general outlines of the project
Literature review	19 Jan – 26 Jan	Reviewing Cost management, Supplier Management and the portfolio of purchasing cost models
Develop RQs	25 Jan – 4 Feb	
Synthesis of literature	27 Jan – 2 Feb	Reviewing findings from literature and critically scrutinize the trustworthiness of the articles
Develop methodology	4 Feb – 10 Mar	Setting up the construction approach and multiple case study method
Find case companies and initiate contact	3 Feb – 15 Mar	Scanning available articles and conference documentation to find appropriate persons and companies
Seminar with supervisor	3 Mar	
Develop interview guide	27 Feb – 2 Mar	Developing interview guide for the interview study
Conduct case study interviews	Volvo Cars (5 Mar) TeleCompany: (10 Mar) Lantmännen: (19 Mar) SIT: (20 Mar) IKEA: (25 Mar)	Interviews focused on the companies' purchasing departments, purchasing cost models
Documentation of interview study	5 Mar - 30 Mar	Cross-case analysis and pattern matching
Develop interview guide	12 Mar	Developing interview guide for the internal interviews
Documentation of research	20 Mar – 15 May	Construction, analysis and conclusion & contribution
Interviews at principal company	Markus Meijer (20 Mar) Emma Dahling (23 Mar) Dennis Roslund (23 Mar) Lina André (24 Mar) Per Jönemo (25 Mar) Fredrik Bengtsson (26 Mar) Mikael Hammar (8 Apr) Kjell Lindh (10 Apr) Sebastian Glimbrand (13 Apr) Erik Birath (15 Apr) Märta Morand (15 Apr) Linda Martinsson (21 Apr)	Discussing cost components, application, success factors and contextual aspects
Workshop 1	8 Apr	Defining range of purchasing cost model with additional cost components
Additional data gathering at Principal company	20 Mar – 3 May	Retrieving essential data through e-mail
Constructing the purchasing cost model	15 Apr – 12 May	Developing the Excel-file
Workshop 2	5 May	Demonstration and testing of purchasing cost model
Retrieving evaluations	5 May – 15 May	The evaluations was sent to all Supplier Managers at CC&SPM and later analysed

Appendix VII

Interview Guide for Case Companies

General

1. How well-developed is your purchasing department
 - a. To what extent is purchasing recognised in the organisation?
 - b. To whom are you reporting? (Organisational structure)
2. How many suppliers do you utilize?
3. How much of the total product cost is purchase cost?

Purchasing Cost Model

4. What purchasing cost model(s) are you utilizing?
5. What is the purpose (applications) of each purchasing cost model?
 - a. Enable decision-making?
 - b. Supplier selection / Supplier evaluation / Supplier development
 - c. Others
6. What kind of decision does the purchasing cost model facilitate?
7. What cost components are included besides price?
8. Which of the transactional phases does it cover?
 - a. Pre-transaction
 - b. Transaction
 - c. Post-transaction
9. To what extent is the purchasing cost model used?
 - a. On a regular bases
 - b. Certain purchases
 - c. On rare occasions
10. How many purchasers use the model in their daily work?
11. Is the purchase cost model(s) standardised or are unique model(s) used
12. Was it developed internally?
13. Where did you get the inspiration? (Structure and framework)
14. Do you use different models for different types of purchases?
 - a. If yes, how come?
15. Historically, have you used any other purchasing cost model prior to this?
 - a. Why did you change?
16. What characterises a good purchasing cost model?
 - a. What criteria are relevant?
 - i. Prioritisations
17. How do you extract data to the purchasing cost model?
 - a. What computers systems do you use?
 - i. Automated
 - ii. Manual
 - iii. Online
 - iv. Offline

Benefits and Drawbacks

18. What benefits have you encountered when using the purchasing cost model?
 - a. Improved decision making
 - b. Basis for communication
 - c. Improved understanding
 - d. Improved relationships with suppliers
 - e. Improved performance measures

- f. Identification of problems
 - g. Reduced supplier management cost
 - h. Increase coordination
 - i. Enable value analysis
 - j. Others
19. What drawbacks & barriers have you identified when using the purchasing cost model?
- a. Time-consuming
 - b. Difficulties in finding and extracting the required information
 - c. Complexity
 - d. Difficulties in quantifying certain costs
 - e. Enabling compliance and usage of the model
 - f. Others

Contextual Aspects

20. Do you see any contextual aspects that affected your choice of purchasing cost model?
21. Previous case studies and literature suggest certain contextual aspects. How does the following affect your purchasing cost model?
- a. Corporate culture
 - b. Type of supplier relations
 - c. Resistance to change
 - d. Cross-functional orientation
 - e. Purchasing sophistication (relates to question 1)
 - f. Others

Success Factors

22. Are there any significant success factors related to the use of your purchasing cost model?
- a. Link to pain point/burning platform
 - b. Create responsibility
 - c. Supporting software
 - d. Gather data continuously
 - e. Organisation-wide involvement
 - f. Focus on objective measures
 - g. Top management support
 - h. Others

Miscellaneous

23. What factors influenced the choice of your purchasing cost model?
- a. Based on certain prerequisites
 - b. Based on the application it serves
 - c. Based on contextual characteristics?
 - d. Historical reasons
 - e. Directives from top-management
 - f. Others
24. Are you planning on substituting your purchasing cost model to another one?
25. Any other key takeaways/experiences from working with purchasing cost models?

Appendix VIII

Guidelines to Purchasing Cost Model

- This purchasing cost model aims to facilitate decision-making by letting the user create different scenarios for one or several products.
- The purchasing cost model can favourably be used when evaluating new sourcing decisions but also current supplier setups.
- This purchasing cost model is developed for Tetra Pak Packaging Solutions CC&SPM. However, all active articles are incorporated in the supporting data.
- Always start with the original template when initiating a new investigation to prevent errors due to already modified cells.
- You are supposed to enter information in the cells marked with yellow colour.
- You can also enter data in cells marked 'Other costs'. Remember to enter the cost per piece.
- Most cost components in the purchasing cost model can be adjusted in order to enable comparison of different scenarios.
- The currency throughout the calculations is Euro (€).
- Some articles lack information. For instance, not all suppliers have setup costs. If this is the case, these cells will show 'Not available' (N/A).
- The data is based on reports from Tetra Pak's Business Warehouse and QlikView. When updating information, insert reports with equal design as the data sheets in this document (identical columns and units). The data in these sheets covers the year 2014.
- The sheets which should be updated on a yearly basis are:
 - Input parameters (Green)
 - Article data (Red)
 - Supplier data (Blue)
 - Inbound Discrepancies data (Orange)
 - Transportation data
 - Quality data
- The cost components included in this purchasing cost model (Landed cost) are divided into:
 - Pre- transactional
 - Transactional
 - Post-transactional
 - Other costs