University of Twente

THALES

Effective Performance Measurement:

First Build Confidence, Then Measure?

Research for developing a new performance measurement system at the purchasing department of the business unit Surface Radar in the Netherlands.

Tolga Tanaydin - February 2009

MASTER THESIS

University of Twente
School of Management and Governance
Enschede, The Netherlands

Tolga Tanaydin
Master program: Industrial Engineering and Management
Specialization: Production and Logistic Management

Effective Performance Measurement:
'First Build Confidence, then Measure?'

Period: February 2008 – February 2009

Research commissioned by:

Thales Netherlands

Supervisor from Thales:
Ton Disselhorst

1st Supervisor from the University:
Fredo Schotanus

2nd Supervisor from the University:
Marco Schutten

Management summary

Due to several global trends the pressure on purchasing to improve its performance has increased. The Purchasing Department of the Business unit Surface Radar in the Netherlands (SR Purchasing NL) recognizes its major role in coping with these business challenges and continuously seeks new ways to improve its performance. As a consequence of this and some signals for improvement, SR Purchasing NL identified the need to research the current Performance Measurement System (PMS) to see whether the PMS meets all the requirements in order to be well prepared for the future. The presented report describes this research. The objective is to develop a new PMS with a limited number of Key Performance Indicators (KPIs) to enable easy maintainability. The central question is therefore stated as follows: *'What is a good PMS for SR Purchasing NL?'*

There are several reasons to doubt the performance of the current PMS. We identify that almost half of the KPIs are not providing new insights at all due to several reasons, and in doing so we show that the current PMS only measures the financial performance. We explained that it is dangerous to neglect non-financial measures, because it stimulates purchasers to use short-term strategies rather than investing in long-term strategies. We uncover several other weaknesses of the system, such as the lack of steering possibilities, the lack of confidence of people in the right measures, the lack of commitment of people to the system, and the wrong assumption of focusing on the material flows rather than assessing the overall purchasing performance. Based on these weaknesses, we explain that managers within Thales that are related to SR Purchasing NL do not have the required insights in the current performance of SR Purchasing NL, while the actual performance of SR Purchasing NL is very important for Thales.

In order to (re)design the right KPIs and to keep them relevant over time, we show that it is essential for SR Purchasing NL to manage the different and changing perceptions of people on the right KPIs. After all, an appropriate KPI today can become not appropriate tomorrow due to new insights. We manage these perceptions by developing a new methodology, namely the so-called 'MAPP Action Cycle' (shown in Figure 1 on Page iii). The actions taken in this cycle are based on the most recent perceptions of people on the 'Actual Performance Position' (APP) of a company. Intended and emergent goals give sense to these perceptions. The organization can learn from emergent goals that are discovered, translated, and communicated as intended goals. In order to make sense of these different perceptions, a simple performance model is needed. People have to believe that if they accept the performance model as the objective reality, it will add value to the company. After this 'sensemaking process', new knowledge can be created by developing, measuring, and assessing KPIs. This knowledge can be made more valuable by supporting it with dashboards, trend-lines, and so on. The decision makers have to understand this valuable knowledge by including it in their mental models. In doing so, they will recreate their perceptions on the APP of a company. Given the scope of this research, we execute the following two steps of this cycle.

First, we evaluate different performance models and develop a customized performance model for SR Purchasing NL, the so-called 'Purchasing-Balanced Scorecard' (P-BSC) (shown in Figure 2 on Page iv). The P-BSC shows the Key Performance Areas (KPAs) for SR Purchasing NL and their interrelations in five dimensions. It shows also that it supports the mission of SR Purchasing NL. We validate the P-BSC by identifying and projecting the intended and emergent goals of SR Purchasing NL into the P-BSC. This step results in a new

performance model with a higher validity, more adequate steering possibility, higher acceptability potential by people, and an alignment with the mission of SR Purchasing NL.

Second, we evaluate all intended and emergent goals for each KPA of the P-BSC in order to formulate basic strategies. From these basic strategies, we develop the most promising alternative KPIs and evaluate them in order to select the new KPIs for SR Purchasing NL. This step results in sixteen new KPIs (see also in Figure 2), five of which are already collected as data by SR Purchasing NL or orther departments and thus make optimal use of existing data.

In order to effectively implement the new PMS, we make some suggestions. First of all, full support is needed from the MT of SR Purchasing NL and the purchasers, after which a project can be started and managed by a project leader. After the other steps of the MAPP Action Cycle have been followed, the implementation can be started and executed in two steps: organizational and technical implementation. Once the PMS is implemented, it must be kept relevant over time with the help of the MAPP Action Cycle. We suggest holding performance reviews four times a year. We estimate that the whole implementation will take five months.

Finally, we do some recommendations, such as: focusing on actions, remaining end-customer oriented, attracting the right people, developing the right culture, creating awareness of all relevant perceptions about the correct working of SR Purchasing NL, making purchasing co-responsible for inventories, providing SR Purchasing NL with the exact needs of After Sales, developing a business model that considers all aspects in the development of Radar- and sensor Systems (Radar Systems) in a balanced manner, and considering offset issues in selecting or developing suppliers.

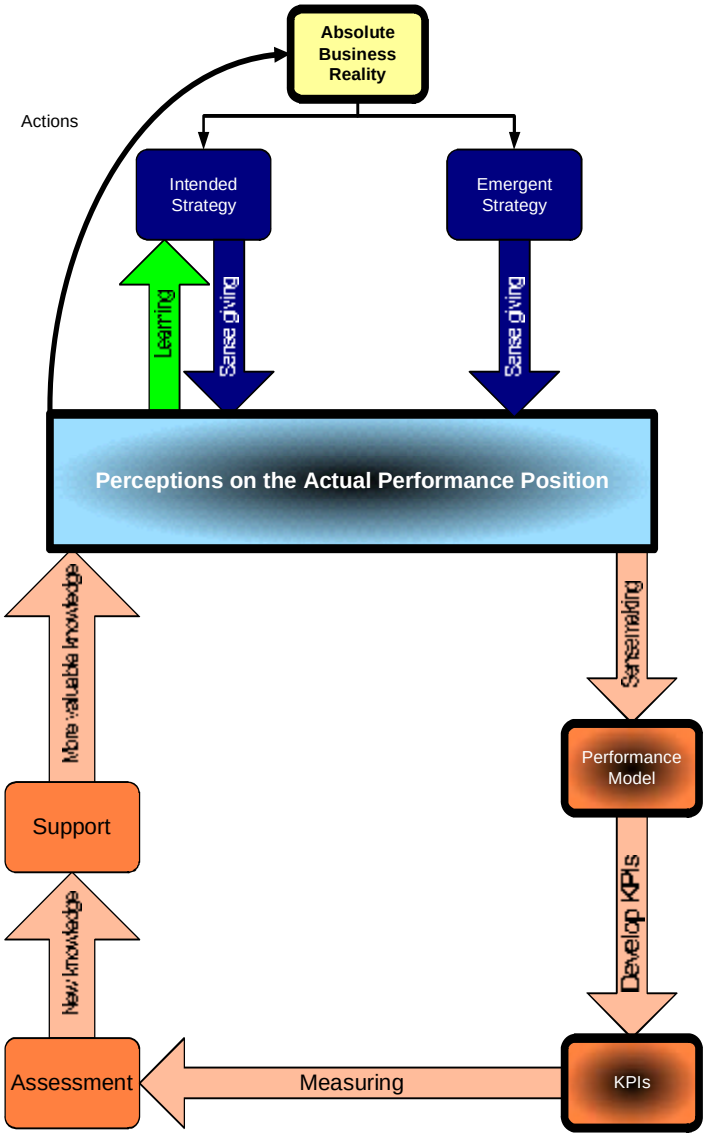

Figure 1 MAPP Action Cycle

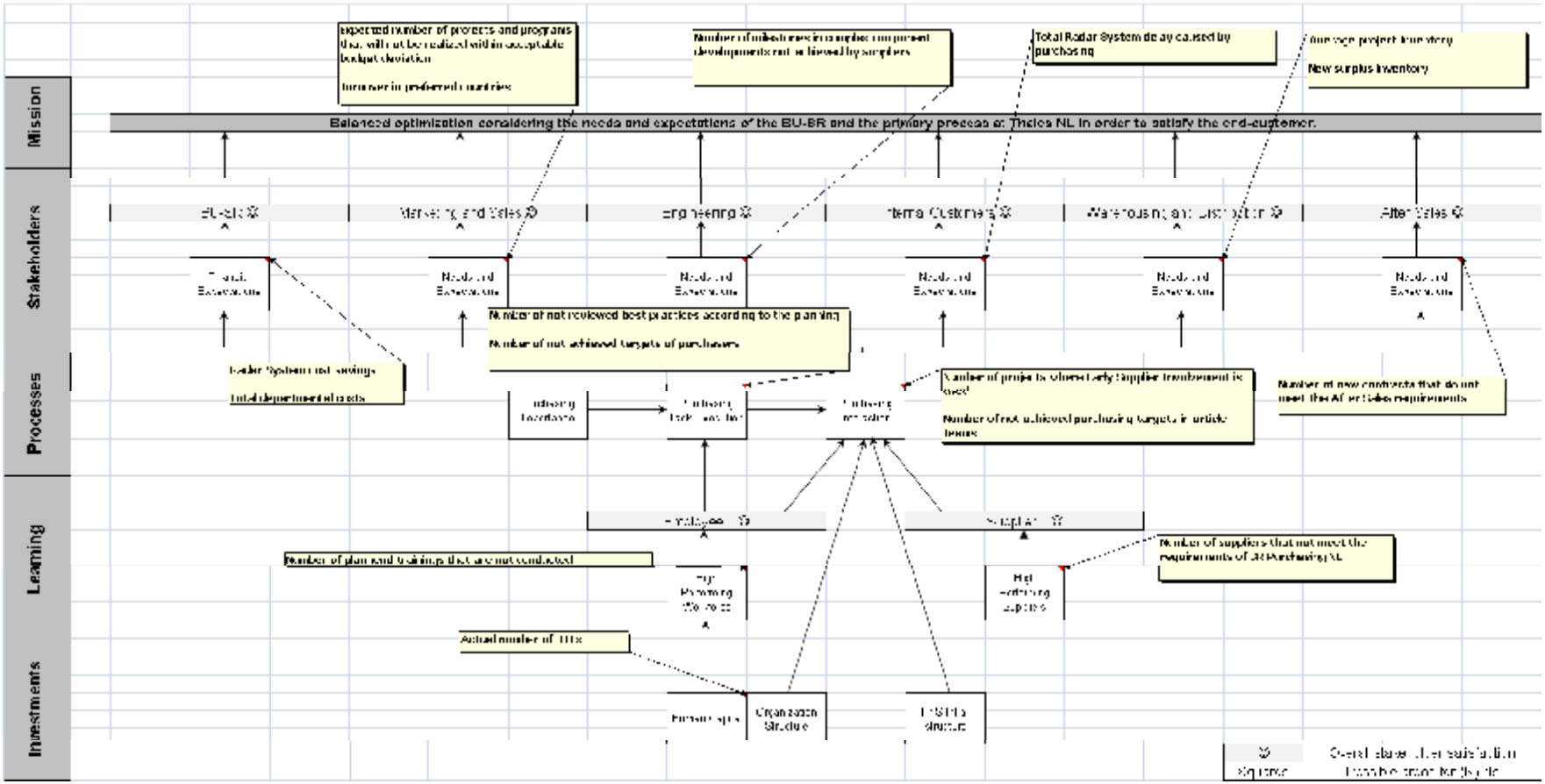

Figure 2 Purchasing-Balanced Scorecard and the KPIs

Preface

This research is the final work for my Master's degree in 'Industrial Engineering and Management' with the specialization 'Production and Logistic Management' at the faculty of 'Management & Governance' of the University of Twente in Enschede, the Netherlands.

First of all, I must gratefully acknowledge my Thales supervisor, Ton Disselhorst, for the opportunity he gave me to study one of my most interesting and exciting research topics in a highly professional company, where the speed of learning seemed almost 'unbelievable'. Furthermore, I am very grateful for his guidance and experienced insights as a business professional throughout the research project.

I also thank my supervisors Fredo Schotanus and Marco Schutten from the University of Twente. Their systematic approach for supporting me ensured the final success of this thesis. They gave me direction during my, sometimes over-confident attempts to find 'the ultimate truth'.

The research presented in this thesis would not have been possible without the help, advice, and encouragement of a large group of other people. Although this thesis does not explicitly mention their names, it is partially their work too: thank you very much!

Last but not least, I offer my family sincere thanks for their unconditional and invaluable support.

Tolga Tanaydin
Hengelo, February 2009

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List of abbreviations and acronyms

AT	Article Team
APP	Actual Performance Position
Ax	Alternative Key Performance Indicator x
BSC	Balanced Scorecard
BU-SR	Business unit Surface Radar
C-BSC	Classical-Balanced Scorecard
CMMI	Capability Maturity Model Integration
EFQM	European Foundation for Quality Management
EOQ	Economic Order Quantity
FRACAS	Failure Reporting Analysis and Corrective Action System
KPA	Key Performance Area
KPI	Key Performance Indicator
MT	Management Team
P-BSC	Purchasing - Balanced Scorecard
PI	Performance Indicator
PM	Performance Measurement
PMS	Performance Measurement System
PPM	Product Purchasing Manager
Radar System	Radar - and sensor System
RQ	Research Question
RS	Research Step
SR Purchasing NL	The Purchasing Department of the Business unit Surface Radar in the Netherlands
TC	Total Cost
TCO	Total Cost of Ownership
VRS	Vendor Rating System
EVRS	Extended Vendor Rating System
QLC Model	Model with the dimensions Quality, Logistic, and Cost
QLCT Model	Model with the dimensions Quality, Logistic, Cost, and Technology

Chapter 1: Introduction

This chapter starts with a presentation of the research background (Section 1.1) and the research objective (Section 1.2). We derive the central question of this research from the objective and formulate research questions to find an answer to the central question in Section 1.3. Subsequently, we describe the research constraint and the research approach in Sections 1.4 and 1.5, respectively. Finally, we present an overview of the structure of the report in Section 1.6.

1.1 Research background

Increasing dynamics of global markets and the effects of global competition have increased the pressure on companies to improve their performance, because strong competition forces companies to offer 'more for less'. The same holds for Thales, which faces threats from emerging market players and customers that have higher expectations than ever. In the defense market, where this research is based on, the customers are requesting highly integrated systems and turnkey solutions[1] with full availability and support over the 20 to 30 year life cycle, while their budgets for defense projects are becoming increasingly smaller (Thales Supplier Portal, 2008a).

As Kraljic (1983) once suggested: 'Purchasing Must Become Supply Management', the management of purchasing activities is becoming more important. Companies are increasingly outsourcing non-core activities by procuring goods and services rather than producing them internally (Trent & Monczka, 2002). According to Jahns (2005), the value added in the products of many companies has decreased and purchasing has a larger impact on a company's profit than ever. These developments are also visible within Thales. The value added in systems is decreasing due to the move towards 'prime contractor ship of systems'. This means that Thales increasingly uses subcontractors to perform parts of its projects. For example, Thales has recently outsourced a large part of the production in the Netherlands. Therefore, SR Purchasing NL, where we will do this research project, has become increasingly important.

SR Purchasing NL has recognized its major role in coping with these business challenges and wants to make real progress in achieving 'superior performance' by continuously seeking new ways to improve its performance. There are several ways to improve performance in general. A recent series of case studies of the British Quality Foundation (Tanner and Davies, 2007), identified the key drivers of performance (see Appendix I) in high performing companies. This study found the use of a PMS to be one of the key drivers of performance, because of its criticality for enabling structural improvements in processes and the achievement of the companies' objectives.

The immediate reason for this research is the confidence of the MT of SR Purchasing NL that an effective PMS can make a serious contribution towards achieving superior performance. They identified the need to research the current PMS to see whether it meets all the requirements in order to be well prepared for the future.

1.2 Research objective

The previous section showed that an effective PMS is essential for SR Purchasing NL. Based on these observations, we formulate the following research objective: *'This research aims to develop a new PMS for SR Purchasing NL'*.

[1] Systems that can be utilized with no additional work needed (just by 'turning the key').

1.3 Central question and research questions

We derive the following central question from the research objective: *'What is a good PMS for SR Purchasing NL'?* To find an answer to the central question it is necessary to formulate Research Questions (RQs). The answers to these questions will provide an answer to the central question. The first two RQs are needed to describe the context of this research:

RQ 1. What is the effect of the current PMS for Thales?

1.1. What is the position and function of SR Purchasing NL within Thales?

1.2. What is the function and the actual performance of the current PMS of SR Purchasing NL?

There are several ways to design a PMS and KPIs, which are usually based on a certain performance model. Therefore, we will first find a good design methodology for SR Purchasing NL based on their needs, followed by a good performance model. We will achieve these by answering the next questions:

RQ 2. What is a good methodology for designing KPIs for SR Purchasing NL?

2.1. What are the requirements for a good methodology for designing KPIs for SR Purchasing NL?

2.2. Which methodology for designing KPIs meets these requirements?

RQ 3. What is a good performance model for SR Purchasing NL?

In order to develop new KPIs for the PMS, we have to apply the performance model on SR Purchasing NL. A new KPI could be the same as one of the current KPIs, but this is not necessary. Finally, we have to ensure a possible implementation of the new PMS and KPIs. The following questions will help us to achieve these:

RQ 4. What are the new KPIs for SR Purchasing NL?

RQ 5. How can the new PMS effectively be implemented?

1.4 Research constraint

The MT of SR Purchasing NL demanded the use of a limited number of KPIs to enable easy maintainability. To quantify the number of KPIs, we conducted interviews with members of the team[2] and they indicated that they are satisfied with the use of around ten KPIs.

1.5 Plan of approach

This section describes the approach that we will follow in the excecution of this research. First, we will explore SR Purchasing NL to get insight in its activities. After that, we will answer the RQs by executing the following Research Steps (RSs):

RS 1. '*Current Situation*' (RQ 1.1 and 1.2)

With support from company presentations, internal documents, the annual report of the Thales organization, interviews, (in)formal talks and our observations, we can obtain an adequate picture of the company's organization structure and main activities. To understand the complex

2 Jelle Winia, Ben Geertsema, Jos van de Bosch, Klaartje van Wageningen, and Ton Disselhorst.

organization structure better, we will combine several organization charts of different departments from the intranet to form an overall impression of the organization structure around the SR Purchasing NL.

We will describe the PMS' function by interviewing the controllers of the system. Afterwards, we will try to find the performance model behind the current KPIs. While the exact rationale has not been found in a document, we will try to understand the rationale by interviewing purchasers, controllers of the PMS, and members from the MT and researching the rationale of a similar performance model of the ASML Company.

Then we will describe the current KPIs and present the outcomes of these KPIs over the past years with the help of performance reports on the intranet. This will enable us to evaluate the results of the KPIs over the past years. We will also pick up signals for possible improvements of the PMS with the help of interviews and our observations. Furthermore, we will try to identify the possible causes, effects, and solutions of these signals.

RS 2. '*A Good Design Methodology*' (RQ 2.1 and 2.2)

To answer RQ 2.1, we have to gain insights in the unique characteristics of SR Purchasing NL that will help us to define requirements for a good design methodology for SR Purchasing NL. We will achieve this by holding interviews and reading internal documents on the intranet, such as on the Thales Portal, Thales Netherlands Portal, and Thales Supplier Portal. Based on the requirements for a good methodology for designing KPIs for SR Purchasing NL, we will find the most suitable methodology by investigating different models.

RS 3. '*A Good Performance Model*' (RQ 3)

As mentioned in Section 1.3, we try to find a good performance model for SR Purchasing NL by following a two-step selection process: the selection of the best performance model category and the selection of the best performance model from the preferred category. We will carry out both selection processes in five phases as follows:

- Alternatives: The determination and description of feasible alternatives.
- Selection-criteria: The determination and description of appropriate selection-criteria.
- Evaluation: The evaluation of the existing alternatives, a combination of alternatives, and a new alternative with the help of the selection- criteria.
- Selection: The comparison of all the alternatives and the selection of the best alternative with the possible use of weights.
- Improvement: The (possible) improvement of the best alternative.

In order to find a good performance category, we will first use a simple categorization from the literature that separates the main types of performance models and assesses their suitability for Performance Measurement (PM) in general. We will do this with the help of generic criteria, which are based on the main idea behind our design methodology about how an effective model should be.

We will critically review the existing and most influential performance models from the literature, a combination of these models, or a new model of the preferred category, with more purchasing-related criteria from the literatue and own observations. Next, we will assess their suitability for PM in purchasing. Finally, we select a good model and make it more explicit and more suitable for the use within SR Purchasing NL in the improvement phase.

RS 4. '*The new KPIs for SR Purchasing NL*' (RQ 4)

Based on the developed design methodology, and with the use of the developed performance model, we will develop new KPIs for SR Purchasing NL.

RS 5. '*Implementation Plan*' (RQ 5)

In order to describe how the new KPIs can be effectively implemented, we have to work out first which approach for writing an implementation plan is the most appropriate for SR Purchasing NL. We will achieve this by using the literature and interviewing a Thales employee that is familiar with implementations within SR Purchasing NL.

1.6 Structure of the report

Figure 3 graphically summarizes the structure of the report. The chapter numbers have been reflected with 'C#' and the research steps with 'RS#'. We will elaborate each RS per chapter, followed by the conclusions and recommendations in the last two chapters. Appendix II shows the list of interviewed persons in this research.

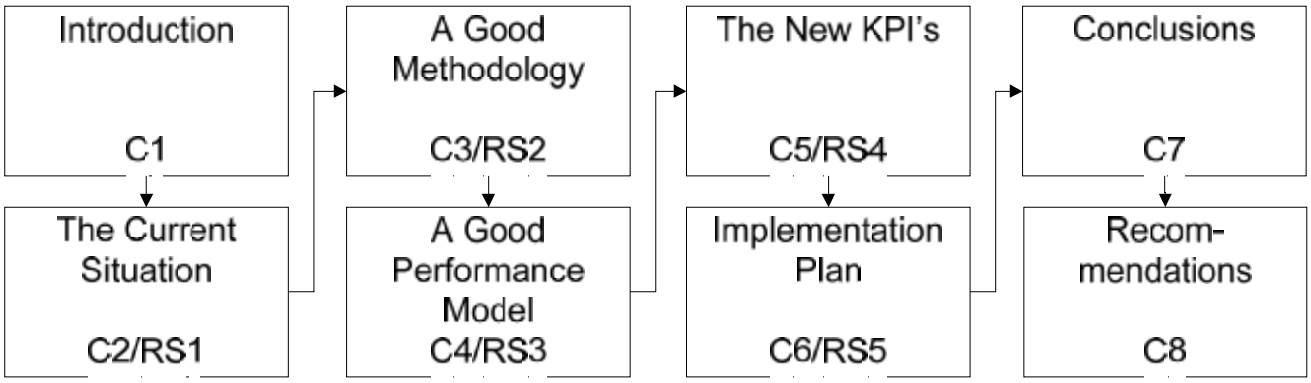


Figure 3 Structure of the report

Chapter 2: Current situation

2.1 Introduction

The purpose of this chapter is to describe the effect of the current PMS for Thales. We will achieve this by giving an overview of the position and function of SR Purchasing NL within Thales and by describing the function and the actual performance of the current PMS of SR Purchasing NL. We describe the Thales organization in Section 2.2. As the name suggests, **SR Purchasing NL,** belongs to three parts of Thales. Therefore we also describe the BU-**SR** (Section 2.3), the Thales **Purchasing** Organization (Section 2.4), and Thales **NL** (Section 2.5). Given that SR Purchasing NL is a purchasing department, which is responsible for the purchasing of parts for the primary process at Thales Hengelo, we also have to pay attention to this primary process (Section 2.6). Finally, we focus on SR Purchasing NL itself and its current PMS in Sections 2.7 and 2.8, respectively.

2.2 Thales

Thales is an international electronics company and primarily active in business areas (often also named as 'core businesses' or just 'markets') dedicated to information systems. Each business area consists of business lines. A business line (or 'division') is a set of business units that is responsible for a given market segment. Table 1 shows the business areas, –lines, and the core products or services of Thales.

Thales					
Business Area	Aerospace	Defense			Security
Business Line	Aerospace	Air Systems	Land & Joint Systems	Naval	Security Solutions & Services
Impression					
Core products or services	Equipment for aircrafts Airborne surveillance & mission systems	Air defense and missile systems Civil air traffic management systems	Network centric systems Network-enabled equipments	Warship prime contracting Systems for surface ships Underwater systems and naval services	IT services Simulation-based training

Table 1 Business areas, –lines, and the core products or services of Thales.

According to the Annual Report 2006, the main competitive advantages of Thales are an outstanding portfolio of innovative products and technologies, solid experience in the defense sector, and a positioning as a global player in security markets. The annual report further shows that Thales realized a net profit of €388 million and annual revenues of more than €10 billion with a total workforce of almost 57.000 employees in about 50 countries.

2.3 Business Unit Surface Radar

The business unit Surface Radar (BU-SR) is part of the business line Air systems. This business unit generated, according to the annual report, €1.6 billion of the € 10 billion revenues of Thales with a workforce of about 5900 employees. Table 2 shows the business units that are part of the business line Air systems.

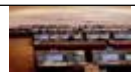
Air Systems							
Impres-sion							
Business Unit	Air Operations	Surface Radar	Weapon Systems	Missile Electronics	Customer Services	Air Traffic Manage-ment Systems	Navigation Aids

Table 2 Business units of the business line Air System.

The BU-SR is a supplier of Radar Systems in three fields. Table 3 shows the division of the BU-SR and their locations. Note that in Thales Hengelo, the BU-SR only focuses on naval radars and sensors that can be used on board of a naval ship.

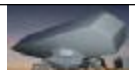
Surface Radar			
Impression			
Division	Ground Radar	Naval Radar	Air Traffic Management Radar
Location	Limours (France)	Hengelo & Delft (The Netherlands)	Rouen (France)

Table 3 Divisions of the BU-SR

Radar Systems are delivered to system integrators or directly to end-users. System integrators are external companies or internal business units of the Thales Group that are capable of integrating these Radar Systems with other systems into a Combat Management System or an Air Traffic Management System. End-users are shipyards, navies or other government customers. The system integrators within the Thales Group (internal system integrators) are shown in Table 4.

Internal System Integrators			
Business Line	Naval	Air Systems	Land & Joint Systems
Business Unit(s)	Above Water Systems	Weapon Systems, Air Operations, and Air Traffic Management Systems	Ground surveillance

Table 4 Internal system integrators of Thales

2.4 Thales Purchasing Organization

The Thales Purchasing Organization's challenge is to optimize the purchasing function of Thales. It has the ambition to support every purchasing department within Thales to become, as they say, 'the preferred customer of its suppliers' by developing strategies from different control levels, namely at corporate-, business line-, country-, and purchasing segment levels. According to Thales Supplier Portal (2008a), the intranet pages of the Thales Purchasing Organization, the 2006 global purchasing volume of Thales (excluding intra-group trading) was €4 billion, which represents more than 50% of the Thales' added value.

2.5 Thales Netherlands

Thales Netherlands, formerly 'Hollandse Signaalapparaten BV', belongs to Thales and generated €480 million revenues in 2006 with a total workforce of 2020 employees. It is the largest defense company in the Netherlands. The main competitive advantages are its presence all along the value chain, its dual-use of technology for military and civil markets, and its multi domestic presence. In the defense market it operates mainly in the naval sector (or 'market segment'). Outside the defense sector, Thales develops several services in the Netherlands, such as a nationwide public transport ticketing system.

Thales Netherlands consists of five establishments with its head office in Hengelo. Given that we carry out this research in Hengelo, we show the business lines and units of Thales Hengelo and their core products and services in Table 5.

Business Area	Defense			
Business Line	Air Systems	Naval		-
Business Unit	Surface Radar Netherlands	Above Water Systems Netherlands	Industrial and Logistic Services	Operations
Core products or services	Supplier of radar and sensors to system integrators and end-users in naval field	Supplier and integrator of Naval Combat Systems[3] Subcontracting	Customer-, Logistic-, and Industrial Services	Supports the primary processes within Thales Netherlands

Table 5 Thales Hengelo and its business lines, –units, and its core products or services.

2.6 Primary process at Thales Hengelo

In this section we will describe the primary process and its management at Thales Hengelo, as reflected in Figure 4. The functional names of the departments are used here to clarify the departmental roles in the primary process. For the same reason we grouped departments which are closely related. Different business units work heavily together in this primary process. Moreover, the departmental activities are not always sequentially carried out from the left to the right as reflected in this figure, and some activities could be skipped in practice.

[3] A Naval Combat System is the total of sensor- and weapon systems on board of a naval ship and a Combat Management System that regulates the whole system.

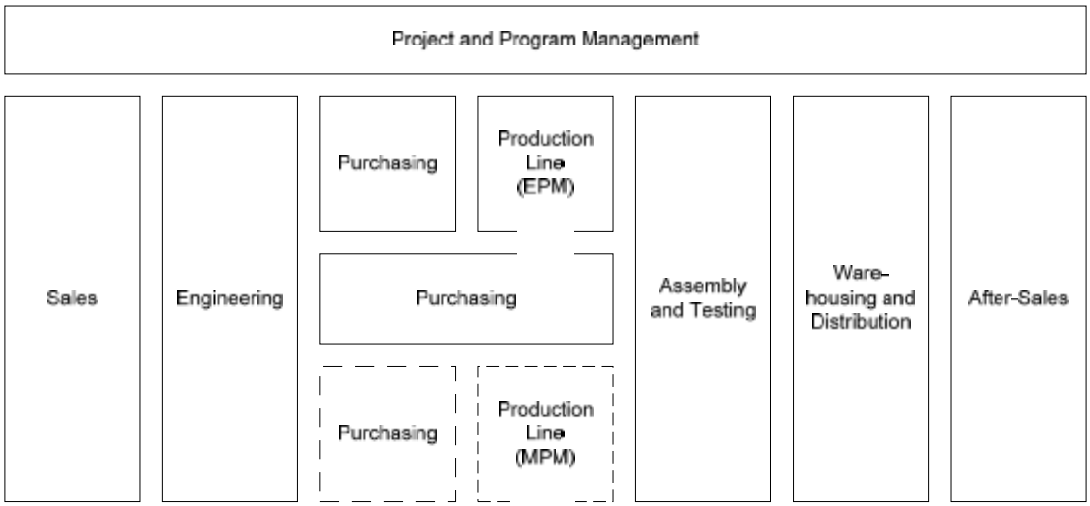


Figure 4 (Management of the) Primary process at Thales Hengelo.

The primary process starts at the Marketing and Sales department, which is responsible for the capturing of customer orders and winning of bids by planning the right system characteristics that will provide the required operational capability of the customer against competitive conditions. It is also responsible for launching new systems without a customer order to meet anticipated demands of potential customers. After determining the system characteristics, the engineering department is responsible for converting these characteristics into a system design.

When the design is finished, the parts for manufacturing and assemblage can be purchased. These parts are called 'buy parts', because they are bought from suppliers. There are also 'make parts', which are produced from buy parts in one of the production lines. There are currently two groups of production lines, namely EPM and MPM. EPM stands for 'Electronic Parts Manufacturing' and MPM stands for 'Mechanical Parts Manufacturing', the latter which will be outsourced to another company during this research. Therefore, this research will focus on the future status of Thales Hengelo, where it purchases mechanical make parts from an external (strategic) supplier. The production lines always produce on a unit production basis, because all the customer orders are customer specific. After the system is assembled, a system test is performed. Note that parts (in contradiction with a system) are only tested, when there is a serious need for it with the aim to push this 'quality control' more to the suppliers. Finally, the system is temporarily stored in a warehouse to be distributed to its customer.

As can be seen in Figure 4, the primary process is managed by projects and programs. According to Pier Dorrepaal, a Product Purchasing Manager (PPM), 'Project Teams' manage systems that are in the bid-phase and 'Program Teams' manage systems that are already sold to a customer. Customers can order three types of systems: new, modified, or standard systems. A new system requires the execution of the full primary process, while orders for a modified system reduce the development process by making use of a basic concept rather than a new design of the system. A standard system is pushed into markets and does not need design modifications and therefore it makes development activities unnecessary. Note that every order is managed customer specific, even if it concerns an order for standard systems, because some 'parameters' always have to be adjusted to the specific needs of the customer, such as the color of the system cases. When a customer has received a system (also denoted as 'system in commercial life'), the system is supported for an extended period, possibly throughout its operational life by the after sales department.

2.7 Surface Radar Purchasing Netherlands

According to Ton Disselhorst, the Thales supervisor of this research and Purchasing Manager of Tactical Purchasers, SR Purchasing NL has an estimated purchasing turnover of around €100 million annually after the outsourcing of MPM. It is responsible for the purchasing of end-product parts (or modules and subsystems) that are needed for the realization of Radar Systems.

The purchasing function within the Project- and Program Teams are managed by Product Purchasing Managers. The word 'product' refers, in our terms, to a 'system'. Every PPM is in close contact with Article Teams (ATs) that are responsible for the purchasing of groups of articles. According to the Thales Netherlands Portal (2008a), there are currently about 28 article groups. A few examples are: RF-Electronics, Mechanics, and Electro-Optical Systems. An AT consists of one tactical purchaser, one operational purchaser, and one specialist. The main responsibility of a specialist is the technical specification of the corresponding article. Figure 5 reflects the main tasks of tactical- and operational purchasers of SR Purchasing NL.

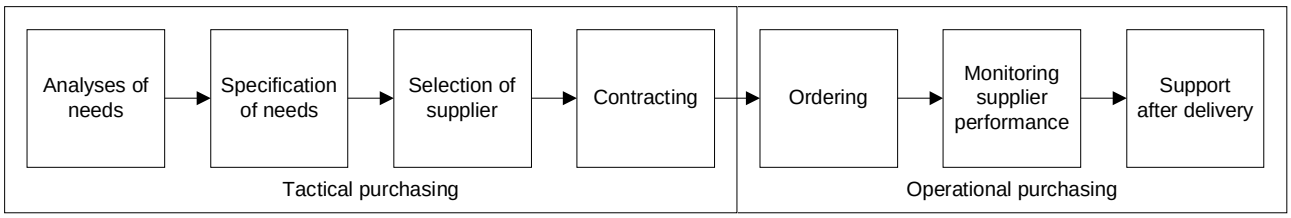


Figure 5 Main tasks of purchasers

These tasks are well-structured and are performed successively. This process always starts with a need that has to be fulfilled. We will give a brief explanation of these tasks:

- Analyses of needs: Determining the purchasing needs
- Specification of needs: Specifying the purchasing needs
- Selection of supplier: Searching and selecting suppliers
- Contracting: Negotiating the most attractive contracts with suppliers
- Ordering: Ordering against agreed conditions
- Monitoring supplier performance: Checking orders and monitoring contracts
- Support after delivery: Evaluating the completion of this process and its end-result

Finally, in order to obtain a good picture of the complete organization structure of Thales and its relation with SR Purchasing NL, we combined several organization charts from different departments. Appendix III shows the result.

2.8 Current PMS

The current PMS of SR Purchasing NL is called the 'Management Control System Purchasing' and is presented in the form of a management dashboard every quarter. According to the controllers[4], the purpose of the system is to provide different managers from Thales Hengelo with insight in the current performance of SR Purchasing NL in a univocal manner. Figure 6 displays the current management dashboard. The colors reflect the actual performance of the parts of the PMS.

[4] Wilco van Rijsbergen and Hanneke Gerritsen.

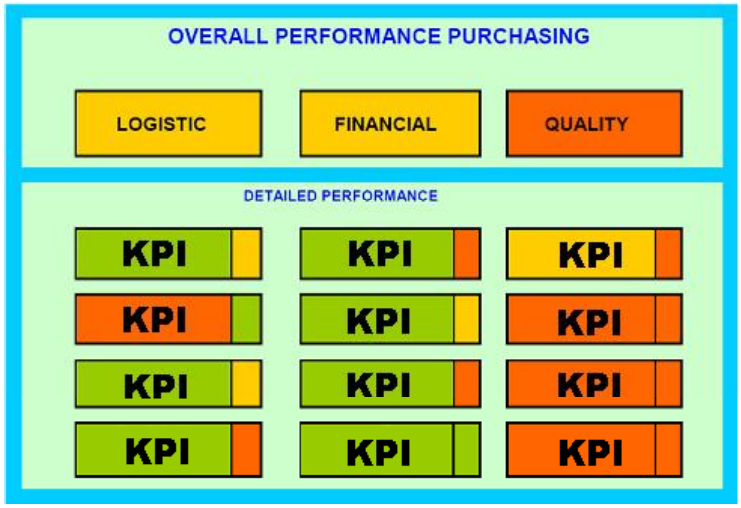


Figure 6 Management Control System of SR Purchasing NL

The 'overall performance of purchasing' is measured in three dimensions, namely Logistic, Financial, and Quality. However, we do not know the exact rationale of this 'performance model', because the designer of the system has left the company for years and we did not find this rationale documented.

This performance model is very similar to the well-known Value Sourcing Concept of ASML (2007) and used by several other companies. The rationale of Value Sourcing is as follows:

'Delivering the right parts (Quality dimension), at the right time (Logistic dimension), and at the lowest cost (Cost dimension) with the required technology (Technology dimension) to ASML'.

We refer to this model as the QLCT model. In line with this interpretation, we formulate the following possible rationale for the performance model of SR Purchasing NL:

'Delivering the right parts (quality dimension), at the right time (logistic dimension), and at the lowest cost (cost dimension) to the internal customers.'

We call this model the QLC Model. We confirmed this rationale by talking with purchasers, the controllers of the system, and members of the Management Team. The difference is that ASML uses an additional Technology dimension and measures the performance of the suppliers instead of the purchasing performance.

These differences are unfavorable for two reasons. First, Technology has a great impact on the performance of SR Purchasing NL, such as the miniaturization of parts. Therefore it must be incorporated. Second, both models focus on the material flows. These flows can be seen as the 'output' of the suppliers or the purchasing department. We find the focus for assessing the performance of purchasing disputable, because we find it important to focus also on, for example, processes that support these material flows (e.g. supplier management and supplier relations management). In assessing supplier performance, we find it more appropriate to hold suppliers responsible for their own output. Both models also have a common disadvantage, because of their focus on the material flows. We find that purchasing's purpose is more than delivering parts. For example, if SR Purchasing NL selects (or develops) suppliers from a specific country, it can stimulate new orders from this country.

Figure 6 shows further that the dashboard is capable of showing the actual performance of a KPI for the current quarter (larger part) and the previous quarter (smaller part). It shows also that the PMS consists of four KPIs per dimension. According to Ben Geertsema, a member of the MT of SR Purchasing NL, this fixed amount of KPIs per dimension is not a conscious choice. Figure 6 does not show the original KPIs and for ease of understanding we display them in Table 6. Extra Performance Indicators (PIs) are added each year from new purchasing objectives of a certain year. For example, the MT has introduced a new PI for assessing the purchasing spent in dollars for the year 2008 based on the current weak dollar. PIs can not be displayed by this dashboard. Note the difference between a KPI and a PI: a KPI is a fixed number of distinct indicators that together are able to indicate the overall purchasing performance, while a PI could be an isolated measure. Table 6 displays the current KPIs and PI. With the help of all the available reports on the intranet (Performance Reports, Q3/2004 – Q1/2008), we investigated the results of the KPIs over time and added some important shortcomings in Table 6.

(Key) Performance Indicators	Important Shortcomings
Logistic dimension	Performed always beneath the norm
Ability to meet operations schedule	Is not measured anymore & Performed always beneath the norm
Supplier delivery reliability	Is not measured anymore
Supplier cycle times	Performed always above the norm
Needed time for placing purchase order	
Financial dimension	
Program cost reduction against budgeted price	
Program budgeted price	
Integral cost reduction of purchasing department	
Program cost reduction in negotiations	
Quality dimension	Performed always beneath the norm
Quality of purchase file	
Supplier performance	Performed always beneath the norm
Supplier reduction	
Spend with preferred suppliers	Performed always beneath the norm
Extra PI: Spend in dollars	Is not measured yet

Table 6 Current KPIs and their shortcomings

Table 6 also visualizes that the financial dimension can be seen as the only 'working' dimension in practice, because there are no serious shortcomings (gray areas). With the help of these shortcomings and interviews with key persons within the purchasing department, such as the controllers of the system, purchasers, and members of the Management Team, we revealed the possible cause(s), effect(s), and solution(s) of these and other signals for improvement. Table 7 on Page - 12 - presents the results, where signals derived from interviews are indicated with '(I)' and signals from our own analysis with '(O)'.

Signal	Possible cause(s)	Possible effect(s)	Possible Solution(s)
The current PMS measures only the financial dimension in practice (O)	The logistic - and quality dimension are 'not working' (Table 6)	Forces purchasers to use short-term strategies to meet financial targets rather than investing in long term strategies. (O)	Develop a new and **working** PMS that measures also non-financial dimensions.
Some KPIs have always performed beneath the targeted value (O)	Use of unrealistic targets (O) Lack of effective steering actions (I)	Users are not motivated to take steering actions (I) No performance improvement (O)	Develop correct target values Develop correct KPIs Formulating steering possibilities
One KPI is performing always above the targeted value (O)	Possible use of the wrong KPI (I). Use of unrealistic targets (O)	No performance improvement (O)	Develop correct target values Develop correct KPIs
No steering possibilities defined (O)	Lack of attention to the further development of the PMS (O)	No performance improvement (O)	Develop steering actions
Users do not understand the QLC Model (I)	Absence of a recent manual (O)	Doubts about the correctness and completeness of the KPIs (I) Users are not motivated to take steering actions (I)	Design a new, correct, and complete set of KPIs Design a set of KPIs that are simple and intuitive to understand
Some users do not agree with the current KPIs (I)	Different perceptions about the right KPIs (I)	Possible use of the wrong KPIs (O)	Develop a system that is able to manage different perceptions of people on the right KPIs
Two KPIs and one PI are not measured (O)	Lack of data (O)	Users are not motivated to maintain the system (I)	Develop a system with a limited number of KPIs Develop KPIs, which are easily measured
Some purchasers confirm sometimes too early the completion of certain actions that are used as input data for the KPIs (I)	Rounding-off errors made by purchasers (O)	Use of unreliable input data for the KPIs (O)	Development of a clear manual
Current dashboard cannot display trend lines and incorporate PIs (O)	Poor design of the management dashboard (O)	Some insights from measuring performance remain uncovered (O)	Redesign of the management dashboard

Table 7 Signals for improvement of the the current PMS and their evaluation.

Based on this table, we conclude that the following parts of the current PMS need extra attention: the KPIs, the performance model, the target values, the management dashboard and the steering actions.

2.9 Conclusion

In this chapter we described the effect of the current PMS for Thales. First, we showed that SR Purchasing NL is heavily involved with different business functions from different business units of Thales for the delivery of Radar Systems and are supported by the Thales Purchasing Organization. Second, we described the function and the actual performance of the current PMS of SR Purchasing NL. The current PMS of SR Purchasing NL should measure the overall performance of SR Purchasing NL and provide different managers within Thales with new insights so that corrective actions can be taken. However, we showed that there are enough reasons to doubt the performance of the current PMS:

- The current performance model only measures the financial performance in practice
- The current performance model, the QLC model, focuses only on the material flow from suppliers to the internal customers and has the following disadvantages:
    - The model does not consider the technological expectations of internal customers
    - The model does not consider the other purposes of purchasing apart from controlling the material flow
    - The model does not consider the support processes that are needed for controlling the material flow
- The users do not understand the QLC model and do not agree with the current KPIs
    - There are no steering possibilities defined
    - The users of the PMS are not motivated to use the PMS
    - The management dashboard cannot incorporate trend lines and PIs

All these weaknesses show that managers within Thales that are related to SR Purchasing NL do not have the required insights in the current performance of SR Purchasing NL. These weaknesses have to be addressed, because purchasing has a great impact on the primary process of delivering Radar Systems and on the profitability of Thales (see Section 1.1). We will develop a new PMS that solves these problems.

Chapter 3: A good design methodology

3.1 Introduction

This chapter describes the process of finding a good methodology for desiging KPIs for SR Purchasing NL. We provide the requirements that the new methodology must meet in Section 3.2. Based on these requirements, we present new questions that have to be answered in order to create the most suitable methodology in Section 3.3. We answer these questions in the Section 3.4, 3.5, and 3.6. Finally, we present the most suitable methodology in Section 3.7.

3.2 Requirements for a good methodology

In order to gain insights in the characteristics of SR Purchasing NL, we first investigated many internal documents on the intranet, such as on the Thales Portal, Thales Netherlands Portal, and Thales Supplier Portal. We then interviewed several purchasers and determined that the SR Purchasing NL has the following unique characteristics:

- Faces complex problems, such as:
    - The relationship between a purchaser and a supplier is not an easy task. Each company wants to maximize their profits and in order for a successful partnership to be established, a balance must be found. This balance is also needed, because the success of one partner can help the success of the other. The management of these relationships can therefore be seen as a complex problem.
    - SR Purchasing NL has to deal with the needs and expectations of different business functions from different BUs. For example, Marketing and Sales wishes that SR Purchasing NL selects suppliers in promising countries in order to stimulate new orders or meet future offset obligations from those countries.
- Faces a fast changing environment, such as:
    - SR Purchasing NL sources globally, which means that exchange rates can influence the selection of suppliers by selecting suppliers in a cheap-currency country.
    - The rate of technological change and number of new technologies is increasing all the time, such as the miniaturization of parts. These parts could lead to the innovation of Radar Systems from the suppliers of SR Purchasing NL.

Companies that face complex issues in a fast changing environment, have to incorporate new gained insights in investigating their best practices and the changes in their environment to remain efficient and effective. New insights are also gained in PM research. For example, PM research has mostly focused on single companies in the past years. However, in the last few years, new models emerge that incorporate the optimization of supply chains (see for example Gunasekaran et al., 2004) or focus on a specific department within a company, such as for purchasing (see for example Wagner & Kaufmann, 2004).

Due to these new insights, many people have different and changing perceptions about the right KPIs. It is therefore very important to develop a PMS that can manage these perceptions to maintain relevant KPIs over time. Figure 7 summarizes how we have come to this requirement.

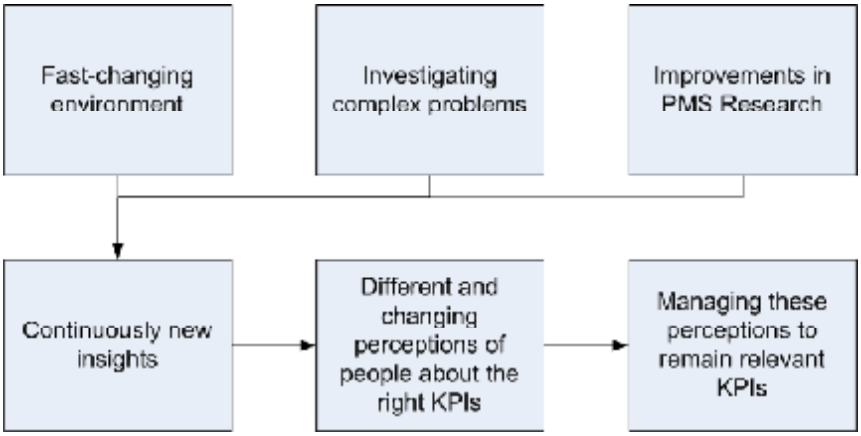


Figure 7 Required design methodology for SR Purchasing NL

3.3 Most suitable methodology

Based on the requirement of Section 3.2, we try to find the most suitable methodology now. Such a design methodology was not found in literature and we are required to develop a new one, based on the literature. In order to manage different and changing perceptions of people about the right KPIs, the additional questions shown below have to be answered, after which the findings will be combined and result in the presentation of a new methodology in Section 3.7:

- *What is the essence of the perceptions (Section 3.4)?*

  We have to know exactly what these perceptions are really about in order to focus on the essence of these perceptions.

- *How can we develop good KPIs from these perceptions (Section 3.5)?*

  Given that there are different perceptions, we have to understand how we can cope with them and develop good KPIs.

- *How are these perceptions (re)created (Section 3.6)?*

  We have to understand how these perceptions are (re)created. This will enable us to become aware of the factors that influence these perceptions of people.

3.4 Essence of the perceptions about the right KPIs

In order to uncover the essence of perceptions of people about the right KPIs, we first investigate two definitions in the literature for the term PM:

- The acquisition and analysis of information about the actual attainment of company objectives and plans and about factors that may influence that attainment (Kerssens-van Drongelen & Bilderbeek, 1994).
- The process of determining how successful organizations or individuals have been in attaining their objectives (Sinclair & Zairi, 1995).

These definitions make clear that PM is about measuring performance and determining in which direction a company wants to improve. This is the same as understanding the 'Actual Performance Position' (APP) of a company. Note that PM is just one way to understand the APP and other ways also exist, such as educating people. Based on this, we formulate and use the following interpretation for a PMS:

'A mechanism for creating new insights in order to better understand the APP of a company by measuring activities.'

We find that a company should take actions in the 'right' direction, based on its most recent understanding of its APP. These actions are taken on physical activities, which we name as the 'absolute business reality' of a company. This is the link of PM with 'Performance Management' as depicted in these definitions from the literature:

- The process by which a company manages its performance. It should be 'in line with its corporate and functional strategies and objectives' (Bititci et al., 1997).
- PM as the process of quantifying the efficiency and effectiveness of action (Neely et al., 1995).

In line with our interpretation of PM, our interpretation for Performance Management becomes:

'A mechanism for better decision-making on the basis of the most recent understanding of the APP of a company to take actions on the absolute business reality of the company.'

The essence of the perceptions about the right KPIs is thus the understanding of the APP of a company.

3.5 Development of good KPIs from different perceptions

The APP of a company can be seen as a very complex reality, because there is not a 'one best' perception. In order to deal with these different perceptions, we simplify the APP of a company into a 'reality'. By answering the following questions, we should be able to answer the main question of this section, namely: 'How to develop good KPIs from different perceptions?':

- What is a reality?

  According to Dummett (1978), there are two main opposite ways of thinking about reality: Realism and Antirealism. Realists claim that there is an objective world in contrast with the Antirealists' view that an objective world does not exist independently of the human mind and thus claiming the existence of only a subjective world. Given that it is not proven, both groups agree that 'reality changes all the time', due to experience or just due to time.

- How is reality observed?

  Humans also have a limited view of reality, because they have a limited set of senses and cannot observe things that cannot be seen, smelled, touched, heard or tasted. Some technologies help to 'sense' more indirectly, but this is only recently and limited. An example is a radar system that allows to see the whole electromagnetic spectrum. There are many other known non-human senses and perhaps other unknowable 'things' in the world by which people are most likely observing just a very small part of 'all that exists'.

- How is reality understood?

  What human sense is often interpreted differently. We can only prove that things in reality exist by establishing an evaluation standard, which is accepted by a group of people. For example, the summation of 1 and 2 is 3 in mathematics and is called a mathematical fact. Unfortunately, for complex, uncertain, and ambiguous situations a common standard cannot be established (read: there are no facts). There are only different perceptions and they can thus be true or false.

  Perceptions emerge from a fictive mental model in the minds of people, which is an internal representation of external reality that humans receive through their senses and earlier experiences stored in their long-term memory (Gentner & Stevens, 1983). It is the result of many factors including education, socialization, availability of information, individual or group needs, imagination, religion, self-confidence, quality of communication, motivation, culture (personal norms and values), and so on. The long-term memory does not always perform well and minor memory problems are fairly commonplace, and serious disorders may also occur (Reason, 1995).

Perceptions could be shared in groups and therefore we are not living in different 'worlds'. For example, in companies (as a social unit) and in businesses (as a group companies) there are shared perceptions.

- How is a complex reality managed?

  To deal with these different perceptions in a complex reality, a 'sensemaking' process could be very helpful. According to Weick (1995), sensemaking is an attempt to make sense of a complex (or ambiguous and uncertain) reality in order to make decisions. It is a collaborative process of creating shared awareness and understanding out of different individuals' perspectives and varied interests. This often holds for managerial situations, because they operate in complex situations, where nearly solid facts exist. In a simple reality, analysis and evaluations are made based on reality itself to take decisions. In groups (or in companies), reality is always socially constructed and accepted as the objective world if they believe that it will lead to better decisions although they do not share completely the same perceptions. Figure 8 and Figure 9 show the decision making for a simple and complex reality, respectively.

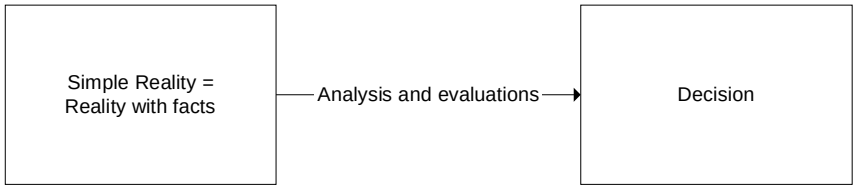


Figure 8 Decision making for a simple reality

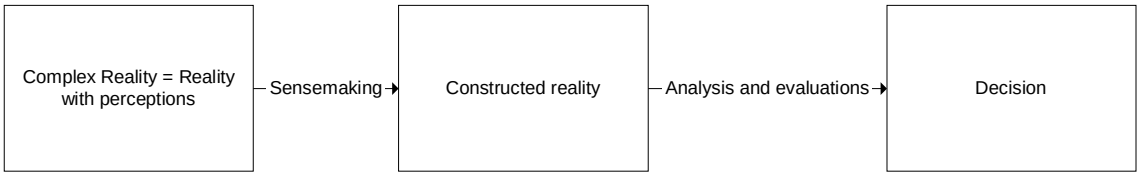


Figure 9 Decision making for a complex reality

A model is a way of (not) seeing things and can thus be used to (re)construct reality that is simple to understand. When it is also made explicit, conceptual, written and unambiguous, it becomes an excellent way of constructing a reality that can be easily communicated.

We are now able to answer the main question of this section. We can deal with different perceptions on the APP of a company by creating a simple performance model, in which all people believe that if they accept it as the objective reality, it will add value to the company.

3.6 (Re)Creation of the perceptions about the right KPIs

In this section, we will show the perceptions on the APP are (re)created. Within PM, we find that there are two main flows of knowledge that (re)create these perceptions:

- The goals of a company

  Based on the fact that companies have limited resources, companies focus on the most important factors to improve performance. This focusing is an implication of the goals of a company. They give sense to people about where improvements are needed. Note that it is important to measure these factors, irrespective of their actual performance. After all, a well performing factor can

perform unsatisfactory tomorrow. According to Mintzberg (1994), a company moves with the help of two types of goals: intended and emergent goals.

An intended strategy is planned, formulated, and based on deliberate rational choices and contains an intentional pattern of actions. It is based on a 'strategic fit' between a company's goals and values, resources, capabilities, structure and systems, and aspirations in a particular industry environment (customers, suppliers, and competitors). In other words, it is based on the fit between 'reality' and 'vision'. Intended strategy is often also called 'Deliberate Strategy', 'Strategy as Design', and 'Formal Strategic Planning' by others. Many goals are formalized in companies, such as in the vision, mission, strategies, business plans, and core values of a company. The definitions of these terms can vary, overlap, and not be clear in practice.

An emergent strategy is a pattern of actions that turns into a consistent pattern of behavior, absolute business reality of a company. It arises from practical experience and day-to-day incidents and implies that a company is learning what works in practice. Emergent strategy is also known as 'strategy as process' and 'strategy as stretch', because it allows stretch between reality and vision. Note that an emergent strategy can become an intended strategy when it is discovered by the management and translated and communicated as an intended strategy. We will call this 'organizational learning'. This knowledge gives 'sense'. We will therefore denote the effect of these goals on the perceptions of people as 'sense-giving'. It gives sense with little or no effort from the receiver.

- Measuring Performance

  By measuring, a company is capable of objectively determining the actual performance of a factor. This results in new knowledge and recreates the perceptions of people on the APP of a company. This knowledge uncovers weak performing factors. Companies usually take actions on weak performing and strategic factors. This knowledge is more complicated than the effect of the goals of a company on the APP. It has to be created by measuring. Therefore we searched for applicable models from the literature and found one model of Oral (2007). This model consists of three functions. We describe these three functions in more detail below and depict the model in Figure 10:

  - the cognitive function constructs a business reality for the purpose of identifying managerial issues that need to be dealt with
  - the creative function builds a critical analysis and decisional system leading to a creative generation of innovative ideas and knowledge related to the identified managerial issues
  - the participative function develops channels of communication and delivery systems in order to have business offerings valued, favored and accepted by the intended actors of the business environment of interest

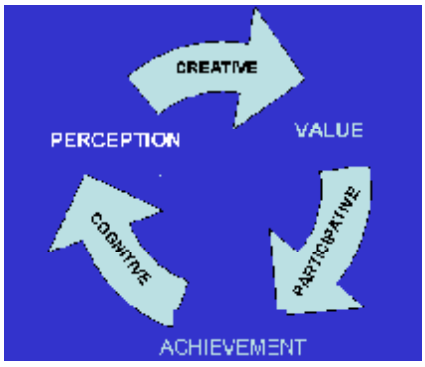


Figure 10 Model of Oral about the recreation of perception

We apply this model to performance measurement. The cognitive function constructs a performance model for the purpose of identifying the APP of a company. The creative function creates new knowledge by developing and measuring KPIs and assessing their values with certain target values. The participative function turns new knowledge into 'more valuable knowledge' with the help of reports, discussion, dashboards, trend lines, and so on. It can help uncover opportunities, recognize trends, identify data anomalies, and create widely accessible reports, and so on. In this research we will call this the 'support' function

3.7 MAPP Action Cycle

Figure 11 on Page - 20 - shows the good design methodology for SR Purchasing NL, which is based on the findings of the previous sections of this chapter. We will call this methodology the 'MAPP Action Cycle', in which MAPP stands for 'Measuring Actual Performance Position'. It is called an action cycle, because performance measurement is useless if it does not lead to actions. The actions taken in this cycle are always based on the most recent perceptions of people on the APP of a company. Intended and emergent goals give sense to these perceptions. The organization can learn from emergent goals that are discovered, translated, and communicated as intended goals. In order to make sense of these different perceptions, a simple performance model is needed. People have to believe that if they accept the performance model as the objective reality, it will add value to the company. After this 'sensemaking process', new knowledge can be created by developing, measuring, and assessing KPIs. This knowledge can be made more valuable by supporting it with dashboards, trend-lines and so on. Next, the decision makers have to understand this valuable knowledge by including it in their mental models. In doing so, they will recreate their perceptions on the APP of a company. As previously mentioned, all sources of knowledge are used in practice to recreate these perceptions and not only performance measurement. We can summarize the main idea behind this methodology as follows:

- First Build Confidence (Build confidence in a good performance model and KPIs)
- Then Measure (Create new knowledge)
- Following Support (Create more valuable knowledge)
- Then Understand (Recreate the perceptions of people about the APP of a company)
- Finally Take Action (Formulate and implement actions)

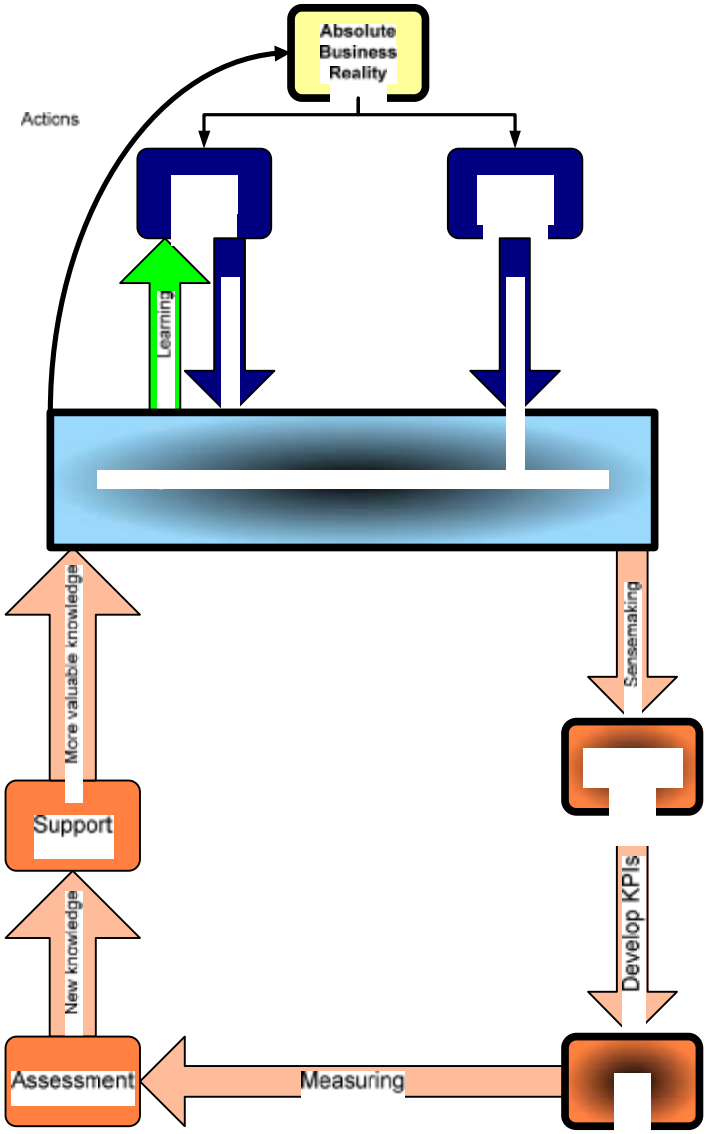


Figure 11 MAPP Action Cycle

Many factors can be investigated in the MAPP Action Cycle. Based on the Research Objective (Section 1.2) we will focus only on the first part of the methodology, namely the 'First Build Confidence' part of the methodology, since this part will result in the required new KPIs for SR Purchasing NL. Based on the MAPP Action Cycle, we will carry out the research as follows:

- Build confidence in a good performance model (Chapter 4)
  As expected in the design phase (see Chapter 1.3), we need to find a performance model for SR Purchasing NL. According to the MAPP Action Cycle, we have to build confidence in a simple performance model. Therefore, we will use 'simplicity' as a creation in the evaluation of different models.
- Build confidence in good KPIs (Chapter 5)
  We will develop new KPIs from the good performance model for SR Purchasing NL with the help of the following sections:
  - Desired focus (Section 5.2)
    We will determine the desired focus of SR Purchasing NL by identifying, evaluating, and

projecting the intended and emergent goals of SR Purchasing NL into the performance model. In doing so, we will gain insights in the perceptions of the management of SR Purchasing NL and other people about the most important KPAs of the performance model.

- Development of basic strategies (Section 5.3)
  We will evaluate all possible intended and emergent goals with the help of relevant literature and the main ideas behind the current KPIs to formulate basic strategies that capture the main idea behind the KPAs of the performance model. Basic strategies are needed, because we are allowed to use a limited set of KPIs (see Section 1.4).
- Development of new KPIs (Section 5.4)
  We will derive the KPIs from the strategies formulated in Section 5.3. We will achieve this with the help of relevant literature and key persons that are related to the concerning KPA. We will ask them to formulate alternatives in a brain storm session in order to generate the most promising alternative KPIs and we will evaluate these alternatives. The brainstorm sessions are a good method, because it stimulates creativity and thus the generation of multiple promising alternatives.

3.8 Conclusion

In this chapter we have developed a methodology for designing KPIs for SR Purchasing NL. First, we determined that SR Purchasing NL needs a methodology that is able to manage different and changing perceptions of people about the right KPIs. Second, we showed that such a methodology does not exist in literature and thus we developed the 'MAPP Action Cycle'. The purpose of this cycle is to take actions according to the latest perceptions of people about the APP of a company. The MAPP Action provides more insights in the way to carry out the next RSs. It seems necessary to develop a simple performance model and develop new KPIs based on this model by developing:

- Basic strategies from the intended and emergent goals of SR Purchasing NL for each KPA of the performance model
- New KPIs from these basic strategies for each KPA of the performance model

Chapter 4: Good performance model

4.1 Introduction

In this chapter, we will find a good performance model for SR Purchasing NL in two steps. First, we evaluate the different categories of performance models with generic criteria and assessed for their suitability in measuring performance in general (Section 4.2). This enables us to focus on the most promising models in more detail in the next step (Section 4.3), where we evaluate the most influential performance models with purchasing-specific criteria and assessed for their suitability for PM in purchasing. Finally, we select a good model and improve it to fit SR Purchasing NL.

4.2 Good performance model category

4.2.1 Alternatives

According to Bourne and Neely (2003), a categorization can be made based upon the distinct procedures that can be discerned in the design process, namely the 'audit led', 'model led', and 'needs led' procedures:

- The audit led procedure is a bottom up procedure that starts with evaluating the existing performance measures to improve these measures. Examples are the procedures of Dixon et al. (1991), and Ghalayini et al. (1997).
- The model led procedure uses a prescribed theoretical model of the organization for designing the performance measures. This means that such models do not change over time (are fixed). A few examples are the MSU+ model (2005), and the procedures of Bitton (1990), and Krause and Mertins (1999).
- The needs led procedure is a top down procedure that uses the needs of all stakeholders as a basis for the development of performance measures. For example, the excellence model of the European Foundation for Quality Management (EFQM Model, 1992) and the BSC are such procedures.

A combined model will also be used as an alternative. The only feasible combined model is the model led procedure incorporated in a needs led procedure, because the model led procedure results in a fixed model that can be incorporated in a changing model that is the result of a needs led procedure. An audit led procedure cannot be combined with the other models, because it focuses only on the existing KPIs. The needs led procedure cannot be incorporated in other models, because the other models are fixed and can not consider the changing needs of stakeholders. A new procedure cannot be developed, because these three procedures and the combined procedures include all possible procedures and combinations.

4.2.2 Selection-criteria

A model is a way of (not) showing things, as mentioned earlier in Chapter 3, and this provides the basis for the next two generic criteria: the 'correctness' and 'completeness' of a model. Based on the findings of Chapter 3, a good performance model for SR Purchasing NL should be simple and thus the 'simplicity' of a model is also used as a criterion.

4.2.3 Evaluation

Table 8 shows the signs and their scores needed for the evaluation of the alternatives in this section. Table 9 shows these evaluations.

Sign	Score
--	Very Low
-	Low
+/-	Reasonable
+	High
++	Very High

Table 8 Signs and the corresponding scores for evaluating alternatives

Cate-gory	SC	Evaluation	Score
Audit	Simple	A model is equal to the set of KPIs	+
	Correct	The existing KPIs are improved.	+
	Complete	If a model seems incomplete, the model cannot be extended.	-
Model	Simple	The use of a prescribed model to represent the overall performance of purchasing seems very complex, because (among others) all the purchasing processes have to be modeled.	-
	Correct	The KPIs are based on prescribed models that are usually based on planned, formulated, and deliberate rational choices. However, new insights cannot be incorporated, because the KPIs are prescribed.	+/-
	Complete	It seems almost impossible to model every factor that has an impact on the purchasing performance.	-
Needs	Simple	The models are top down approaches. Therefore it is likely to develop a quite simple model on for example one A4 paper.	+/-
	Correct	This approach can deliver correct KPIs for some cases, but not for complex issues, where a bottom-up approach is more desired.	+/-
	Complete	It focuses on the right things to consider the real needs and expectations of stakeholders.	+
Combined	Simple	The model becomes seems a bit more complex than the needs-led model, because prescribed models are used for complex issues. However, the prescribed models are lying behind the needs-led model and can be left out in the daily use.	+/-
	Correct	The model will have a higher correctness with respect to the needs led approach, because models are incorporated for complex issues.	+
	Complete	The completeness remains unchanged with respect to the needs led approach.	+

Table 9 Evaluation of alternatives for a good performance model category

4.2.4 Selection

Table 10 summarizes the scores for all categories on each criterion. We will use the same weights for the criteria, because they all are perceived equally important. This is also confirmed by the Thales supervisor of this research. The audit led procedure and the models led procedure are no options, because they score very low on completeness. From the remaining models, the combined model is the best alternative. Therefore, we selected it as the best alternative.

	Audit led	Model led	Needs led	Combined model
Simplicity	+	-	+/-	+/-
Correctness	+	+/-	+/-	+
Completeness	-	-	+	+

Table 10 Comparison of alternatives for a good performance model category

4.3 Development of a good performance model

4.3.1 Alternatives

We will now analyze needs led performance models from the selected category, a model led procedure incorporated in a needs led procedure, of Section 4.2. Lardenoije et al. (2005) reviewed influential needs led models that have the potential to be used in purchasing with purchasing related criteria. He described the following models: EFQM Excellence Model, Productivity Measurement and Enhancement System (Pritchard, 1990), Balanced Scorecard (Kaplan & Norton, 1992), Performance Prism (Neely & Adams, 2000), Tableau de Bord (Fitzgerald et al., 1991), and Performance Pyramid (Lynch & Cross, 1991). We dropped the following two of the above models as alternatives:

- Tableau de Bord

  This model is a nested structure of setting indicators for the top management level and translates these indicators to lower levels, such as divisions, functions, and regions. As such, it results in one Tableau de Bord for each unit. Given that the scope of the research is to design a PMS for only SR Purchasing NL, we will drop this model as an alternative.

- Productivity Measurement and Enhancement System

  This is a step-by-step formal process of identifying objectives, measuring the attainment of these objectives, and communicating the actual performance to people. Since this is a formal process and not a (conceptual) performance model as we have met in Section 3.5, it will also be dropped for evaluation.

The other models are interesting performance models. A combination of the models is not possible, because the models are fundamentally different. New models will not be developed, because the existing models have been reviewed many times and are used by many companies. We will (briefly) describe the alternatives:

- EFQM Excellence Model

  This model can be considered as a framework that measures progress in excellence. Excellency is defined by the model as the excellent management of the organization and the attainment of excellent results. There are two types of areas: 'enablers' and 'results'. An enabler is a criterion that forms the basis to reach excellent results. Results are caused by enablers and make 'innovation and learning' possible by comparing the gap between these two types of areas. Figure 12 displays the EFQM model with all its criteria.

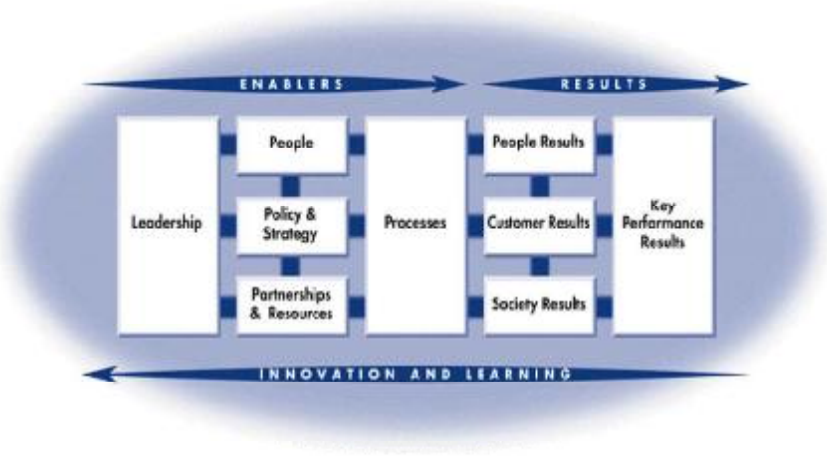


Figure 12 EFQM model

- Balanced Scorecard

  A well-known PMS is the BSC developed by Kaplan and Norton (1992). The BSC provides a view of an organization's overall performance with the help of questions derived from four perspectives:

  - Financial Perspective: 'To succeed financially, how should we appear to our shareholders?'
  - Customer Perspective: 'To achieve our vision, how should we appear to our customers?'
  - Internal Processes: 'To satisfy our shareholders and customers, what business processes must we excel at?'
  - Learning and Growth: 'To achieve our vision, how will we sustain our ability to change and improve?'

  These perspectives are also ordered. The BSC translates the mission of a company to measures in these different dimensions. This is depicted in Figure 13.

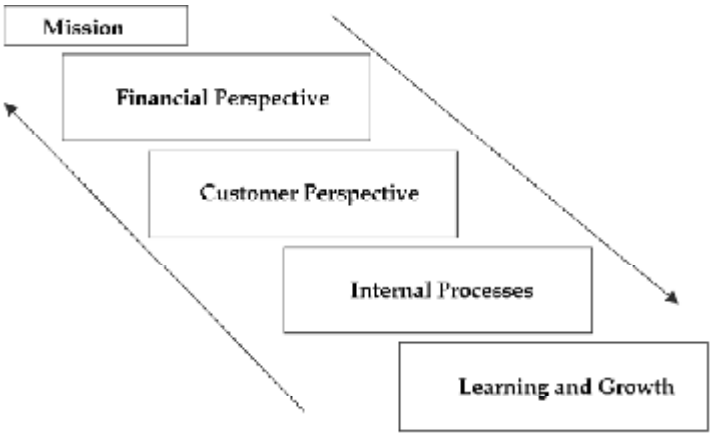


Figure 13 Balanced Scorecard

- The Performance Prism

  This model is a three-dimensional model that has five facets (see Figure 14) (or dimensions) that answer particular questions:

  - Stakeholder Satisfaction: 'Who are the most influential stakeholders and what do they need?'
  - Strategies: 'What strategies should we adopt to satisfy the needs of these stakeholders?'
  - Processes: 'Which processes are needed to execute these strategies?'
  - Capabilities: 'What capabilities are needed to operate these processes?'
  - Stakeholder contribution: 'What contributions are required from the stakeholders, if we are to develop these capabilities?'

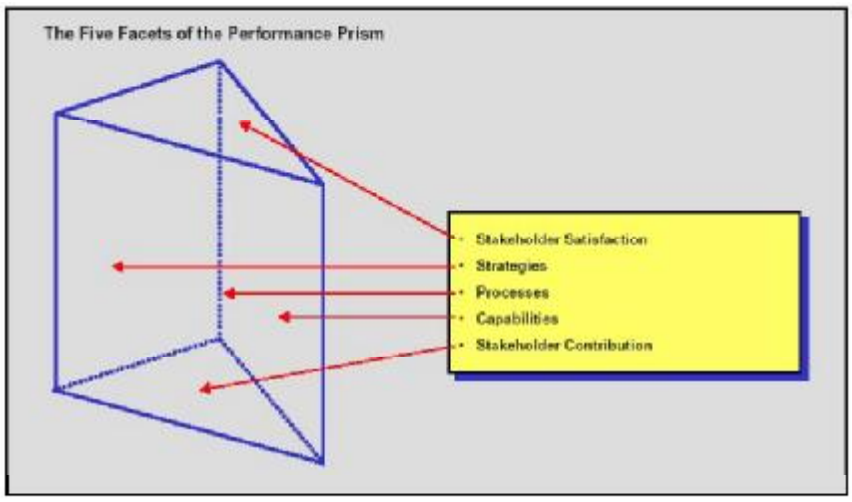


Figure 14 Performance Prism

- The Performance Pyramid

  This pyramid-shaped model provides a view of an organization's overall performance with the help of nine prescribed performance indicators at different organizational levels. The idea is that an organization operates at different levels with different focus, but it is important that these different levels support each other by starting from the corporate vision to individual objectives. Therefore, strategic objectives flow down through the organization, while information flows upwards. The pyramid has a range of objectives for both external effectiveness and internal efficiency. Figure 15 illustrates the Performance Pyramid system.

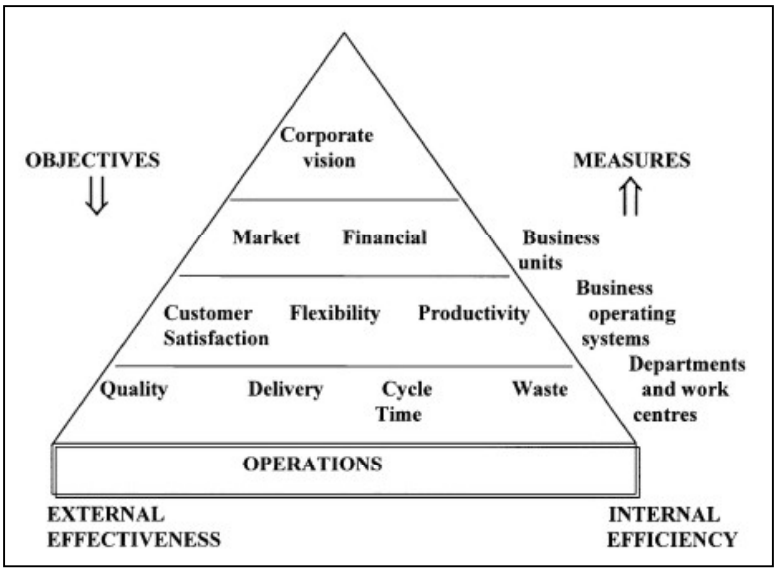


Figure 15 Performance Pyramid

4.3.2 Selection-criteria

This section evaluates the suitability of the models for PM in purchasing with the use of more purchasing-related criteria. Lardenoije (2005) used purchasing-related criteria in his analyses to compare performance models, which are reviewed below:

- *Coverage of both strategic and operational aspects of purchasing*

  We agree with this criterion, because we are interested in the overall purchasing performance, which includes the full coverage of possible aspects.

- *Possibility to include performance towards all three principal stakeholders in purchasing: internal customers, suppliers, and top management*

  We partly agree with this criterion. We understand the necessity of multiple stakeholders, because in purchasing more stakeholders exist than (internal) customers. However, we do not agree with the three stakeholders. SR Purchasing NL has to deal with other business functions at Thales NL as well. Therefore we will relax this criterion for the time being into: 'Possibility to include performance towards multiple stakeholders' and determine the exact stakeholders later.

- *Inclusion of 'lead' and 'lag' indicators for purchasing*

  The lead and lag indicators will make the performance model considerably more valuable, because it will show interrelations between KPAs. As this enables a better understanding of the model, we use this criterion and for ease of understanding name it: 'the inclusion of cause and effect relationships'.

- *Usefulness for individual-level PM*

  Mastenbroek & Wijchers (2007) argued that the purpose of the use of indicators should be overall performance improvement and not controlling people, which is also the purpose of this research (see Section 1.1.). Talks with purchasers confirm that such a criterion is not preferred in a department where the expectations exist that people take their own responsibilities.

- *Inclusion of both effectiveness and efficiency measures of purchasing*

  This criterion is very important and we will therefore use it in our decision-making process. It reflects to what extent the model is efficiently and effectively measuring purchasing performance.

Based on interviews with the MT of SR Purchasing NL and on earlier findings of this research, we developed additional criteria. We have to add the criterion 'flexibility', because we want to easily add, change, or remove KPIs to review the existing KPIs regularly. This is in coherence with the cycle idea behind the MAPP Action Cycle (see Chapter 3). Furthermore, we will not use the criterion 'simplicity', because we used it in Section 4.2 for the selection of the best performance model category and we therefore assume that all models from the preferred category are simple enough. Finally, a chosen model must be feasible to be executed given the time limitations of this research, and we denote this by the 'Feasability of the project'. The final selection criteria become: *Strategic and operational measures (SC1), The involvement of multiple stakeholders (SC2), Cause and effect relationships (SC3), Effectiveness and efficiency measures (SC4), Flexibility of the model (SC5), and Feasibility of the project (SC5).*

4.3.3 Evaluation

We used the same signs for displaying the scores of alternatives on each criterion as in Section 4.2.3. Table 11 shows the evaluations and scores of the alternatives on each criterion.

Model	SC	Evaluation	Score
EFQM Excellence	SC1	The model has the possibility to use performance indicators from the strategic to operational level.	+
	SC2	The model deals with fixed stakeholders, but the model can be extended with other stakeholders.	+
	SC3	The model does not specify this functionality and it is not possible to include this functionality in the model, because the criteria have not a cause and effect relationships.	-
	SC4	The model provides possibilities for including effectiveness and efficiency measures.	+
	SC5	The model can be adapted to the specific needs of the company.	+
	SC6	The model is feasible given the research resources.	+
Balanced Scorecard	SC1	The model has the possibility to use performance indicators from the strategic to operational level.	+
	SC2	The model deals with fixed stakeholders, but the model can be extended with other stakeholders.	+
	SC3	The model provides the use of cause and effect relationships.	++
	SC4	The model provides possibilities for including effectiveness and efficiency measures and it stimulates the use of efficiency measures by formulating the processes dimension explicit.	++
	SC5	The model can be adapted to the specific needs of the company.	+
	SC6	The model is feasible given the research resources.	+
Performance Prism	SC1	The model has the possibility to use performance indicators from the strategic to operational level.	+
	SC2	The model deals with all stakeholders.	++
	SC3	The model provides the use of cause and effect relationships.	++

	SC4	The model provides possibilities for including effectiveness and efficiency measures and it stimulates the use of efficiency measures by formulating the processes dimension explicit.	++
	SC5	The model can be adapted to the specific needs of the company.	+
	SC6	The model is not feasible given the research resources, because it requires the elaboration of the different stakeholders, the strategies to consider the needs of these stakeholders, the processes to execute these strategies, and the capabilities to operate these processes.	-
Performance Pyramid	SC1	The model provides explicitly four levels, ranging from strategic to operational levels.	++
	SC2	The model deals with fixed stakeholders and cannot be extended with other stakeholders.	-
	SC3	The model does not specify this functionality, but it can be included in the model.	+
	SC4	The model provides possibilities for including effectiveness and efficiency measures.	+
	SC5	The model uses fixed criteria and is therefore not flexible.	-
	SC6	The model is feasible given the research resources.	+

Table 11 Evaluation of alternatives for a good performance model

4.3.4 Selection

The results of all alternatives are summarized in Table 12.

	SC1	*SC2*	*SC3*	*SC4*	*SC5*	*SC6*
EFQM	+	+	-	+	+	+
BSC	+	+	++	++	+	+
P.PRISM	+	++	++	++	+	-
P.PYRAMID	++	-	+	+	-	+

Table 12 Comparison of the alternatives for a good performance model

We do not use weights for these criteria, because they all seem equally important, as also confirmed by the Thales supervisor of this research. As criterion 6 is a hard constraint that must be met, the performance pyramid was eliminated as an alternative. The goal is a model that scores well on all criteria and the BSC model is the only model that fulfills this. The fact that all models score high on many criteria might be the consequence of first focusing on the most promising models (Section 4.2).

4.3.5 Improvement

4.3.5.1 Introduction

We improve the Classical Balanced Scorecard (C-BSC) by making it more explicit and more suitable for SR Purchasing NL in this section. We will call the new BSC as the Purchasing Balanced Scorecard (P-BSC). First, we review the dimensions of the C-BSC (Section 5.3.5.2). Second, we add an extra functionality from another model to further improve the model (Section 4.3.5.3). Next, we describe the relations between the

KPAs in Section 4.3.5.4. Finally, we present the new performance model and compare it with the current model of SR Purchasing NL in Section 4.3.5.5.

4.3.5.2 Review of the C-BSC dimensions

We will critically review the dimensions of the C-BSC from up to down now:

- Mission

  We mentioned earlier that the terms mission, vision, and strategy could be unclear or overlap in practice. Therefore, we will first clarify which interpretation we use. A vision can be defined as, in our view, the desired APP of a company. It describes the purpose of a company in a simple and very optimistic way, as a 'just achievable' wish or dream to inspire and encourage people. A mission is more detailed than a vision and describes what a company, as a whole, really wants to achieve. There are many strategies to serve a company's mission, such as Corporate Strategy, Business Strategies, Functional strategies, and so on. The BSC translates what a company really wants to achieve by using complementary strategies.

  As earlier mentioned SR Purchasing NL belongs to the BU-SR and is part of the primary process at Thales Hengelo, which is divided over certain BUs. There are two formalized missions, which give directly sense to SR Purchasing NL:

  - The mission of the BU-SR:

    '*Purchasing wants to achieve, through a pro-active and customer-oriented attitude, based on professional knowledge and skills, the highest possible contribution to the optimization of the results of SR in general, through an optimal purchasing of developments, products, goods and services.*'

    In other words, purchasing has to meet all the needs and expectations of the BU-SR.

  - The mission of Thales Netherlands (Thales Netherlands Portal, 2008b):

    '*Thales Netherlands wants to be a major contributor to the success and development of its customers and employees, and to the leading position of Thales in the areas of combat systems, radar- and sensor systems as well as industrial and logistic services. We do so by creating profitable and sustainable business, which is realized in a respectful way, based on the ability to develop and exploit customer-focused solutions and to attract and develop excellent people.*'

    Based on the function of SR Purchasing NL (delivering parts to the primary process), the essence of this mission for SR Purchasing NL can be explained as follows: all units involved in the primary process at Thales Hengelo together have to create maximum value in their business reality and satisfy the end-customer.

  We did not mention the mission of the Thales Purchasing Organization. As described in Section 2.4, this organization guides all purchasing departments within Thales in order to enable them serving their company missions. Therefore, we can say that SR Purchasing NL must serve the following mission:

  '*Balanced optimization considering the needs and expectations of the BU-SR and the primary process at Thales Hengelo in order to satisfy the end-customer.*'

- Financial dimension

  The financial dimension of the C-BSC is meant to satisfy the shareholders of a company. The link between purchasing and its shareholders is not as explicit as the link of a whole organization with its shareholders. In practice, SR Purchasing NL faces only financial expectations from the BU-SR. Therefore, the financial dimension can be seen as one of the needs and expectations of the BU-SR. We will incorporate the financial dimension in the needs and expectations of the BU-SR, which can be seen as a stakeholder in the P-BSC.

- Customer dimension

  Based on the description of the primary process in Section 2.6 and the new mission for the P-BSC, SR Purchasing NL has to aim at the following stakeholders: the BU-SR and the primary process at Thales Hengelo.

  While these stakeholders are not end-customers as in the C-BSC we will rename the Customer dimension of the C-BSC into the 'Stakeholders' dimension. Note that, the primary process is divided over several BUs and that overlap is possible. Another remark is that the BU-SR has financial expectations from SR Purchasing NL. Other non-financial needs and expectations are represented in the concerning departmental functions in the primary process.

- Internal processes dimension

  In this perspective we will explore the factors that can improve the purchasing processes, by searching for constructs (main elements) of purchasing performance. It is very important to use constructs here, because it makes this dimension more explicit, without omitting possible purchasing performance factors. The following constructs are found in the literature:

  - three constructs from Rodriques et al. (2006): The dimensions of purchasing competence
  - fourteen constructs from Purchasing Excellence Publiek: MSU+ Model
  - eleven constructs from Van Weele (2007): Inkoop in Strategisch Perspectief
  - seven constructs from Telgen et al. (2001): Possible kinds of value added by the purchasing department

  In our selection process of the best useable constructs, we were interested in a limited number of constructs that would result in the distinct KPAs that together represent the overall purchasing performance.

  We found the perspective of Rodriques et al. the most applicable, because it consists of three easy to understand and broad defined KPAs. It is also the most recent research and it is discussed in a critical literature review and validated through a sample of 164 companies. For ease of perception, we will denote this dimension with only 'Processes' dimension. Table 13 summarizes the KPAs and their descriptions.

KPA	**Description**
Purchasing Importance	The perceived status and recognition of purchasing versus other functional areas, and by perceived top management support.
Purchasing Task Execution	The level of activity execution to do the best purchase in the following dimensions: search for information, use of analysis techniques, proactive focus, and procedural control.
Purchasing Interaction	The degree of purchasing's access to information from other functions, participation in decisions made in other functions, and supplier involvement.

Table 13 Used constructs of purchasing performance

- Learning and growth dimension

  Wagner & Kaufmann (2004) discuss the main ideas behind managerial publications about P-BSCs. They show that the main innovative idea, in line with the C-BSC, is the addition of 'suppliers' to the BSC. We did not find other innovative ideas related to purchasing from this discussion or other recent literature.

According to the findings of Wagner & Kaufmann, 'suppliers' can be added to the BSC in two different ways. First, suppliers can be added as the fifth dimension, indicating the contribution of suppliers to the learning and growth dimension. In other words, it shows that suppliers deliver knowledge to people. Second, the skills and capabilities of suppliers can be added in the learning and growth dimension in order to improve a company's processes. In other words, it shows that suppliers become a partner of the processes together with people. Although this holds for a selected and limited group of (strategic) suppliers, the second option is more appropriate for purchasing that has a strategic role, which applies to SR Purchasing NL (see Section 1.1). Therefore we will use the second alternative in our P-BSC and add suppliers to the 'Learning and Growth' dimension.

The main question for Learning and Growth: 'To achieve our vision, how will we sustain our ability to change and improve?' indicates that we have to configure people and suppliers in such a way that they will have a creative and innovative effect on the processes of a company. Therefore we make this dimension more explicit by adding 'High Performing Workforce' and 'High Performing Suppliers'. High Performing Workforce is a set of employees that, among others, have the required skills for their jobs, are motivated, and aligned with company objectives. High Performing Suppliers are suppliers that, among other things, deliver the right parts, at the right time, and at the lowest cost with the required technology.

Note that this is more about learning than about growth. Therefore we will split learning and growth into different dimensions. In order to grow, a company must **invest**. Therefore, we will call this dimension 'Investments' for ease of understanding. A company must invest in:

- Human Capital

  A company needs people. More preferably, a company has to attract people with high quality. High quality people are people that have personal traits that cannot be transmitted to others or learned, such as creativity, wisdom, courage, empathy and so on.

- Organization structure

  A structure is needed that defines different parts of an organization that have to collaborate and contribute to serve an organization's function.

- IT/IS Infrastructure

  An infrastructure is needed to optimally configure the different parts of the organization

4.3.5.3 Addition of an extra function

In order to improve the model, we will add a learning function of the EFQM model (of Section 4.3.1) to the P-BSC by analyzing the so-called enablers and results. This will deliver new insights in what degree the KPIs are meeting their intended purpose. We will do this only for the stakeholders in the model, because stakeholders are able to easily give feedback with the help of interviews, questionnaires, and so on. It is also a good idea to compare other activities in the model with their results, such as benchmarking the supplier performance (result) and comparing the results of the concerning KPIs (enabler). However, it will make the model more complex and more difficult to understand.

4.3.5.4 Relations in the P-BSC

In this section, we explain the (most important) relations in the P-BSC between the identified KPAs:

- Stakeholders

  We do not show the relations between the stakeholders, because it is sufficient for purchasing to consider their needs in respect with purchasing. The relation between different stakeholders will not increase the purchasing performance of SR Purchasing NL.

- Processes

  The purchasing importance affects the purchasing task execution. If purchasing is perceived as unimportant it will be limited to non-strategic tasks. Therefore, it has the most impact on the purchasing task execution. According to Pearson et al. (1996), the increasing use of cross-functional teams in purchasing will help enhance the perception of others about purchasing. As this typically is a long process and does not have a strong direct impact, we do not show this link between purchasing interaction and task execution. Furthermore, the purchasing importance will have influence on the task execution and the interaction. The purchasing interaction will optimize the efforts of purchasing more globally, because it is aligned with other business functions. Therefore, the purchasing task execution is supportive to purchasing interaction. The findings for the process dimension are summarized in Figure 16.

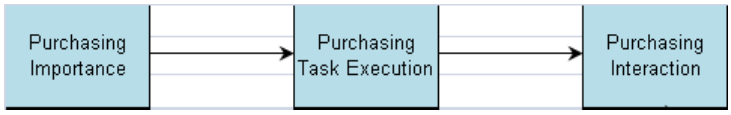


Figure 16 Relations between the KPAs in the Processes dimension

- Learning
  A High Performing Workforce contributes to the purchasing task execution and the interaction of purchasing, because there are purchasers involved. However, suppliers are only involved in the interaction of purchasing.
- Investments

  Human Capital is needed to eventually achieve a high performing workforce. Investing in organization structure and IT/IS Infrastructure will lead to knowledge exchange in the form of teams or with the help of IT/IS Applications. These two KPAs therefore contribute the most to the purchasing interaction.

4.3.5.5 New performance model and the relation with the current model

On the next two pages, Figure 17 shows the complete P-BSC and Figure 18 shows the relation of the P-BSC with the QLC Model (see Section 2.8). The key improvements are:

- The P-BSC is in line with the mission of SR Purchasing NL. The users of the PMS will therefore more easily understand the rationale of the model and more easily accept the model and the KPIs, because the model considers the needs of many stakeholders.
- The P-BSC also focuses on the support processes that are needed to control the different purposes of purchasing. This is achieved by the different dimensions of the model. Another implication is the possibility for faster steering. After all, these levels enable the P-BSC to adjust when something goes wrong in one of the levels. The QLC Model can adjust when the customers are already dissatisfied.
- The P-BSC makes the purchasing performance more explicit by defining KPAs. This makes the management of the different parts easier.
- The P-BSC is focusing on the material flow with all important factors.
- The P-BSC is focusing also on other purposes than the material flow.

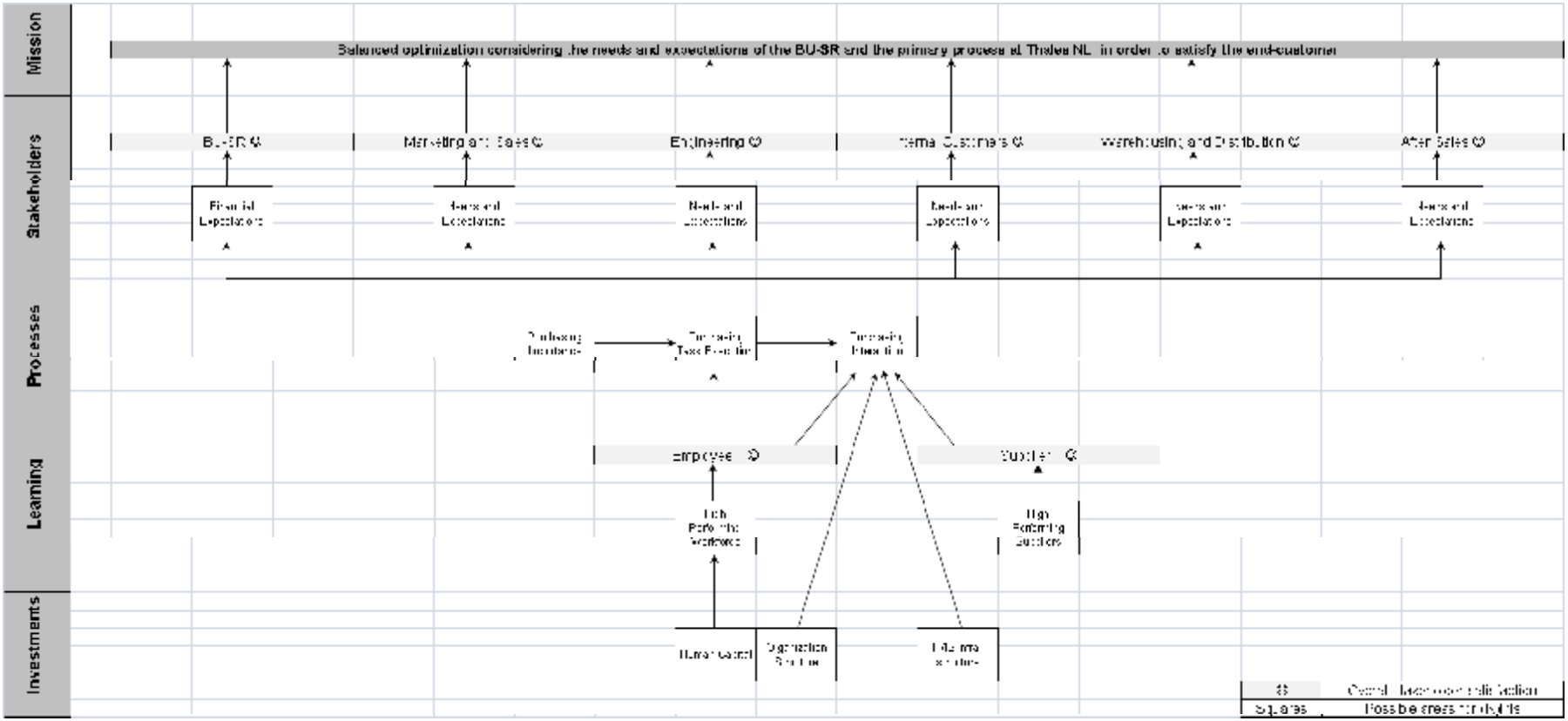


Figure 17 P-BSC

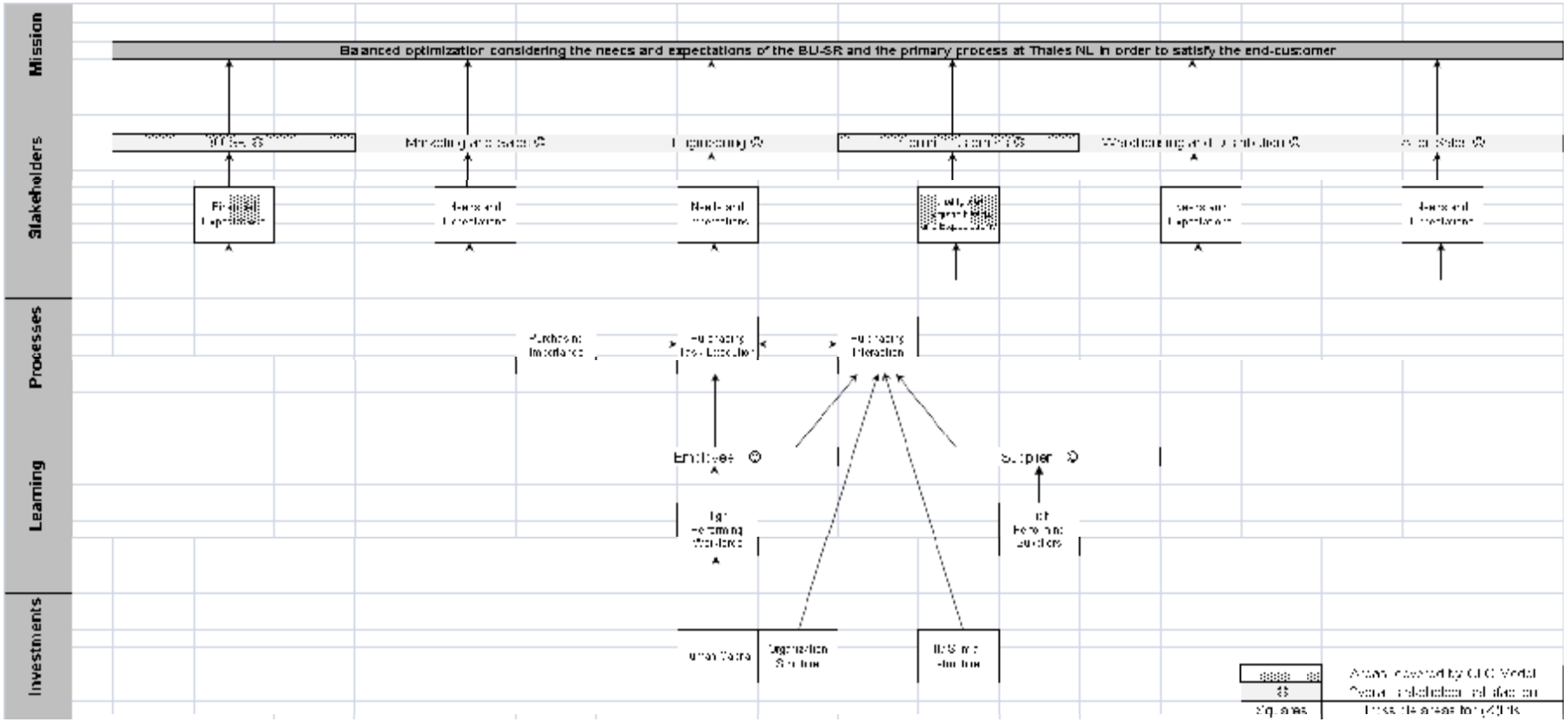


Figure 18 Relation between the P-BSC and the QLC Model

4.4 Conclusion

In this chapter we developed a performance model for SR Purchasing NL. We evaluated different models and selected the Classical Balanced Scorecard as the best alternative. We added suppliers to the learning dimension of the scorecard and added a learning function from the EFQM model to improve the model and make it more suitable for purchasing. Finally, we made the model more explicit by defining KPAs and their interrelations. This resulted in a new model, the so-called Purchasing Balanced Scorecard (see Figure 17 on Page - 34 -) with the following key improvements compared to the current QLC model of SR Purchasing NL:

- In line with the mission of SR Purchasing NL
- Easier to understand than the current model
- Easier to accept than the current model
- Considers different stakeholders
- Enables the possibility for faster steering
- Includes a variety of KPAs
- Focuses on all the aspects with respect to the material flow
- Focuses also on other purposes of purchasing apart from controlling the material flow

Chapter 5: The new KPIs

5.1 Introduction

In this chapter, we will develop new KPIs for SR Purchasing NL in three steps:

- First, we identify and project the intended and emergent goals in the P-BSC (see Chapter 4). Next, we evaluate these projections and propose a desired focus, on which we elaborate in Section 5.2.
- Second, we develop basic strategies for each KPA in the P-BSC in Section 5.3. We will achieve this by evaluating the intended and emergent goals for each KPA and capture its essence.
- Third, we derive new KPIs from these strategies in Section 5.4. We will achieve this by conducting brain storm sessions with several Thales employees with the help of a long-list of KPIs in order to generate the most promising KPIs. Next, we select the best alternative and work it out in order to make it measureable.

5.2 Desired focus

5.2.1 Identification of intended goals

In this section, we will identify the intended goals of SR Purchasing NL. As mentioned in Section 3.4, Mintzberg criticized that strategic planning is not just 'saying things, but also 'doing' things. We actually want to make a nuance: it is (again) a combination of first building confidence, then saying, and finally doing. An organization communicates intended goals with the help of for example intranet pages and presentations. On the intranet pages within the Thales Group more than 1000 intended goals exist that could be applied to SR Purchasing NL. For example, the Thales Purchasing NL formulates 'guidelines' for almost every purchasing-related activity. A sense making process (see Section 3.5) for defining the intended goals of a company is needed, because some goals can be, for example, wrong, inappropriate, remain unnoticed, or have opposite directions. Figure 19 shows the realization of the intended goals for SR Purchasing NL.

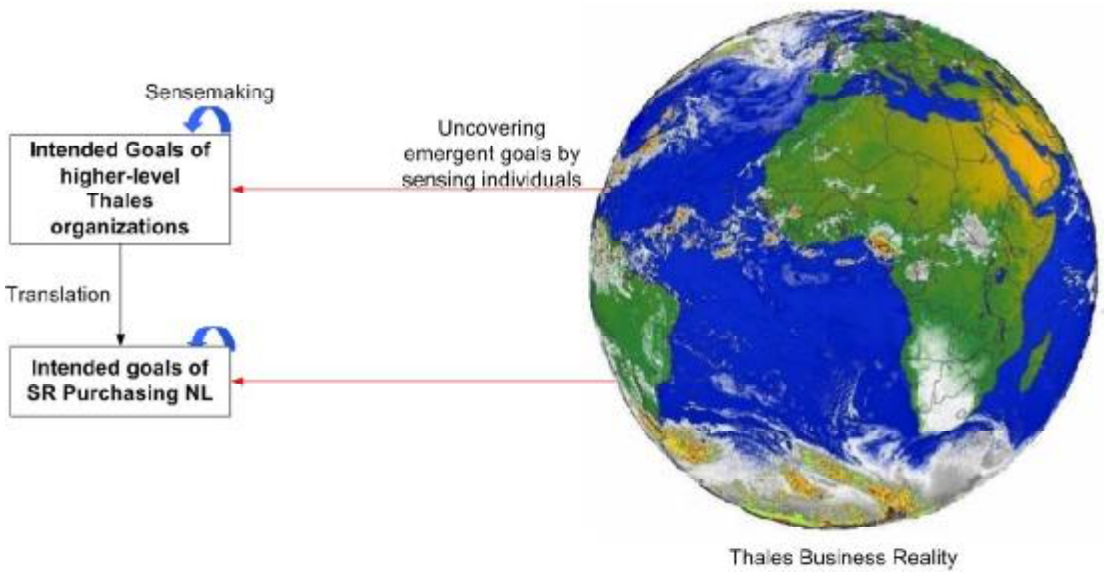


Figure 19 Intended goals of SR Purchasing NL

Figure 19 also shows that emergent goals are uncovered by individuals that are sensing the Thales Business Reality. As explained in Section 3.5, managers can discover these emergent goals and (re)formulate them as intended goals if they have confidence in them. Goals have to be translated to lower level departments if the goals also apply to them. The higher level Thales organizations for SR Purchasing NL are the Thales Netherlands, BU-SR, and Thales Purchasing Organization. Appendix IV shows the goals of Thales NL (Thales Netherlands Portal, 2008c), the BU-SR (Van de Bosch, 2008), and the Thales Purchasing Organization (Thales Supplier Portal, 2008b). The former director of SR Purchasing NL presented the mission, strategic objectives for purchasing, and the KPIs for the year 2008 in his yearly presentation. This can be seen as the output of his sensemaking process with the aim to create awareness of the most important goals for people to focus on. Therefore, we will use all the identified performance-related factors in these goals as 'the' intended goals of SR Purchasing NL and assign them to KPAs of the P-BSC (see Appendix V).

5.2.2 Identification of emergent goals

In this section, we try to become aware of the emergent goals for SR Purchasing NL and project these goals in the P-BSC. This gives us the opportunity to understand what people think is important for SR Purchasing NL.

Emergent goals can be derived in several ways. In this research, we will hold interviews, use questionnaires, and attend operational and tactical group meetings to uncover emergent goals. The original interview questions and questionnaires are included in Appendix VI. In the next subsections we will describe these information-gathering processes. To facilitate a more non-influenced setting, a number of steps have been taken in holding the interviews and using the questionnaires:

- the interviews and questionnaires are carried out anonymous
- the respondents are questioned individually
- the respondents are questioned without fore-knowledge about the content of the interview

To select the right respondents for interviews and questionnaires, we have taken into account the following issues. We select the different respondents from mainly the strategic and tactical control levels, assuming their awareness of issues on the operational level and their ability to better estimate emergent goals. We also select respondents from each business function involved in the primary process, as identified in Section 2.6. This is needed to become aware of the different needs and expectations of all stakeholders. Finally, we prefer people with higher working experience.

The interviews' purpose is to become aware of emergent goals through 'free association', in other words, by uncovering emergent goals in the minds of respondents without influencing them. This was done using the following open question: *'In your opinion, what are the five most important factors on which SR Purchasing NL has to perform well en how does it perform currently on these factors?'*

The same respondents are used for the interviews and questionnaires. The questionnaires' purpose is to notice other important factors that did not come directly to mind when the respondents were interviewed, but that they did have an opinion on. For the questionnaires we used closed questions based on performance-related factors derived from different sources. Three types of sources are selected:

- Theoretical perspectives, where 'drivers' of purchasing performance are identified
- Intended goals within Thales, which are relevant for SR Purchasing NL
- KPIs from comparable purchasing organizations

We intentionally used factors that are interrelated or overlap each other, because a slightly different factor can sometimes have a whole different meaning to someone. However, factors that were practically the same as other factors are eliminated. The used sources, the corresponding number of derived performance-related factors are displayed in Table 14. In total, we derived 102 possible factors. Based on these factors, we formulated questions. The questions contained one or more factors. For example, the reduction of material costs with the help of improving design, process, and packaging are 3 factors in one question.

Type of perspective	Nr. of factors	Source
Theoretical perspectives	7	Thales Intranet: De Thales Inkoopstappen
	9	Rodriques et al.: The dimensions of purchasing competence
	14	Purchasing Excellence Publiek: MSU+ Model
	11	Arjan van Weele: 'Inkoop in Strategisch Perspectief'
	7	Telgen et al.: Possible kinds of value added by the purchasing department
Intended goals for SR Purchasing NL	7	Thales Intranet: Strategic Goals of SR Purchasing NL
	9	Thales Intranet: Visie Thales Corporate Purchasing
	4	Thales Intranet: Visie Thales Air Systems Purchasing
KPIs from comparable purchasing organizations	4	Center for Strategic Supply Research (Carter et al., 2005): Semiconductor Manufacturer
	4	Center for Strategic Supply Research: Telecommunication Service Provider
	13	Center for Strategic Supply Research: Computer Hardware Manufacturer and Service Provider
	13	Center for Strategic Supply Research: Automative Parts Manufacturer

Table 14 Potential goals derived from the literature

We have to value every performance-related factor. After all, not every performance-related factor is a goal. In order to focus on the most important factors, we will use the categorization of Grant (2001), because it uses two dimensions, 'relative strength' and 'strategic importance', to assess a company's key strengths and key weaknesses. This is in line with our interpretation of the APP of a company, as stated in Section 3.4. We will change the name 'relative strength' into 'actual performance' to proceed in our own terms.

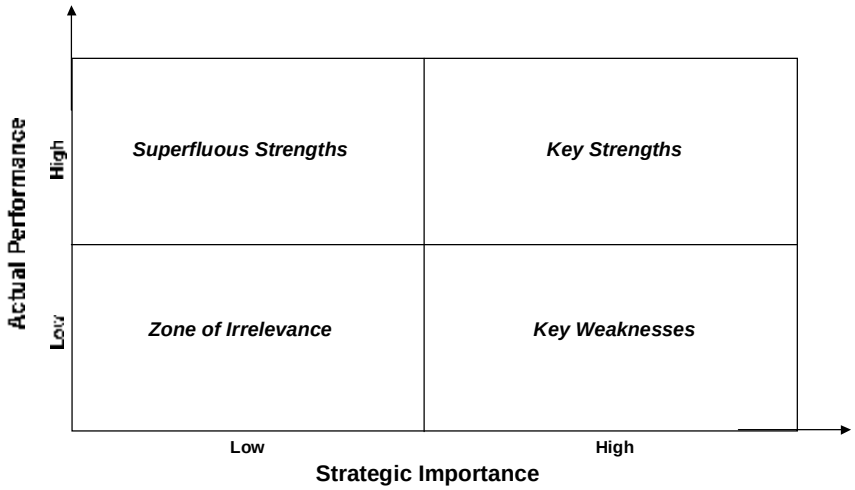


Figure 20 Categorization for valuing performance-related factors.

We will mark all key factors (key strengths and – weaknesses in Figure 20) as emergent goals. The factors with low strategic importance are not seen as important goals, since their impact is small. Companies can

change their strategy in order to transform superfluous strengths into key strengths. These issues are, however, beyond the scope of this research. In our opinion, the dimension 'actual performance' is not needed to determine KPIs. The KPIs should reflect the most important factors, irrespective of its performance. After all, a good performing KPI can perform less in the future. The 'actual performance' dimension is useable to focus on some key weaknesses temporarily. We incorporated this dimension to enable the use of these data for potential PIs in a follow-up research.

By attending the group meetings of operational and tactical purchasers during this research period, we identified also emergent goals. Following, we valued (on strategic importance and actual performance) these factors according to our observations. Finally, we assigned the identified emergent goals of SR Purchasing NL to KPAs of the P-BSC (see Appendix VII).

5.2.3 Projection of the intended and emergent goals

Next, we are able to visualize the goals in the P-BSC. On the next pages, Figure 21 and Figure 22 show the projection of the intended goals of Section 5.2.1 and the emergent goals of Section 5.2.2, respectively.

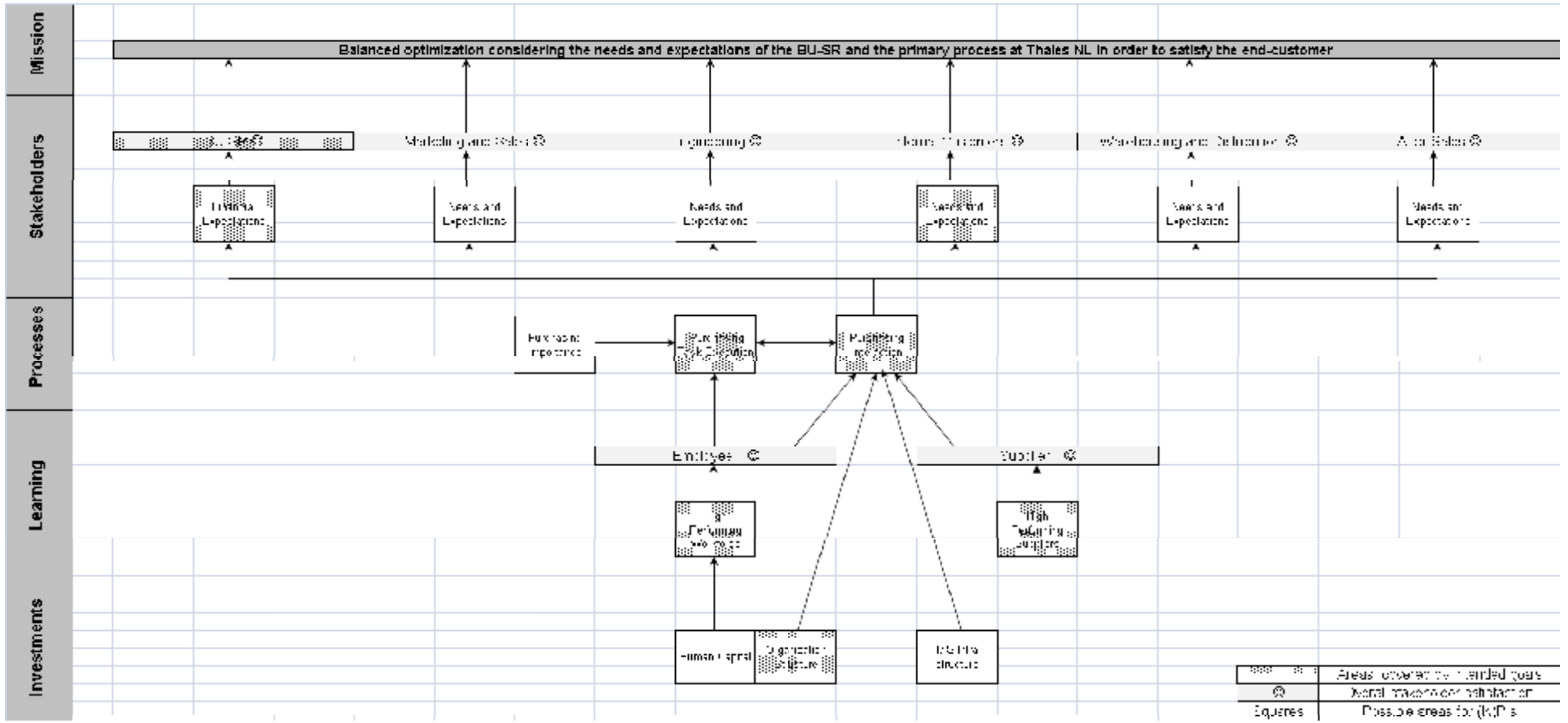


Figure 21 Projection of the intended goals in the P-BSC

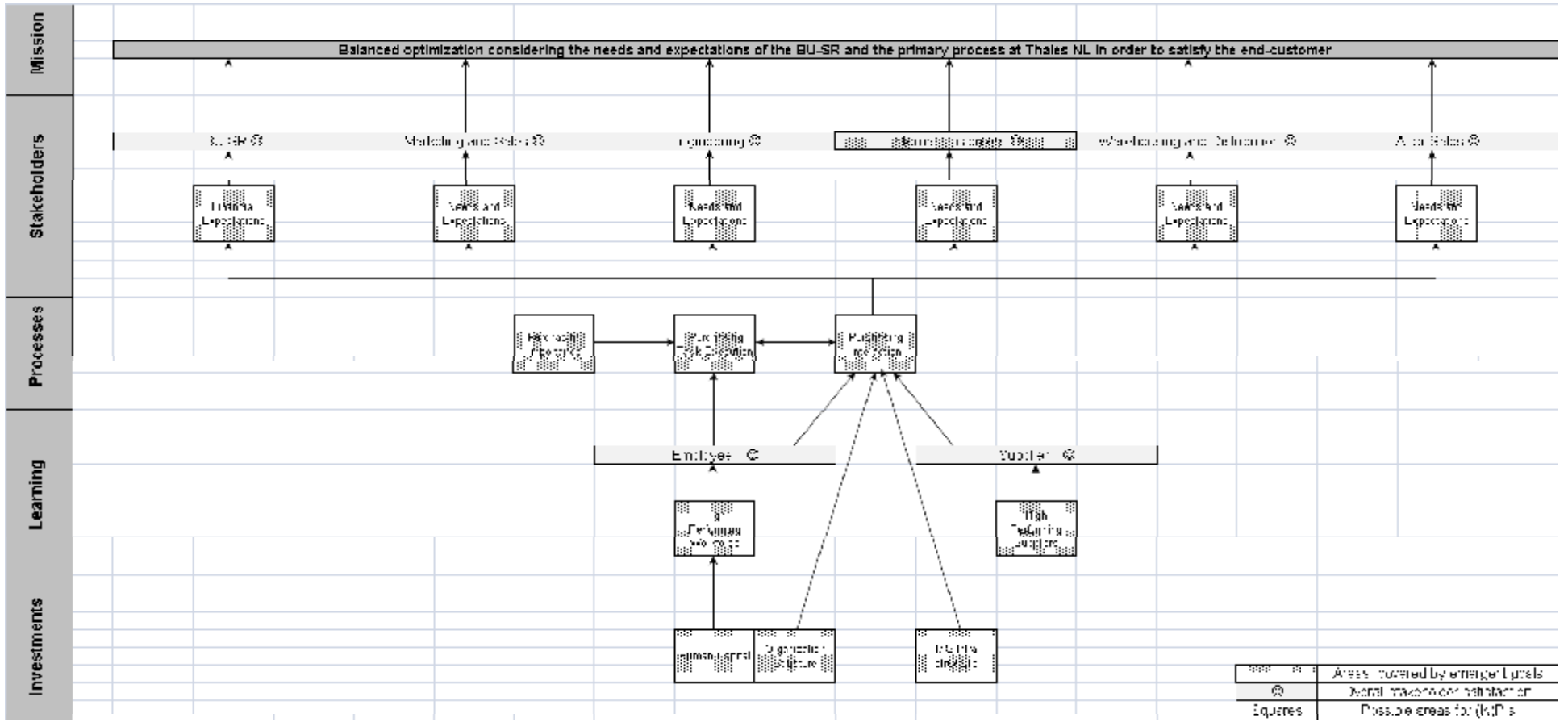


Figure 22 Projection of the emergent goals in the P-BSC

5.2.4 Desired focus

Based on the projections of Section 5.2.3, we will propose a desired focus on the P-BSC. First, we discuss these projections in more detail. The first projection, the intended focus, shows that SR Purchasing NL should consider: the financial expectations of the BU-SR, the overall satisfaction of the BU-SR, the expectations of the Internal Customers, and some of the KPAs. The second projection, the emergent focus, shows that SR Purchasing NL should consider: the expectations of every stakeholder, the overall satisfaction of the Internal Customers, and all the KPAs. After this discussion of these two projections, we propose the whole model, as it is now without modifications, as the desired focus for the following reasons:

- The P-BSC covers all the intended and emergent factors → we can assume that the P-BSC is a complete model. Therefore, we do not need to add other KPAs.
- All KPAs were covered by the intended or emergent goals. Therefore, we do not have to exclude KPAs.
- The satisfaction of the stakeholders is only found important for the stakeholders BU-SR and the Internal Customers. However, we think that it is very important to consider, at least once a year, the needs of all stakeholders in the model. Therefore, we will propose the assessment of all stakeholders' satisfaction.
- The limitation to the use of a small number of KPIs makes it attractive to focus on the highest dimension. However, to control this model optimally we have to evaluate every KPA. It is not sufficient to control the highest level, because if something is wrong at the bottom, in half a year, something will also be wrong at the top.

5.3 Development of basic strategies

5.3.1 Strategy for Business Unit Surface Radar

Table 15 shows the identified goals for BU-SR and Table 16 evaluates these goals.

Nr.	Type of Goal	Goal
1	Strategic Objective & Purchasing Objective 2008 & Emergent Goal	Minimize total costs and risks with emphasis on cash management
2	Emergent Goal	The application of cost management through the whole value chain.
3	Emergent Goal	The reduction of material costs with the help of improving design, process, packaging, etc.
4	Current KPIs from financial dimension	Program cost reduction against budgeted price & Program budgeted price
5	Current KPI from financial dimension	Integral cost reduction of purchasing department
6	Current KPI from financial dimension and Emergent Goal	Program cost reduction in negotiations

Table 15 Identified goals for the BU-SR.

Nr.	Evaluation

1	The main idea of this goal is minimizing total costs and risks. Cash management is one way to reduce costs and is therefore not the essence of this factor. Minimizing cost can also lead to more risk. For example, a company can face more obsolescence risk if its decreases its inventories. The aim is to find the best combination of costs and risks by improving processes, selecting the right suppliers, and so on in order to minimize the costs for the short and long term. The KPAs of the P-BSC will cover these non-financial goals and it is therefore sufficient to focus on minimizing cost for this KPA. The function of the BU-SR is the realization of a Radar System (as described in Section 2.7) and these costs do therefore not include future costs, such as maintenance costs.
2 **3**	These goals are examples of minimizing costs.
4	This goal consists of two interrelated KPIs: Program cost reduction against budgeted price This KPI shows the cost reduction of a program against its budgeted price. The target value of this KPI is set in such a way that only small savings are seen as 'good performance'. The idea is that a high saving indicates the overestimation of the budget by a PPM and thus the sale of an expensive Radar System to a customer. After all, the sales price is based on among others the estimation of this budget. This is not a desired effect, because it influences the competitiveness of the Radar Systems. Program budgeted price This KPI is about the improvement (decrease) of the budget for similar Radar Systems over time. Otherwise, it is possible to use the same budget for each (comparable) Radar System over time and the same saving is realized without additional effort. Based on the evaluation of these interrelated KPIs, we make the following observations: ➔ The use of the first KPI for two opposite purposes can work contra-productive. On the one hand, the PPMs have to estimate the right budget (anticipate future cost reductions) in order to minimize the deviation of the budget in comparison to the actual cost. On the other hand, a difference is also seen as a cost saving, which is a positive effect. According to Joris Buijnsters, a Tactical Purchaser, it is even possible that a PPM recalculates its budget in the case of an occurring cost saving. This will make the saving of a purchaser 'disappear' and result in a more accurate budget for a PPM. Based on these observations, we suggest splitting the two 'purposes' behind this KPI as follows: ▪ Minimizing the budget deviation with actual costs. We will add this goal as an additional goal for Marketing and Sales Satisfaction and name it as 'New Goal from Analyses' in Section 5.3.2. ▪ Maximizing difference between budget and actual cost. This goal is an example of minimizing costs. It is not complete, because budgets can be estimated when the major part of the specifications are known and therefore cannot show cost savings that are realized in the early phases of a Radar System. This is a pity, because the impact of purchasing on cost reduction is very high in the early phases of a Radar System, according to Telgen et al. (2008). ➔ The second KPI is only applicable to comparable Radar Systems This KPI is relevant for Radar Systems that are comparable, while SR Purchasing delivers mainly customized Radar Systems. It makes no sense to compare the budgets for Radar Systems that have different functions and thus different costs. According to Reinhard Leussink, a PPM, this KPI originates from the time that purchasing was centralized at Thales NL. We can therefore assume that this KPI is not relevant for SR Purchasing NL anymore.

5	This goal shows the costs of the department to ensure the operation of SR Purchasing NL. It consists of the costs for personnel, education, buildings, travel costs, and so on. This can be seen as the investment of the BU-SR in SR Purchasing NL in order to achieve superior performance. Given that SR Purchasing NL is a cost center (SR Purchasing NL, 2008), the financial performance is the rate of savings (total cost savings / total departmental cost).
6	This goal is an example of minimizing costs.

Table 16 Evaluation of the identified goals for BU-SR.

Based on these evaluations, we formulated the following basic strategy: *'Reducing total costs in the realization of Radar Systems against low departmental costs'*.

5.3.2 Strategy for Marketing and Sales

Table 17 shows the identified goals for Marketing and Sales and Table 18 evaluates these goals.

Nr.	Type of Goal	Goal
1	Emergent goal	The independent fulfillment of offset requirements by large suppliers.
2	Emergent goal	To take into account offset requirements when selecting suppliers.
3	Emergent goal	The availability of Radar Systems with limited export-restrictions.
4	New Goal from Analyses (see Section 5.3.1)	Minimizing the budget deviation with actual costs.

Table 17 Identified goals for Marketing and Sales.

Nr.	Evaluation
1	This goal is an example of selecting the right suppliers that can (indirectly or directly) contribute to offset requirements of a certain country.
2	
3	This goal is about selecting suppliers from the right countries, where there are limited export restrictions. This is important for Marketing and Sales, because it makes it easier to sell Radar Systems (without costly redesigns) worldwide. The use of suppliers in a specific country can also boost future sales, because it is easier to fulfill future offset requirements. The main idea is that purchasing should do business in countries that are preferred by Marketing and Sales in order to satisfy them. We can estimate this with the turnover for each country, because a turnover is not always automatically offset. Each purchase must be namely actively attributed to a certain country and must meet several criteria (e.g. date of purchase) in order to be used as offset. Another disadvantage of this simplification is that purchaser can intentionally buy against higher prices in order to increase sales. Nevertheless, we will use this simplification. The reason is that we will use other KPIs to give an overall view of the actual performance position of SR Purchasing NL.
4	This goal from analyses (see Section 5.3.2) is about minimizing the budget deviation with respect to actual costs.

Table 18 Evaluation of the identified goals for Marketing and Sales.

Based on these evaluations, we formulated the following basic strategy: *'Increasing the purchasing turnover in countries that are preferred by Marketing and Sales & Minimizing the budget deviation with actual costs'*.

5.3.3 Strategy for Engineering

Table 19 shows the identified goals for Engineering Satisfaction.

Nr.	Type of Goal	Goal
1	Emergent	The timely and without problems development of new Radar Systems.

Table 19 Identified goals for Engineering

While there is only one goal, we are able to formulate directly the basic strategy as follows: *'Increasing the contribution of SR Purchasing NL to stimulate on-time and flawless development of new Radar Systems'*.

5.3.4 Strategy for Internal Customers

Table 20 shows the identified goals for Engineering Satisfaction.

Nr.	Type of Goal	Goal
1	Strategic Objective & Purchasing Objective 2008 and Emergent Goal	Adequate and timely delivery
2	Emergent Goal	The delivery of parts in accordance with specifications to the internal customer
3	Emergent Goal	The delivery of parts in accordance with rules (social, environment, export, etc.) to the internal customer.
4	Emergent Goal	The flexibility of purchasing in agreeing delivery periods with the internal customer.
5	Emergent Goal	The delivery of make parts with correct packaging.
6	Current KPI – Logistic Dimension	Ability to meet operations schedule.
7	Current KPI – Logistic Dimension & Emergent goal	The quality of bought parts.

Table 20 Identified goals for Internal Customers

All these goals are about delivering the right parts, at the right time to internal customers. As mentioned earlier in Section 2.8, this is also the main idea behind the current QLC model without the cost dimension (The cost dimension is already worked out as the financial expectation of the BU-SR in Section 5.5.2).

This material flow is managed by the ERP system at Thales Netherlands. By backwards planning from the Radar System delivery date, it generates a purchase order with a due date to ensure the availability of the right parts at the right time. It deals with several factors, such as the structure of a Radar System, the production cycle times, internal and external transport times, time needed to place an order, and a safety time to buffer uncertainties.

We make two observations in relation with this KPA:

1. It is essential to incorporate inventories, because otherwise each purchaser is for example able to:
    - purchase parts as early as possible

This will satisfy the purchaser and internal customer, because the part is delivered on-time. However, the average 'project inventory'[5] will increase.

- purchase parts in higher quantities to meet production schedule

  This will satisfy the purchaser and internal customer, because future requests can be met directly from inventory. However, the 'Surplus inventory'[6] will increase

- purchase parts in higher quantities to profit from economies of scales

  This will satisfy the purchaser and internal customer, because it pays less for a part. The Surplus inventory will increase again.

  While the goal 'To take into account Surplus inventory' is already identified in this research and assigned to Warehousing and Distribution, we will only add 'To take into account Project inventory' as New Goal from Analyses for Warehousing and Distribution in Section 5.3.6.

2. Meeting due dates from the ERP system is not the best solution, because among others:

   - The delivery times of suppliers in the ERP system are not always reliable

     Wilco Van Rijsbergen, a Tactical Purchaser, states that their Radar Systems are customer specific and consist of many specific complex parts. This means that purchasing buys many parts in low quantities from different suppliers. It seems therefore an impossible task to update all the purchasing parameters used by the ERP system, such as the delivery times of parts. The purchasers prefer therefore the use of estimations. These estimations are often over-estimated in order to meet the planning, which is based on these parameters.

     The inability of to reschedule the due dates for purchasing parts leads to suboptimalization. This has two main implications for purchasing:

     - Dynamics at 'downstream' departments (e.g. inbound transport and production) can cause the build-up of inventories in the case of delays or can cause the use of expensive rush orders in the case of accelerations
     - Dynamics at 'upstream' departments (e.g. marketing and engineering) can cause unrealistic due dates for purchasing
       For example, specifications for a new developed part can become clear in a late stadium, by which the use of rush orders become inevitable. It is also possible that the marketing department sells a Radar System that must be delivered faster than the earliest possible delivery time according to the ERP system.

     Setting high targets for purchasing, while its effect is minimal for the end-customer is inefficient and ineffective. As uncertainties will exist, rescheduling of production orders must be seen as an opportunity and must be stimulated. It is an opportunity for ensuring lower Radar System delay for the end-customer. The aim of purchasing must become to reduce the Radar System delay due purchasing. It will make purchasing more responsible for thinking proactively to the end-customer. This can be achieved by replanning production orders, focusing on the most critical purchase orders, and so on.

Based on these evaluations, we formulate the following basic strategy: *'Reducing the average Radar System delay caused by purchasing'*.

5.3.5 Strategy for Warehousing and Distribution

Table 21 shows the identified goals for Warehousing and Distribution Satisfaction and Table 22 evaluates these goals.

[5] Inventory that is bought for a specific project or program
[6] Inventory, for which no need exists according to the (forecasted) production planning

Nr.	Type of Goal	Goal
1	Emergent Goal	The determination of order- and stock policies.
2	Emergent Goal	The quantity stock
3	Emergent Goal	To take into account Surplus inventory.
4	New Goal from Analyses	To take into account Work in Process inventories.

Table 21 Identified goals for Warehousing and Distribution

Nr.	Evaluation
1	This goal is a means to achieve some results, such as a low inventory. It is easier to focus on the contribution of purchasing on these results rather than these policies. After all, these policies can have many procedures and it will make it more difficult to capture the essence of this KPA.
2	This goal is about the inventory of SR Purchasing NL. The relevant inventories of SR Purchasing NL are Project inventories and Surplus inventories, which are also identified as emergent goals.
3	The Surplus inventory exists, because purchasing does not order the actual needed (quantities of) parts. It is almost impossible to order exactly the needed parts, because there is always a probablity that an unused part of few euro's can over time become so important that it can avoid expensive redesigns in the after sales phase. In order to understand this issue better, we held interview with two persons: Bart Heideman, a Logistic Business Consultant from the Warehousing and Distribution department. He states that the Warehousing and Distribution department calculates a so-called 'Economic Order Quantity' (EOQ). It is a purchase advice for SR Purchasing NL in order to minimize total inventory holding cost and ordering cost. It deals with the expected demand, holdings cost, and order costs. He states that purchasing has to follow these advices as much as possible and that there are cases that purchasing had better payed more to get less. The reason is that they are scrapping some of the surplus inventories. John Cusveller, an Operational Purchaser, which orders frequently more than advised. He claims that they cannot follow all advices to deal with for example minimum order quantities of suppliers, anticipating uncertainties (e.g. delivery problems), price discounts, and so on. In order to satisfy its internal customers, he states that he is the one that will determine the quantities to be ordered. We do agree with Fred Brouwer, a Tactical Purchaser, that it seems that the right EOQ is a knowledge issue and that the EOQ formula is not the truth. Therefore, more cooperation between the departments is needed. Based on this, we propose a joint strategy to reduce the surplus inventory. The main idea is that if both departments work heavily together, this inventory should decrease over time. We will focus only on the extra arrived surplus inventory. Otherwise, it is very easy to minimize the surplus inventory by scrapping. Resale's deliver money, but are not the primarily work of SR Purchasing NL. It is better to avoid surplus rather than resale.
4	The Work in Process inventory shows in what for degree parts are delivered 'just in time' till it is used. Therefore, we suggest minimizing the average Project inventory Warehousing and Distribution.

Table 22 Evaluation of the identified goals for Warehousing and Distribution

Based on these evaluations, we formulate the following basic strategies: *'Reducing the increase of surplus inventory together with Warehousing and Distribution & 'Minimizing average Project inventory'*.

5.3.6 Strategy for After Sales

Table 23 shows the identified goals for After Sales Satisfaction and Table 24 evaluates these goals.

Nr.	Type of Goal	Goal
1	Emergent Goal	To take integral costs into account.
2	Emergent Goal	The availability of purchasing information to after sales.

Table 23 Identified goals for After Sales

Nr.	Evaluation
1	This goal is about the fact that by realizing a Radar System, future costs as for maintenance are also determined. We will denote the total costs of to realize a Radar System as Total Costs (TCs) and the TC and their future maintenance costs as Total Cost of Ownership (TCO). Remember that the BU-SR has financial expectations from SR Purchasing NL in the form of a low TC. The After Sales (which belongs to another BU) has expectations on a certain TCO, which depends on the end-customer. After all, a lower TCO is preferred when After Sales has a maintenance contract and thus is responsible for the occurring costs. This TCO depends on the demanded availability of the Radar System by the end-customer. A higher TCO will deliver more income for After Sales when there are no maintenance contracts, because the end-customer will pay the maintenance. The optimal TCO and TC ratio should therefore be found in order to deliver the best Radar System for After Sales.
2	The After Sales department uses often the same suppliers as SR Purchasing NL for purchasing parts. This emergent goal is about the availability of SR Purchasing NL information to After Sales. This goal is discussed during the group meetings and solved. Therefore, we see this goal as an incident. However, the essence behind this goal is broader, namely the quality of the organization of the use of SR Purchasing NL suppliers by After Sales.

Table 24 Evaluation of the identified goals for After Sales

In order to capture the essence behind these evaluations, we discussed this subject with Marcel Vink, a Purchasing Manager of the After Sales department. Together, we made the link clear between the use of different suppliers and the determination of an optimal TCO and TC ratio. Figure 23 displays this link. The red lines indicate promising places to focus on and the gray areas are needed to understand their context. Following, Table 25 evaluates these red arrows.

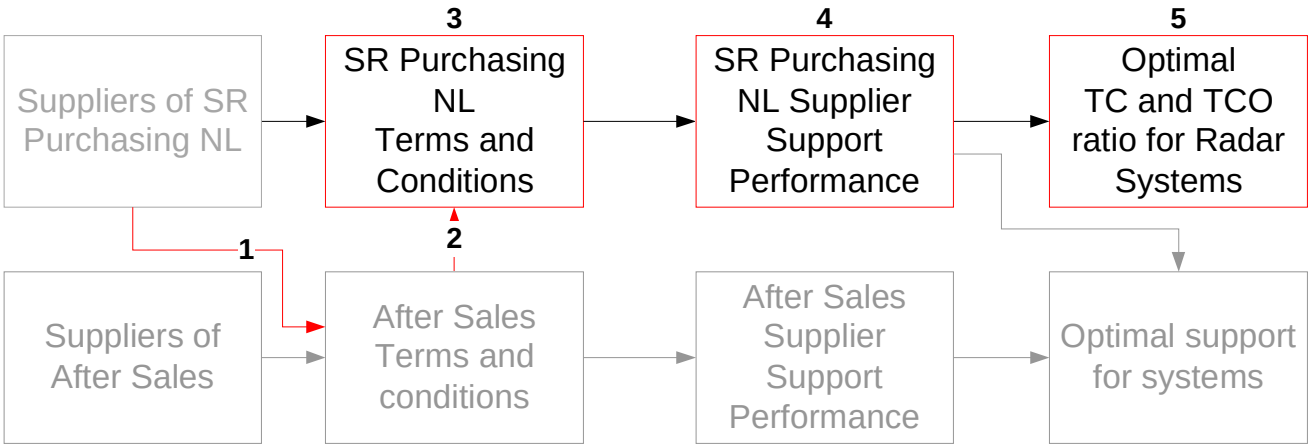


Figure 23 Link of SR Purchasing with After Sales

Nr.	Evaluation
1	The overlap of suppliers. The red line shows the use of SR Purchasing NL suppliers by After sales. The amount of overlap between business units can be useful to predict the importance of the cooperation between them. Cooperation is needed to reduce for example double work or increase economies of scales. In this case however, every supplier of SR Purchasing NL is a potential supplier of After Sales. After all, all parts can become defect and can be needed to maintain the Radar System. It is therefore not interesting to measure the overlap in this case, because the overlap is roughly 100%.
2	The input of After Sales Terms for SR Purchasing NL Terms and Conditions. This line shows the input of After Sales for SR Purchasing NL contracts. This input should be the After Sales related terms and conditions. This would enable to demand 'support performance' from suppliers. According to Marcel Vink, After Sales does not know what they demand from suppliers, because the (maintenance) policies are in development. This means that we cannot measure this input.
3	SR Purchasing NL Terms and Conditions Although that After Sales does not exactly know what it expects from purchasing, the purchasers think proactively to meet some after sales demands in which they believe. For example, Henk Kelder tries to proactively contribute to after sales by negotiation low failure rates and repair costs on its own thoughts. This contribution could be measured, but preferable in a more structured way. We suggest that After Sales delivers as soon as possible their basic needs, such as stating repair prices in contracts for most important parts. According to Ferit Serti, a logistic engineer, without contracts suppliers can ask very high prices if they know that there are no alternatives for Thales. Note that, the template of a SR Purchasing NL contract does not contain After Sales related subjects.
4	SR Purchasing NL Support Performance Based on the contract, suppliers deliver some (support) performance. If After sales provides a clear policy in the near future it would be possible to extend the current Vendor Rating System (VRS) of SR Purchasing NL to assess this performance. It is not the primarily responsibility of SR Purchasing NL to assess its suppliers on support criteria, but SR Purchasing NL is capable to take corrective actions on these suppliers or to select an alternative supplier.
5	The optimal TC and TCO ratio

	According to Cees Doets, a Logistic Engineer, it is impossible to measure this ratio. They calculate the TCO only on request and it takes around three weeks time. It seems therefore impossible to calculate the TCO for all Radar Systems. Although new IT/IS systems become better over time, it seems that the calculation of this ratio will remain impossible for a very long time.

Table 25 Evaluation of the red lines of Figure 23

To capture the essence behind these evaluations, it is better to focus on the highest feasible level, because the lower levels are then incorporated. Therefore, we suggest to formulate basic strategies for now and the near future. According to Vink, it is possible to provide a short list with the basic needs of After Sales for the most important parts in short time. However, a list with the exact needs of After Sales in line with their plans to develop vast maintenance contracts can be provided on a later stadium. Based on this, we formulate the following basic strategies:

Now: *'Taking into account the basic needs and expectations of after sales in negotiations with suppliers of the most interesting parts for After Sales'*

- Near Future: *'Increasing the suppliers' support performance by assessing their performance with the help of supplier-specific criteria derived from maintenance contracts of After Sales.'*

5.3.7 Strategy for Purchasing Importance

Table 26 shows the identified goals for Purchasing Importance.

Nr.	Type if Goal	Goal
1	Emergent Goal	The acceptance of the importance of purchasing by other business functions.
2	Emergent Goal	The acceptance of the importance of purchasing by top management.

Table 26 Identified goals for Purchasing Importance

These two goals complete each other and the basic strategy becomes therefore: *'Acceptance of the importance of SR Purchasing NL by top management and other business functions'*.

5.3.8 Strategy for Purchasing Task Execution

Table 27 shows the identified goals for Purchasing Task Execution.

Nr.	Type	Factor
1	Emergent Goal	The optimization of the supplier file
2	Emergent Goal	The use of fewer suppliers.
3	Emergent Goal	The use of a fixed policy and procedures in taking purchasing decisions.
4	Emergent Goal	The development of a strategy for each AT.
5	Emergent Goal	The active search for information in order to take a future decision (proactive attitude).
6	Emergent Goal	The functioning of the purchasing management.
7	Emergent Goal	To take proactively the long-term needs of purchasing into account.
8	Emergent Goal	The measurement of performance and the ongoing improving of performance.

9	Emergent Goal	The efficient execution of purchasing orders.
10	Emergent Goal	The development and management of supplier relations
11	Emergent Goal	The purchasing step: 'Supplier selection'.
12	Emergent Goal	The purchasing step: 'Contracting'.
13	Emergent Goal	The purchasing step: 'Ordering'.
14	Emergent Goal	The purchasing step: 'Monitoring'.
15	Emergent Goal	The purchasing step: 'Evaluation'.
16	Emergent Goal	The availability of 2nd source suppliers.
17	Emergent Goal	The obtainment of scale advantages with favorable ordering conditions by the use of potential order intakes.
18	Emergent Goal & Strategic Objective 2008 & PI	To take into account the dollar value when selecting suppliers.
19	Emergent Goal	The update of purchasing parameters in the ERP system, such as delivery periods, price lists, and so on.
20	Emergent Goal	The qualifications of make parts.
21	Strategic Objective	Optimal purchasing of developments, products, goods and services
22	Strategic Objective	Adequate supplier relation management
23	Strategic Objective & Emergent Goal	Adapt and improve purchasing activities, process and organization to a changing environment
24	Purchasing Objective 2008	Implement supplier partner ships
25	Purchasing Objective 2008	Supplier Improvement Programs
26	Purchasing Objective 2008	Improve usage of best suppliers in the Approved Vendor List
27	Current KPI from logistic dimension	Needed time for placing purchase order
28	Current KPI from Quality dimension	Percentage use of preferred suppliers & Spend with preferred suppliers
29	Current KPI from Quality dimension	Supplier reduction
30	Emergent Goal & Strategic Objective	The investigation into existing and new purchasing markets and the identification of opportunities and risks.

Table 27 Identified goals for Purchasing Importance

Given the large amount of goals, we will not evaluate all these goals one by one. To capture the essence, we will group these goals first. According to Bunn (1993), Purchasing Task Execution can be divided into the following groups:

I. Search for information
This is the scanning of the internal and external business environment to identify and monitor information sources relevant for taking buying decisions. A few examples are: internal memos, sales representative of selected vendors, trade publications, and so on.

II. Use of analysis techniques
The extent to make use of formal and/or quantitative tools to objectively evaluate aspects of a buying decision. A few examples are: Price Analysis, Cost analysis, Make or buy analysis, Inventory control, and so on.

III. Proactively focusing
The extent to which a buying decision considers the strategic objectives and long-range needs of

a company. A few examples are: Supplier relationship management, Long-range purchasing objectives, Contingency plans, Forecasting, and so on.

IV. Procedural control
The extent to which the evaluation of a buying decision is guided by established policies and procedures. A few examples are: Standard procedures, terms and conditions, and so on.

Table 28 shows the assignment of the goals in the groups:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
I					■																									■
II																														
III	■	■					■			■						■						■	■	■	■				■	
IV			■	■		■		■	■		■	■	■	■	■		■	■	■	■	■					■	■	■		

Table 28 Assignment of goals into Purchasing Task Execution groups

On the basis of these results, we can make the a few observations. All goals are covered. The groups are thus also applicable to SR Purchasing NL. There are no factors identified in this research that shows the importance of the use of analysis techniques (Group II). The main focus is Procedural control and Proactive focusing. The latter focuses on its turn on mainly supplier management

The essence can be therefore seen as Procedural Control and Supplier Management, but we see all these groups as a means to achieve certain goals, such as supplier management. The optimal use of these means is covered by a company's 'best practices' and the achievement of results by executing these practices. It is also necessary to maintain these best practices in order to incorporate new gained insights. Based on this, we formulate the following basic strategy: *'The use and further improvement of the best practices of SR Purchasing NL in order to gain results'*.

5.3.9 Strategy for Purchasing Interaction

Table 29 shows the identified goals for Purchasing Interaction.

Nr.	Type of Goal	Goal
1	Emergent Goal	To have access to information of other business functions.
2	Emergent Goal	The participation with decision of other business functions.
3	Emergent Goal	Taking a make or buy decision.
4	Emergent Goal	Het optimaliseren van product-/procesinnovatie en –ontwikkeling.
5	Emergent Goal	The integration of suppliers in the order realization process (simplifying, standardizing, and synchronizing operational processes).
6	Emergent Goal	The early involvement of selected suppliers in the design phase.
7	Emergent Goal	The common (departments, suppliers, business units, and so on) optimization of the supply chain.
8	Emergent Goal	The common management of risks and opportunities, based on transparency.
9	Emergent Goal	The common sharing of efforts in the long term.
10	Emergent Goal	The improvement of quality by early involvement of the purchasing department in the product development.

11	Emergent Goal	The reduction of time-to-market by early involvement of the purchasing department in the product development.
12	Emergent Goal	The reduction of costs by early involvement of the purchasing department in the product development.
13	Emergent Goal	The purchasing step: 'Determination of the needs'.
14	Emergent Goal	The purchasing step: 'Specification of the needs'.
15	Emergent Goal	The development of Radar Systems with the help of a business model by taking into account with technique, costs and time-to-market.
16	Emergent Goal	Effective communicating between departments
17	Emergent Goal	The timely delivery of complete specifications.
18	Emergent Goal	The delay of inbound transportation.
19	Strategic Objective	Provide the right purchasing skills and experiences to business units
20	Purchasing Objective 2008	Steering and coaching recent outsourcing
21	Purchasing Objective 2008 and Emergent goal	Sharing purchasing knowledge to business units.

Table 29 Identified goals for Purchasing Interaction

Given the large amount of goals, we will not evaluate all these goals one by one. To capture the essence, we will group these goals. According to the P-BSC, the interaction of SR Purchasing NL can be divided in the following groups: Interaction with business functions (I) and Interaction with suppliers (II). Table 30 shows the assignment of the goals in the groups:

g\f	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
I																					
II																					

Table 30 Assignment of goals into Purchasing Interaction Groups

We can make the interaction with suppliers more concrete by formulating it as 'supplier involvement'. The identified goals of group II confirm that this reformulation is possible. Based on these evaluations, we formulate the following basic strategy: '*Improving the interaction with business functions and the involvement of strategic suppliers*'. Note that it is not preferred to involve all types of suppliers, but only 'strategic' suppliers.

5.3.10 Strategy for High Performing Workforce

Table 31 shows the identified goals for High Performing Workforce.

Nr.	Type of Goal	Goal
1	Emergent Goal	The degree of strength in commerce.

2	Emergent Goal	The skills and knowledge of suppliers.
3	Emergent Goal	The availability of an air conditioning system.
4	Mission	Proactive and customer-oriented attitude based on professional knowledge and skills.
5	Strategic Objective and Emergent Goal	Stimulate motivation and competencies of all Purchasing staff.
6	Purchasing Objective 2008	Develop leadership and sub-contract management skills

Table 31 Identified goals for High Performing Workforce

In order to capture the essence, we will group these goals with the help of constructs for High Performing Workforce. These constructs are derived from a Dutch research company (CRF International, 2008) and are as follows: Flexible conditions (I), Education and training (II), Climate for action (III), Promotion chances (IV), and Primary conditions (V). Table 32 shows the assignment of the goals in the groups:

Groups\ Factors	**1**	**2**	**3**	**4**	**5**	**6**
I						
II						
III						
IV						
V						

Table 32 Assignment of goals into High Performing Workforce groups

We can see that all factors are covered by Group II, except Factor 3. Factor is about the lack of an air-conditioning system. It can be seen as an incident and such facilities are centrally arranged at Thales NL level for all BUs. Therefore it is not part of the essence behind this KPA. Factor 5 is broad defined and can be applied to all groups. This factor is about the motivation and competencies of people. We will exclude the motivation aspect, because we will assess the satisfaction of all relevant stakeholders as meant by the P-BSC (see Chapter 4). The competencies aspect is covered by Group 2. Based on these evaluations, we formulate the following basic strategy: *'Increasing performance of employees by education and training'*.

5.3.11 Strategy for High Performing Suppliers

Table 33 shows the identified goals for High Performing Suppliers.

Nr.	**Type of Goal**	**Goal**
1	Emergent Goal & Purchasing Objective 2008	Improve supplier performance
2	Emergent Goal	The reliability of supplier deliveries
3	Emergent Goal	The average payment periods of Thales
4	Emergent Goal	The improvement of quality with the help of keeping up the number of failures per part.
5	Emergent Goal	Supplier Improvement Programs.

6	Purchasing Objective 2008	Improve supplier delivery performance
7	Purchasing Objective 2008	Implement soft vendor rating
8	KPIs from Logistic dimension	Supplier cycle times
9	KPIs from Logistic dimension	Supplier delivery reliability

Table 33 Identified goals for High Performing Suppliers.

In order to capture the essence, we will group these goals with the help of specific systems that are used at SR Purchasing NL:

- VRS

  This specific system records and ranks the performance of the suppliers of SR Purchasing NL and covers the factors 1, 2, 6, 8, and 9.

- Extended Vendor Rating System (EVRS)

  This specific system is an extension to the VRS for strategic suppliers by measuring additional 'softer' criteria, such as customer responsiveness and covers factor 7.

- The FRACAS

  The Failure Reporting Analysis and Corrective Action System (FRACAS) reporting, analysis and corrective action software system is used for (among others) reporting supplier failures in order to take corrective actions. This system covers factor 4. Note that, FRACAS results in a higher VRS over time. Therefore we exclude this factor in the determination of a basic strategy by focusing on the above systems.

Following, we will evaluate the remaining goals:

- Goal 3

  The payments of Thales indicate that it is also important to focus on the different needs and expectations of suppliers to ensure high performing suppliers. The model provides the function to assess their satisfaction and implement PIs if needed. In order to develop KPIs, we will focus on the needs of SR Purchasing NL.

- Goal 5

  The supplier improvement programs are temporarily projects that will not be included in this research, because we are interested in KPIs that will remain relevant over time.

Based on these evaluations, we formulate the following basic strategy: *'Improving the overall performance of suppliers that are currently measured by the VRS of SR Purchasing NL'*.

5.3.12 Strategy for Human Capital

Table 34 shows the identified goals for Human Capital.

Nr.	Type of Goal	Goal
1	Emergent goal	The optimal utilization of personnel

Table 34 Identified goal for Human Capital.

While there is only one goal, we are able to formulate directly the basic strategy as follows: *'Ensuring optimal utilization of personnel'*.

5.3.13 Strategy for Organization Structure

Table 35 shows the identified goals for Organization Structure.

Nr.	Type of Goal	Goal
1	Emergent Goals	The establishment of the purchasing organization
2	Purchasing Objective 2008	The integration of purchasing in the BU-SR

Table 35 Identified goal for Organization Structure.

Both goals are examples to optimize the organization structure for SR Purchasing NL. Based on this, we formulate the basic strategy as follows: *'Setting up an organization structure that is in line with the purchasing goals and fulfills the needs of SR Purchasing NL'.*

5.3.14 Strategy for IT/IS Infrastructure

Table 36 shows the identified goals for IT/IS Infrastructure.

Nr.	Type	Factor
1	Emergent goal	The availability of e-procurement solutions
2	Emergent goal	The use of information systems for purchasing
3	Emergent goal	The use of information technology for purchasing, such as internet and intranet.

Table 36 Identified goals for IT/IS Infrastructure.

These factors are all examples of IT/IS Infrastructure. SR Purchasing NL has to invest to develop an optimal IT/IS Infrastructure. Based on this, we are able to formulate the basic strategy as follows: *'Setting up an IT/IS Infrastructure that supports SR Purchasing NL'.*

5.4 Derivation of new KPIs

5.4.1 Alternative KPIs and selection criteria from the literature

We will provide each key person a long list of 153 useful and innovative KPIs from different companies in different industries (see Appendix VIII). These KPIs are derived from the report of Carter et al. (2005). Following, we will hold a brainstorm session with these key persons to generate the most promising KPIs based on the basic strategies of Section 5.3. In order to select the best alternative, we will use among others the following selection criteria derived from a report of Vrolijk et al. (2003):

- Robustness: The robustness indicates the 'firmness' of an indicator. An indicator is firm if it is not sensible for possible mistakes in the assumptions under which the indicator is created.
- Measurability: The measurability of an indicator depends on the availability of data.
- Transferability: Transferability is about the ability to reproduce a value of an indicator on a future date.
- Simplicity: The indicator and the main idea behind the indicator must be easy to understand.

- Validity: The validity reflects in what for degree an indicator measures what it wants to measure.
- Relevance: An indicator should have a connection with what it wants to measure.
- Timeliness: An indicator should remain relevant over time.
- Reliability: An indicator is reliable if it produces the same value in the same circumstances.
- Sensibility: A sensitive indicator should reflect changes in the right way of factors that are related with the indicator.
- Completeness: The completeness of an indicator reflects all the aspects that are important to deliver a complete view of the situation.
- Needed effort: The needed effort for the development of an indicator plays a role to determine an appropriate quality-time ratio.

With the help of interviews, we confirmed that Thales agrees with all these criteria for the assessment. We added the following criterion based on the constraint of this research (see Section 1.4):

- The use of a limited set of KPIs.

Finally, a KPI must be controllable in order to improve performance, and thus we also add:

- Controllability: The ability to influence the reflection of an indicator with the help of steering actions.

5.4.2 New KPIs for the Business Unit Surface Radar

The concerning basic strategy for this section is as follows:*'Reducing total costs in the realization of Radar Systems against low departmental costs'*. We selected Reinhard Leussink, a PPM at SR Purchasing NL, to participate in a brain storm session to develop alternatives (Ax) (shown in Table 37) for measuring this KPA. Each alternative can consist of one or more KPIs. We focused on averages (e.g. total costs) rather than on outliers (e.g. number of programs that do not meet the savings target). The reason is that we prefer to use an annual total savings target for the whole department, because is difficult to find targets for each Radar System.

Ax	KPI name
A1	Radar System cost savings Total departmental costs
A2	Radar System cost savings in bid phase for new - and modified Radar Systems Radar System cost savings in development phase for new - and modified Radar Systems Radar System cost savings in negotiations for new, modified, and standard Radar Systems Administrative costs (cost/purchase order) Total departmental costs
A3	Number of cost reduction actions Total departmental costs
A4	Number of cost reduction actions in bid phase for new - and modified Radar Systems Number of cost reduction actions in development phase for new - and modified Radar Systems Number of cost reduction actions in negotiations for new, modified, and standard Radar Systems Administrative costs (cost/purchase order) Total departmental costs

Table 37 Alternative KPIs for the BU-SR

These alternatives meet all the required criteria of Section 5.4.2, except the following criteria:

- Validity:

  The first two alternatives (A1 and A2) are based on actual cost savings. The next two alternatives (A3 and A4) are based on the number of cost reducing actions, which should predict cost savings. However, the quality or impact of these actions is not addressed

- The use of less KPIs and needed effort:

  The alternatives with only two KPIs (A1 and A3) need less effort than the other two alternatives (A2 and A4), because they need fewer measurements.

- Controllability:

  The alternatives A2 and A4 are better controllable, because they give directions where improvements have to be made. The alternatives A1 and A3 only show a number and *if* improvements have to be made, not *where*.

Table 38 shows the results of the evaluations. The criteria that are discussed explicitly in this section are indicated by the color gray.

	Robustness	Measurability	Transferability	Simplicity	Validity	Relevance	Timeliness	Reliability	Sensibility	Completeness	Needed effort	The use of less KPIs	Controllability
A1	+	+	+	+	+	+	+	+	+	+	+	+	-
A2	+	+	+	+	+	+	+	+	+	+	-	-	+
A3	+	+	+	+	-	+	+	+	+	+	+	+	-
A4	+	+	+	+	-	+	+	+	+	+	-	-	+

Table 38 Evaluation of alternative KPIs for the BU-SR

Based on these evaluations, we select A1 as the best alternative. Although highly controllable, A2 and A4 are not selected, because we cannot afford the use of 5 KPIs for only this KPA. Given that A1 is superior to A3, A1 is selected as the best alternative and called 'rate of purchasing savings'. It shows the added value of the purchasing department as a cost center. Table 39 shows the selected KPI in more detail.

KPI Name	**Radar System cost savings**
Goal	Increase KPI value by increasing Radar System purchasing cost savings
Measurements	$\sum_{X} Cxf \quad Cxl$, with: Cxf: First estimation of the total cost of Radar System x Cxl: Latest estimation of the total cost of Radar System x + savings of other departments x∈X, X: Set of Radar Systems in current programs and projects of SR Purchasing NL
Data sources	Cxf, Cxl, and X: PPMs
KPI Name	**Total departmental costs**

Goal	Decrease KPI value by decreasing departmental costs.
Measurements	Cd , with: Cd: Total departmental costs
Data source	Cd: Monthly financial reports of SR Purchasing NL

Table 39 Selected KPIs for the BU-SR

5.4.3 New KPIs for Marketing and Sales

The concerning basic strategy for this section is as follows: *'Increasing the purchasing turnover in countries that are preferred by Marketing and Sales. & Minimizing the budget deviation with actual costs'*. We selected John Alfrink, Bid manager of the BU-SR, to participate in a brain storm session to develop alternative KPIs (shown in Table 40) for this section.

Ax	KPI name
A1	Turnover in Preferred Countries
	Actual budget deviation of current projects and programs
A2	Turnover in Preferred Countries
	Expected number of projects and programs that will be not realized within acceptable budget deviation.

Table 40 Alternative KPIs for Marketing and Sales

These alternatives meet all the required criteria except one: controllability. A2 is better to control, because in A1 PPMs can easily manipulate the results of the budget-related KPI. For example, PPMs can intentionally add the easiest projects (with less uncertainties) to improve their average score. Therefore we select A2 as the best alternative (see Table 41).

KPI Name	**Turnover in Preferred Countries**
Goal	Increase KPI value by doing more business in preferred countries of Marketing and Sales.
Measurement	$\frac{Tm}{Tp} \times 100$, with: Tm: Realized purchasing turnover in countries that are preferred by Marketing and Sales over last 12 months. Note that for known future purchasing needs, the suppliers of these purchases are not determined yet. This is the reason why we measure the realized purchasing turnover. Tp: Total purchasing turnover over last 12 months.
Data sources	Tm: Bas Sorgdrager (Offset Department) Tp: ERP System
KPI Name	**Expected number of projects and programs that will not be realized within acceptable budget deviation.**
Goal	Decrease KPI value by estimating the right budgets by for example anticipating future cost reductions.

Measurement	$\sum_{X} Dx$, with: Dx = 1, if project or program x is expected that it will not be realized within acceptable budget deviation. Dx = 0, if project or program x is expected that it will be realized within acceptable budget deviation. xєX, X: Set of current programs and projects of SR Purchasing NL
Data sources	Dx and X: PPMs

Table 41 Selected KPIs for Marketing and Sales

5.4.4 New KPIs for Engineering

The concerning basic strategy for this section is as follows: *'Increasing the contribution of SR Purchasing NL to stimulate on-time and flawless development of new Radar Systems'*. We selected the following persons to participate in a brain storm session to develop alternatives KPIs for this section:

- Rango Knepper, a PM, who is involved in many Radar System development projects
- Joris Buijnsters, a Tactical Purchaser, who is involved in many component development projects at the supplier-side

Knepper states that the essence behind the fulfillment of the needs and expectations of Radar System engineering is a collaborative process of a purchaser and a technician in an AT. The essence behind the function of purchasing is, according to Knepper, to deliver market knowledge, such as new parts and prices. According to him, a specific contribution to Radar System engineering cannot be attributed to one of these two disciplines.

Buijnsters refines Kneppers statement by noticing that the essence of purchasing is good and fast communication between technicians and suppliers. It is about understanding the real needs of technicians and finding the best solution with the best suppliers. He confirms that it is a collaborative process and also a complex process where a purchaser seeks for feasibility of components and avoiding too expensive parts. Therefore, we do not measure this process.

Purchasing makes concrete agreements in component engineering at the supplier side. Buijnsters states that for complex parts development at supplier side milestones are defined and set in so-called development contracts, making them easy to measure and control. A purchaser can take corrective actions of suppliers to meet their milestones. Finally, it is also valid, because it shows the contribution of purchasing to on-time and flawless developments of new parts and is thus aligned with the basic strategy for this KPA. Table 42 shows the alternatives that are identified. These alternatives meet all the required criteria except one: controllability. A2 is better to control, because in A1 engineers can easily manipulate the results. For example, PPMs can intentionally make up easy milestones to improve their average score. Therefore we select A2 as the best alternative (see Table 42).

Ax	KPI name
A1	Performance-against-date milestones for complex component developments (%)
A2	Number of milestones in complex component developments not achieved by suppliers

Table 42 Alternative KPIs for Engineering

KPI Name	Number of milestones in complex component developments not achieved by suppliers

Goal	Decrease KPI value by managing the development process at suppliers.
Measurement	$\sum_{X} Dx$, with: Dx = 1, if milestones in complex component development x are not achieved Dx = 0, if milestones in complex component development x are achieved xєX, X: Set of current complex component developments at supplier side
Data sources	Dx and X: PPMs: Tactical Purchasers (Document: Development contracts)

Table 43 Selected KPI for Engineering

5.4.5 New KPIs for Internal Customer

The concerning basic strategy for this section is as follows:*'Reducing the average Radar System delay caused by purchasing'*. We selected Ben Geertsema, Purchasing Process and Supply Chain Manager, to participate in a brain storm session to develop alternatives KPIs for this section. Table 44 shows the promising alternatives that are identified.

Ax	KPI
A1	On time delivery according to planning (%)
A2	Total Radar System delay caused by purchasing

Table 44 The alternative KPIs for Internal Customer

The alternatives meet all criteria, except:

- Reliability

  A1 consists of several components. It is therefore easier to manipulate than A1.

- Validity

  A1 is not highly valid, because it leads to suboptimalization of purchasing (see Section 5.3.5). A2 is more valid. It takes global optimization into consideration.

- Needed effort

  A1 is very easy to measure. It is recorded by the ERP system and collected by the Warehousing and Distribution department. In A2, SR Purchasing has to collect data from different departments.

- Controllability

  A2 is better to control. It provides more steering possibilities for purchasing in order to meet production schedule and to reduce the Radar System delay, such as delivering the most critical parts first and stimulating re-planning of production orders.

- Relevance

  A2 is more relevant, because it optimizes globally.

Table 45 shows the evaluation of the concerning alternatives.

	Robustness	Measurable	Translatable	Simplicity	Validity	Relevance	Timeliness	Reliable	Sensible	Complete	Needed effort	The use of less KPIs	Controllable
A1	+	+	+	+	-	+/-	+	+	+	+	+	+	-
A2	+	+	+	+	+	+	+	+	+	+	-	+	+

Table 45 Evaluation of alternative KPIs for Internal Customers

Based on these evaluations, we will select the A1 as the best alternative. This KPI is about the physical material flows and is thus very important for the primary process. The higher validity, relevance, and controllability in A2 are therefore essential for such an important KPI. We find the low score in A1 on needed effort less important, because it is worth the effort. Table 46 shows the selected KPI:

KPI Name	**Total Radar System delay caused by purchasing**
Goal	Increase KPI value by meeting the purchasing schedule and decreasing Radar System delay by for example: delivering the most critical parts first and proactively stimulate the re-planning of production orders.
Measurement	$\sum_{X} Dpx$, with: Dx: Expected additional delay of Radar System x caused by part p xєX, X: Set of current Radar Systems of SR Purchasing NL
Data sources	Dx: Bart Heideman (SR Logistics) X: PPMs

Table 46 Selected KPIs for Internal Customer Satisfaction

5.4.6 New KPIs for Warehousing and Distribution

The concerning basic strategy for this section is as follows: *'Reducing the increase of surplus inventory together with Warehousing and Distribution & 'Minimizing average Project inventory'*. We selected Bart Heideman to participate in a brain storm session to develop alternatives KPIs for this section. Table 47 shows the alternatives that are identified and selected:

Existing KPI	**Average project inventory**
Goal	Decrease KPI value by on-time delivering parts to internal customers.
KPI maintained by	Bart Heideman (SR Logistics)
Joint existing KPI	**Average project inventory**
Goal	Decrease joint KPI value by ordering the real needs of internal customers together with Warehousing and Distribution. A few examples are: ▪ Reducing the minimum order quantities of suppliers

	▪ Making benefits of economies of scales if there is a need for ▪ Coping with uncertainties, such as delivery problems ▪ Ensuring reliable inventory quantities by cycle counting
KPI maintained by	SR Logistics (Bart Heideman)

Table 47 Selected KPIs for Warehousing and Distribution Satisfaction

5.4.7 New KPIs for After Sales

The concerning basic strategy for the short term (see Section 5.36) is as follows: *'Taking into account the basic needs and expectations of after sales in negotiations with suppliers of the most interesting parts for After Sales'*. We selected Marcel Vink to participate in a brain storm session to develop alternatives KPIs for this section. Table 48 shows the alternatives that are identified.

Ax	KPI name
A1	Stating basic Terms and Conditions for After Sales in contracts
A2	Number of new contracts that do not meet the After Sales requirements

Table 48 Alternative KPIs After Sales

These alternatives meet all the required criteria, except the criteria 'Controllability'. A2 is better to control, because in A1 purchasers can manipulate easier the results. For example, a purchaser can intentionally add simple contracts that meet their requirements to improve their average score. Based on these evaluations, we select A2 as the best alternative. Table 49 shows the alternative that is selected.

KPI Name	Number of new contracts that do not meet the After Sales requirements
Goal	Negotiating basic needs of Ater Sales with suppliers for the most critical parts.
Measurement	$\sum_{X} Cx$, with: Cx = 1, if contract x does not meet the After Sales requirements Cx = 0, if contract x does not meet the After Sales requirements xιX, X: Set of current purchasing contracts of critical parts
Data sources	Cx: Contract SR Purchasing NL (Thales Netherlands Portal, 2008d) X: Marcel Vink (After Sales)

Table 49 Selected KPIs for After Sales Satisfaction

5.4.8 New KPIs for Purchasing Importance

The concerning basic strategy for this section is as follows: *'Acceptance of the importance of SR Purchasing NL by top management and other business functions'*. We selected Jan van Putten (purchasing manager of Thales NL) and Ton Disselhorst to participate in a brain storm session to develop alternatives KPIs for this section. In our discussion, it seemed that it is very difficult to formulate promising KPIs. Two possible KPIs are identified, which are at least relevant (have a relation with purchasing importance). Table 50 shows the alternatives that are identified:

Ax	KPI
A1	The participation of SR Purchasing NL in higher organization levels of the BU-SR and Thales NL.
A2	The impact of SR Purchasing NL on the strategic objectives of the BU-SR and Thales NL.
A3	The impact of purchasing on the return of investment of the BU-SR and Thales NL

Table 50 Alternative KPIs for Purchasing Importance.

However, these KPI are performing very low on important criteria, such as measurability, validity, controllability. Therefore, we do not select KPI for this KPA.

5.4.9 New KPIs for Purchasing Task Execution

The concerning basic strategy for this section is as follows: *'The use and further improvement of the best practices of SR Purchasing NL in order to gain results'*. We selected Jelle Winia (Quality Assurance Manager at SR Purchasing NL), which has much experience in process improvement projects, to participate in a brain storm session to develop alternatives KPIs for this section

The best practices of SR Purchasing NL are stored in a so-called reference system. This system is called a reference system, because it gives a reference (or a direction) in how processes have to be performed. The intention is that SR Purchasing NL has to make use of a new reference system in the near future. This new system must combine all the relevant best practices for the whole BU-SR. This means that the BU-SR will combine all the best practices of BU-SR France, BU-SR Netherlands, and Thales Corporate into one system (Chorus SR). In this research, we will focus on the future state, where there is one reference system for the BU-SR. The best practices are recreated based on new insights. Based on the discussion, we uncovered the recreation of best-practices. Figure 24 shows this process.

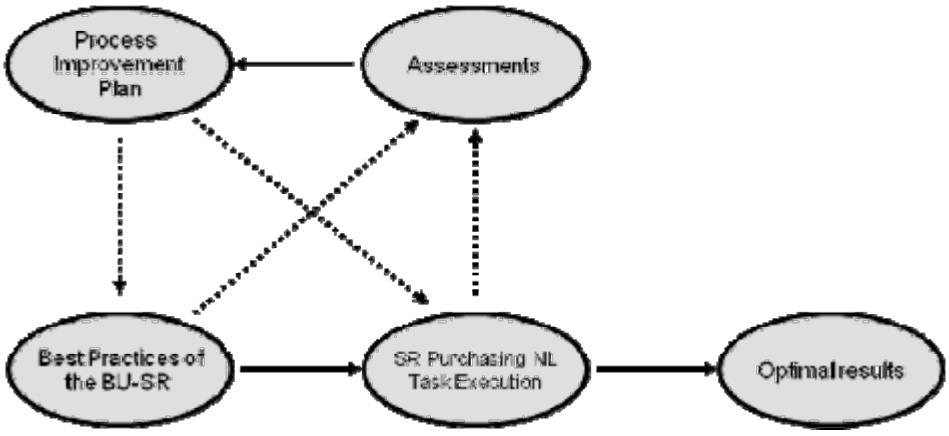


Figure 24 (Re)Creation of the BU-SR best practices

We will evaluate these areas one by one:

- **Best practices of the BU-SR**
  The best practices of the BU-SR are stored in the form of repeatable procedures in a reference system of the BU-SR. This system delivers mandatory practices to SR Purchasing NL, because these practices are proven over time and accepted by people as the most efficient and effective way of the SR Purchasing NL task execution. The measurement of the quality of these practices is a complex

problem, because there are many ways to measure this. Companies use therefore models. Thales uses the following purchasing task related models:

- Capability Maturity Model Integration (CMMI) (CMMI for Development Version 1.2, 2006)
- Supply-Chain Operations Reference-model (SCOR) (SCOR, 2001)
- ISO standards

- **SR Purchasing NL Task Execution**

  SR Purchasing NL Task Execution receives thus mandatory practices and executes SR Purchasing NL tasks. The in-process execution should be conforming the best practice. This can be assessed. The output is the realization of the task execution. This way of execution can be in conformity with the mandatory practices or not. In the latter case, this way of executing could be an improvement or deterioration in respect with the best practice. We did not find any alternative KPIs during the execution of SR Purchasing NL tasks.

- **Assessments**

  The assessment of the actual task execution in comparison with the concerning mandatory practice is needed, because a process improvement plan can be needed if the task is executed (due new insights) better than the best practice in the reference system. Note that also process improvement models and company objectives are needed to make effective plans. As mentioned earlier in this research, (process improvement) models help (to make improvements) by providing an easy understanding of the problem and company objectives help to by giving direction where improvement have to be made.

- **Process Improvement Plan**

  Finally, every executed plan updates the reference system with better practices.

Based on this model, we developed two alternative KPIs. A1 measures every step of the process, while A2 measures on a higher level. Table 51 shows these alternatives:

Ax	KPI name
A1	Performance according to several process related models Progress in process auditing according schedule Progress in finishing corrective actions according schedule Accomplishment of personal targets
A2	Maintaining best practices Number of not achieved targets of purchaser

Table 51 Alternative KPIs for Purchasing Task Execution

These alternatives meet all the required criteria, except the following criteria:

- Robustness: A2 is more robust, because it is possible that the steps of the recreation of best practices is not complete in reality. A2 includes these all factors that do exist in maintaining best practices.
- Timeliness: The used models can change over time. According to Jelle Winia, these models ensure an improvement round and are then replaced by other models in practice.
- Needs less effort: A2 needs considerably less effort, because there are less KPIs. This makes it also easy to understand.

Table 52 shows the evaluation of the concerning alternatives.

	Robustness	Measurable	Transferable	Simplicity	Validity	Relevance	Timeliness	Reliable	Sensible	Complete	Needed effort	The use of less KPIs	Controllable
A1	-	+	+	-	+	+	-	+	+	+	-	-	+
A2	+	+	+	+	+	+	+	+	+	+	+	+	+

Table 52 Evaluation of alternative KPIs for Purchasing Task Execution

Based on these evaluations, we select A2 as the best alternative. It scores higher on all criteria. Table 53 works the selected KPIs out.

KPI Name	***Number of not reviewed best practices according to the planning***
Goal	Increase KPI value by maintaining the best practices of SR Purchasing NL
Measurement	$\frac{Mr}{Mp}$, with: Mr = Number of maintained best-practices of SR Purchasing NL Mp = Number of best practices that were planned to be maintained
Data source	Jelle Winia (Quality Assurance Manager SR Purchasing NL)
KPI Name	***Number of not achieved targets of purchasers***
Goal	Increase KPI value by achieving purchaser targets
Measurement	$\frac{Tr}{Tp}$, with: Tr = Number of targets that are achieved by purchasers Tp = Number of planned targets for purchasers
Data source(s)	Tr and TP: Managers of tactical - and operational purchasers (Ton Disselhorst and Klaartje van Wageningen)

Table 53 Selected KPIs for Purchasing Task Execution

5.4.10 New KPIs for Purchasing Interaction

The concerning basic strategy for this section is as follows: *'Improving the interaction with business functions and the involvement of strategic suppliers'*. We selected Koert Koers, a PPM of SR Purchasing NL, to participate in a brain storm session to develop alternatives KPIs for this section.

The interaction of purchasing with other business functions takes place with ATs. As mentioned earlier, these teams consist of a tactical purchaser, operational purchaser and a technician. These people can involve in its turn other disciplines, such as suppliers, logistic engineers and so on. In order to measure the interaction of purchasing in ATs, we want to measure the accomplished targets of a purchaser. A purchaser should make a policy and an action plan for each year. This can be seen as the contribution of the purchaser to the AT. We therefore suggest the use of the following possible KPI: '*Number of not achieved purchasing targets in ATs*'.

Following, the involvement of suppliers can be measured for example per phase, such as bid phase, engineering, negotiation (selecting suppliers). This would deliver a few KPIs while it is more important to show the early involvement of suppliers. It is explained earlier in Section 5.4.3 that this involvement can have huge benefits on the costs of a Radar System. We suggest therefore the use of the following KPI: '*Number of projects where Early Supplier Involvement is used*'. Table 54 shows the alternative that is identified and selected.

KPI Name	**Number of not achieved purchasing targets in ATs**
Goal	Increase KPI value by achieving purchasing targets in ATs
Measurement	Number of purchasing targets that are not achieved in ATs
Data Source	ATs
KPI Name	**Number of projects where Early Supplier Involvement is used**
Goal	Increase KPI value by early involving suppliers in the primary process of delivering Radar Systems
Measurement	Number of projects where suppliers are early involved
Data Source	PPMs

Table 54 Selected KPIs for Purchasing Interaction

5.4.11 New KPIs for High Performing Workforce

The concerning basic strategy for this section is as follows: *'Increasing performance of employees by education and training'*. We selected Ton Disselhorst to participate in a brain storm session to develop alternatives KPIs for this section. Table 55 shows the alternatives that are identified:

Ax	**Measurement**
A1	Cost of education per FTE[7]
A2	Number of employees that are domain experts
A3	Number of planned trainings that are not conducted

Table 55 Alternative KPIs High Performing Workforce

These alternatives meet all the required criteria, except the following criteria:

- Needed effort

  The needed effort is the easiest in A1, because all the needed data is already available within SR Purchasing NL. The other alternatives need a bit more effort, because the data is not readily available. However, the data can be measured easily.

- Validity

  We find A1 performing the weakest, because following more expensive trainings implicates better trained people. This is completely untrue. We find that A3 perform moderate on this criterion, because it predicts an optimal education and training. A2 shows that an employee is trained well in order to perform its tasks.

[7] full time employees

- Sensible

  A3 is less sensible, because conducted trainings and provided educations will result in a higher KPI value if it finally develops an employee into a domain expert.

- Robustness

  A2 and A3 are less robust than A1, because the values of these KPIs can change much if the assumptions behind the KPIs vary, such as:

  - The characteristics of a domain expert
  - The reason for someone to give training or education

  However, A3 score better on this criterion than A2, because the managers of operational – and tactical purchasers assess the need for certain training. This means that the assumption is more firm than in the case of A2, where we have no firm idea at all. Table 56 shows the evaluation of the concerning alternatives.

	Robustness	Measurable	Transferable	Simplicity	Validity	Relevance	Timeliness	Reliable	Sensible	Complete	Needed effort	The use of less KPIs	Controllable
A1	+	+	+	+	-	+	+	+	+	+	+	+	+
A2	-	+	+	+	+	+	+	+	-	+	+/-	+	+
A3	+/-	+	+	+	+/-	+	+	+	+	+	+/-	+	+

Table 56 Evaluation of alternative KPIs for High Performing Workforce

Validity is the most important criterion according to the MT of SR Purchasing NL. A1 is therefore unacceptable. Following, we select the alternative that performs above-average on all criteria, namely A3. Table 57 displays the selected KPI.

KPI Name	**Number of planned trainings that are not conducted**
Goal	Increase KPI value by providing education to employees
Measurement	Tp – Tr, with Tp: Planned trainings Tr: Realized trainings
Data sources	TP & Tr: Managers of operational - and tactical purchasers

Table 57 Selected KPI for High Performing Workforce

5.4.12 New KPIs for High Performing Suppliers

The concerning basic strategy for this section is as follows: *'Improving the overall performance of suppliers that are currently measured by the VRS of SR Purchasing NL'*. We selected Ton Disselhorst to participate in a brain storm session to develop alternatives KPIs for this section. Table 58 shows the alternative that is identified and selected:

KPI Name	**Number of suppliers that do not meet the requirements of SR Purchasing NL**
Goal	Increase KPI value by taking corrective actions on suppliers that are monitored by the

	VRS of SR Purchasing NL
Measurement	Number of suppliers that do not meet the VRS and EVRS requirements
Data source	VRS

Table 58 Selected KPI for High Performing Suppliers

5.4.13 New KPIs for Human Capital

The concerning basic strategy for this section is as follows: *'Ensuring optimal utilization of personnel'*. We selected Ton Disselhorst to participate in a brain storm session to develop alternatives KPIs for this section. Table 59 shows the alternative that is identified and selected.

KPI Name	**Actual number of FTEs**
Goal	Increase or decrease KPI value to meet the required FTEs
Measurement	Actual number of purchasing FTEs
Data source	Monthly financial reports of SR Purchasing NL

Table 59 Selected KPIs for Human Capital

5.4.14 New KPIs for Organization Structure

The concerning basic strategy for this section is as follows: *'Setting up an organization structure that is in line with the purchasing goals and fulfills the needs of SR Purchasing NL'*. We selected Jan van Putten to participate in a brain storm session to develop alternatives KPIs for this section. Table 60 shows the alternatives that are identified.

Ax	**Measurement**
A1	The participation of people from the right disciplines in the ATs
	The coverage of all article segments by ATs.

Table 60 Alternative KPI for Organization Structure

Measurements on this subject are nearly controllable by SR Purchasing NL, because it impacts different business units, and country structures. Following, these measures do change very slowly over time and therefore it scores low on timeliness. These measures are also difficult to measure. Team members can contact non-team members indirectly and this makes it less valid to measure only team members as participators. Therefore, we will not define a KPI for this area.

5.4.15 New KPIs for IT/IS Infrastructure

The concerning basic strategy for this section is as follows: *'Setting up an IT/IS Infrastructure that supports SR Purchasing NL'*. We selected Klaartje van Wageningen, Purchasing Manager of Operational Purchasers, to participate in a brain storm session to develop alternative KPIs for this section. The IT/IS Infrastructure is centrally arranged on Thales NL and Corporate level. This means that SR Purchasing NL has no influence on the development of IT/IS applications on its own. Therefore, we did not develop a KPI for this section. Klaartje van Wageningen conforms that if a best practice indicates a need for a certain application, Thales can provide SR Purchasing with the best tools.

5.5 Conclusion

In this chapter we developed new KPIs for SR Purchasing NL. The research constraint allowed the use of around ten KPIs to enable easy maintainability of the KPIs. We faced with many facets and it seemed very difficult to find 10 KPIs to assess the overall performance of SR Purchasing NL. Finally, we developed 16 new KPIs that are able to assess the overall performance of SR Purchasing NL. However, 5 of these KPIs need no or hardly maintenance. This means that 11 KPIs have to be maintained. Therefore, we find that we have succeeded to meet the research constraint.

The KPIs are:

- Radar System cost savings
- Total departmental costs
- Turnover in preferred countries
- Expected number of projects and programs that will not be realized within acceptable budget deviation
- Number of milestones in complex component developments not achieved by suppliers
- Total Radar System delay caused by purchasing
- Average project inventory
- New surplus inventory
- Number of new contracts that do not meet the After Sales requirements
- Number of not reviewed best practices according to the planning
- Number of not achieved targets of purchasers
- Number of not achieved purchasing targets in ATs
- Number of projects where Early Supplier Involvement is used
- Number of planned trainings that are not conducted
- Number of suppliers that do not meet the requirements of SR Purchasing NL
- Actual number of FTEs.

Chapter 6: Implementation plan

6.1 Introduction

In this chapter we provide a plan in order to effectively implement the developed PMS and KPIs. In Section 6.2, we determine the structure of the plan. Based on this structure, we write the plan in the Sections 6.3 and further.

6.2 Structure of the implementation plan

While the used performance model within the developed PMS is based on the BSC, we use a handbook (QPR Software, 2001) for implementing the BSC from another company. We selected Hanneke Gerritsen, who is experienced with PM and is the former controller of the PMS, to discuss the most appropriate implementation plan for SR Purchasing NL. She is also experienced in several implementations within SR Purchasing NL. With her ideas, and ideas from the handbook, we developed a structure for an implementation plan. The parts of the structure are worked out in the following sections: Prerequisites (Section 6.3), Project Start-up (Section 6.4), Deliver other MAPP Cycle components (Section 6.5), Organizational implementation (Section 6.6), Technical implementation (Section 6.7), Operation (Section 6.8), Project Scope and Cost (Section 6.9), and Overall planning (Section 6.10).

6.3 Prerequisites

In order to ensure a successful implementation a few prerequisites have to be fulfilled and together with Hanneke Gerritsen we discussed these. The new KPIs are, in contrast with the current KPIs, well-spread over different KPAs of SR Purchasing NL over different levels. According to Hanneke Gerritsen, the current KPIs are mainly based on data that can be easily retrieved by one person from the ERP system, with as main disadvantage the low validity (not all important areas are measured). New KPIs will require higher costs and more effort, resulting in the necessity of the full support from the MT and employees. More concrete, the following issues are vital:

- The believe of the MT in the benefits of the developed methodology, performance model, basic strategies and the KPIs versus the additional administrative costs.
- The believe of the employees in the benefits of the developed methodology, performance model, basic strategies and the KPIs versus the additional effort that is needed from them to maintain and use the whole PMS.

6.4 Project start-up

A project leader, preferably a member of the MT or someone closely related to them, has to be assigned to start up and manage the implementation. As the MAPP Action Cycle is not only a PMS, but also a performance management system, the project leader must be aware of the (changing) goals of SR Purchasing NL during implementation.

Pilots are often used for large projects, but despite the small number of KPIs (11/16 KPIs) that need to be maintained, we suggest the use of pilots. The reason for this is that Hanneke Gerritsen expects that many people perform similar tasks differently, while standard procedures are needed to measure in a univocal manner. The resulting discussions to select the best procedure make managing the project in steps more preferable. After each pilot, the following questions must be answered:

- Do the KPIs work? Examples are:
    - Is the data available?
    - Is there sufficient IT/IS support?
    - Do people cooperate?

- Do the KPIs deliver the required insights? In other words, do the KPIs deliver new knowledge to improve performance?

Finally, we want to state that all general project-planning issues must be taken into account, such as the availability of a budget, the use of milestones, and risk analysis. It is also preferable to make decisions about possible software solutions and the assignment of a controller for the PMS.

6.5 Finishing other components of the MAPP Action Cycle

The following essential functions from the MAPP Action Cycle of Chapter 3 were beyond the scope of this research project and have to be developed in order to create a working PMS:

- Developing PIs

  The results of the information gathering process of this research (see Section 5.2.4) can also be used to identify key weaknesses and formulate them as PIs. The current PIs have to be incorporated, such as the dollar plan (see also Section 2.8).

- Assessment function

  Well-thought targets, developed by the MT of SR Purchasing NL in cooperation with purchasers, have to be set for the KPIs.

- Support function

  Development of effective dashboards and reports with graphs to support the measurements is necessary to increase their value.

- Corrective actions

  In order to take corrective actions, the best actions per KPI must be defined and implemented.

6.6 Organizational implementation

The integration of the PMS and the communication of the complete PMS to all relevant stakeholders is necessary to achieve a good understanding. Together with Gerritsen, we developed the following two-step approach in order to enable the integration of the PMS in the measurement processes:

- Assessing pluriformity in processes: Identifying different procedures for performing similar tasks.
- Achieving uniformity in processes: Defining standard procedures to make them measurable.

The processes for the management, such as action plans, strategies and reports, have to be adapted and communicated to the different stakeholders. Table 61 shows the stakeholders and the corresponding parts of the PMS that have to be communicated. A responsible person has to be assigned to each KPI.

Who	**What**
The relevant business functions at Thales NL	Performance Model and KPIs
The BU-SR	Basic strategies
SR Purchasing NL employees	Complete PMS
MT of SR Purchasing	Complete PMS
Suppliers	Supplier related KPIs (e.g. early involvement of suppliers)

Table 61 Communication of the new PMS to different stakeholders

6.7 Technical implementation

The technical implementation phase is needed to further optimize the PMS with the help of IT/IS applications, and the IT department at Thales Netherlands will play a major role in:

- Reducing the effort to become aware of new perceptions of relevant people about the (changing) goals of SR Purchasing NL
- Reducing the effort to collect data for KPIs
    - Identification of the needed data and the current source systems.
    - Analyzing the capabilities of these source systems in order to create an overall system
- Producing effective reports
- Producing effective dash boards
- Implementing effective improvement actions

6.8 Operation

Once the PMS is delivered and implemented, it must be kept relevant over time with the help of the MAPP Action Cycle by the controller of the system (see Section 3.7). Many parts of the PMS can be reviewed more quickly than the initial development, because these parts do not need to be developed from scratch. We displayed the key elements that are essential in the operating of the MAPP Action Cycle in Table 62.

Element of the MAPP Action Cycle	**Element of the MAPP Action Cycle**	**Explanation**	**Frequency**
Building confidence in a performance model	(Re) Creation of the performance model	3 year	6 months
Building confidence in KPIs	Identification of intended and emergent goals and (re) formulation of basic strategies and the concerning KPIs	1 year	1 month
Building confidence in PIs	Identification of key weaknesses and (re) formulation of PIs by MT, Operational - and Tactical Purchasers.	Continuous	Unknown
Measuring and Assessment	(Re) Creation of new knowledge	Periodically reviews	Unknown
Supporting	(Re) Creation of more valuable knowledge, Reports, Trend lines, dashboard, graphs, and so on.	Periodically reviews	Unknown
Understanding	Analyzing results and recreation of perception on actual performance position	Periodically reviews	Unknown
Taking Actions	Formulating and implementing actions	Periodically reviews	Unknown
Organizational Learning	Reformulating Intended Goals	Periodically reviews	Unknown

Table 62 Essential elements in the operation of the MAPP Action Cycle

We suggest to review the (K)PIs quarterly, allowing for sufficient time between implementing an action plan and execution thereof. As mentioned many times, the main focus is understanding and actions.

6.9 Project planning and costs

It is very difficult to make a good estimation of the required time and cost of the project, because SR Purchasing NL is new to this kind of PMS and implementation will cost relatively more time. Together with Hanneke Gerritsen, we estimated the required time for each phase of the implementation project (see Table 63).

Phase	Planning
Start-up of project	1 week
Finishing MAPP Action Cycle	2 months
Organizational Implementation	2 months
Technical Implementation	2 weeks

Table 63 Overall implementation planning

Phases 4 and 5 can be performed parallel, shortening the total required implementation time. Non-recurring costs, such as the costs for software licenses and operation of the PMS, make up the costs for the project. We cannot quantify these costs, because they depend heavily on the selection of the alternatives that exist.

6.11 Conclusion

In this chapter we described how the new KPIs can effectively be implemented. We described that the project must be managed as a separate project, and started-up and managed by a project leader. Full support and effort is needed from the MT of SR Purchasing NL and the employees to successfully implement the new KPIs. In the organization implementation phase, the PMS must be integrated in the processes of SR Purchasing NL and the complete PMS must be communicated to all relevant stakeholders. The implementation must be carried out in pilots of two KPIs, because pluriformity is expected in the way that people perform similar tasks. The other essential functions of the MAPP Action Cycle of Chapter 3 that were beyond the scope of this research project have to be developed in order to create a working PMS. The PMS must be further optimized with the help of IT/IS applications in the technical phase. Once the PMS is delivered and implemented, it must be kept relevant over time with the help of the MAPP Action Cycle by the controller of the system. The costs of this project are difficult to predict, but the time needed is estimated to be 5 months.

Chapter 7: Conclusions and Recommendations

This chapter will summarize the most important conclusions (Section 7.1) and provide point by point recommendations for SR Purchasing NL (Section 7.2).

7.1 Conclusions

The effect of the current PMS for Thales

SR Purchasing NL is heavily involved with different business functions from different business units of Thales for the delivery of Radar Systems, while the impact of SR Purchasing on the profitability of Thales is increasing. The current PMS of SR Purchasing NL provides different managers within Thales with new insights so that corrective actions can be taken. However, we showed that there are enough reasons to doubt the performance of the current PMS. Based on the identified weaknesses, we explained that managers within Thales that are related to SR Purchasing NL do not have the required insights about SR Purchasing NL. We explained that these weaknesses need to be addressed in order to increase the performance of purchasing and thus the profitability of Thales.

The developed methodology for designing KPIs

Based on the needs of SR Purchasing NL, we developed the MAPP Action Cycle (see Section 3.7). This cycle is able to manage different and changing perceptions of people about the right KPIs to remain relevant KPIs (to design and redesign KPIs). The purpose of this cycle is to take actions according to the latest perceptions of people about the APP of a company. We can summarize the main idea behind this methodology as follows:

- First Build Confidence (Build confidence in a good performance model and KPIs)
- Then Measure (Create new knowledge)
- Following Support (Create more valuable knowledge)
- Then Understand (Recreate the perceptions of people about the APP of a company)
- Finally Take Action (Formulate and implement actions)

The developed performance model for SR Purchasing NL

We evaluated different models and selected the Classical Balanced Scorecard as the best alternative. We added suppliers to the learning dimension of the scorecard and added a learning function from the EFQM model to improve the model and make it more suitable for purchasing. Finally, we made the model more explicit by defining KPAs and their interrelations. This resulted in the so-named Purchasing-Balanced Scorecard (see Section 4.3). This model has the following key improvements compared to the current model of SR Purchasing NL:

- In line with the mission of SR Purchasing NL
- Easier to understand than the current model
- Easier to accept than the current model
- Considers different stakeholders
- Enables the possibility for faster steering
- Includes a variety of KPAs
- Focuses on all the aspects with respect to the material flow

- Focuses also on other purposes of purchasing apart from controlling the material flow

The new KPIs for SR Purchasing NL

We developed new KPIs that suit SR Purchasing NL, because these KPIs are in line with the MAPP Action Cycle and based on the Purchasing-Balanced Scorecard. They are translated from basic strategies that are based on intended and emergent goals within Thales Netherlands. The research constraint allowed the use of around ten KPIs to enable easy maintainability of the KPIs. We faced with many facets and it seemed very difficult to find 10 KPIs to assess the overall performance of SR Purchasing NL. Finally, we developed 16 new KPIs that are able to assess the overall performance of SR Purchasing NL. However, 5 of these KPIs need no or hardly data collection. This means that 11 KPIs have to be maintained. Therefore, we find that we have succeeded to meet the research constraint. The developed KPIs are:

- Radar System cost savings
- Total departmental costs
- Turnover in preferred countries
- Expected number of projects and programs that will not be realized within acceptable budget deviation
- Number of milestones in complex component developments not achieved by suppliers
- Total Radar System delay caused by purchasing
- Average project inventory
- New surplus inventory
- Number of new contracts that do not meet the After Sales requirements
- Number of not reviewed best practices according to the planning
- Number of not achieved targets of purchasers
- Number of not achieved purchasing targets in ATs
- Number of projects where Early Supplier Involvement is used
- Number of planned trainings that are not conducted
- Number of suppliers that do not meet the requirements of SR Purchasing NL
- Actual number of FTEs.

The implementation plan for the new PMS

Full support and effort is needed from the MT of SR Purchasing NL to implement the new PMS and KPIs. The implementation must be managed by a project leader and consists of different phases. The costs of this project are difficult to predict, but the time needed is estimated to be 5 months.

With the help of these conclusions, we are able to answer the central question of this research:

'What is a good PMS for SR Purchasing NL'?

A good PMS for SR Purchasing NL is therefore based on the MAPP Action Cycle in order to remain relevant KPIs over time. The KPIs should be translated from the Purchasing-Balanced Scorecard and incorporate the intended – and emergent goals of SR Purchasing NL. In doing so, this system must provide

different managers new insights about SR Purchasing NL in order to increase the performance of SR Purchasing NL.

Finally, we want to state that in performance measurement, we often encounter the following saying: "Measuring is KNOWING". But how do you know in a complex situation what you have to measure? We argue that it is very important in Performance Measurement that:

You have to build CONFIDENCE in the right measures first
and then measure in order to KNOW more and
become more CONFIDENT about the actual performance position of your company!

7.2 Recommendations

- Focusing on actions
  Never discuss measurement values. The aim is to understand the APP of SR Purchasing NL (in the PMS) or its suppliers (in the VRS) and to take actions. In FRACAS, corrective actions on registered supplier failures are currently not always taken. Without actions, these efforts will only cost money and create no value for SR Purchasing NL.

- Coping with the complex organization structure
  Look through the complex organization structure of Thales to remain end-customer oriented. Due to this structure, there are also many different perceptions of people about the correct way of working. Therefore we do the following recommendations:
  - Attract the right people with for example: creativity, courage, assertivity, communication, leadership, self-confidence, empathy, and so on.
  - Develop the right culture, such as: openness for different perceptions, critique to (group) perceptions, not punishing mistakes, not directly judging people, and so on.
  - Create awareness of all relevant perceptions, such as: automating perception gathering processes (e.g. online surveys) and involving all relevant stakeholders (also outside Thales Netherlands)

- Making purchasing co-responsible for inventories
  At this moment, purchasers are not responsible for inventories, while they have much impact on the inventories. By making them co-responsible together with the Warehousing department, the inventories can be managed more efficient and effective.

- Providing purchasing with the exact needs of After Sales
  A list with the exact needs of After Sales in line with their plans to develop vast maintenance contracts must be provided to purchasing. This will enable the incorporation of the Terms and Conditions of After Sales in the supplier contracts of SR Purchasing NL.

- Creating a business model for the development of Radar Systems
  A business model has to be made for Radar System developments in order to make trade-offs between costs, cycle times, and quality. Currently, there is no such a model and quality seems leading.

- Considering offset issues in selecting or developing suppliers
  The purchasing department must prefer suppliers from countries, where offset obligations (will be) exist. Moreover, it should also select and develop suppliers that are able to fulfill these offsets on its own.

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Appendix

Appendix I: Key drivers of superior performance

- People management
- Leadership
- Drive for continuous improvement
- Customer focus
- Measuring Performance
- Process focus
- Active partnering with suppliers
- Communication
- Stimulating innovation
- Creativity
- Managing assets
- Resources & technology
- Corporate social responsibility.

Appendix II: List of interviewed persons

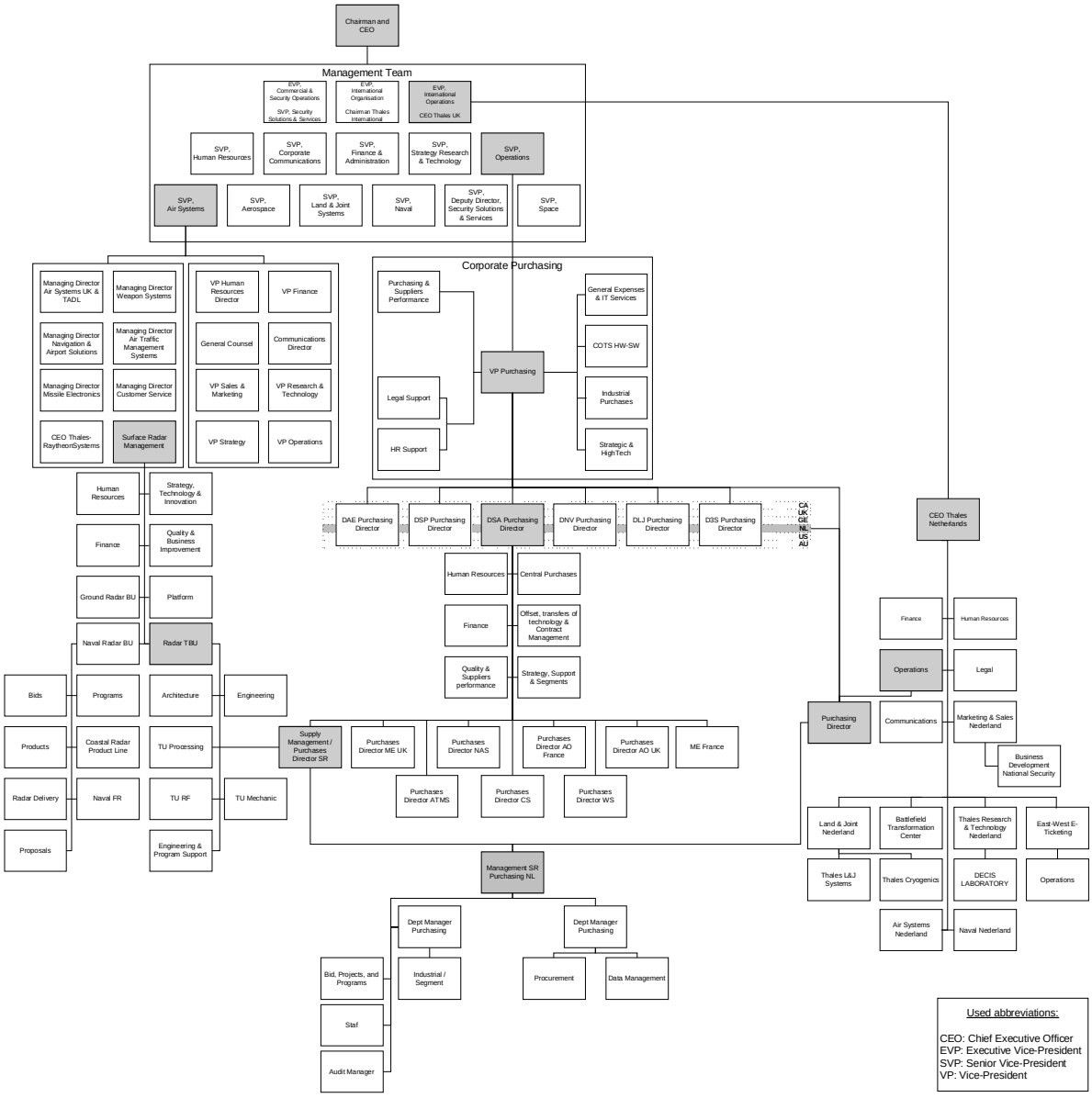
The following persons are quoted in this report:

Arie Molijn
André Tiesinga
Bart Heideman
Ben Geertsema
Cees Doets
David van de Weg
Ferit Serti
Fred Brouwer
Frits Haselhoff
Geert van de Merwe
Hanneke Gerritsen
Henk Kelder
Jan Van Putten
Jan Lutje Spelberg
Jelle Winia
John Alfrink
John Cusveller
John Hof
Joris Buijnsters
Jos van de Bosch
Karel Bomkamp
Klaartje van Wageningen
Koert Koers
Maarten Kuyck
Marcel Damen
Marcel Vink
Martijn Kromhout van de Meer
Pier Dorrepaal
Pierre Teunisse
Rango Knepper
Reinhard Leussink
Ton Disselhorst
Wilco van Rijsbergen

The following persons are not directly quoted, but enriched the report:

Charles Assink
Martin Bos
Nadine Joubert

Appendix III: Lines of command around SR Purchasing NL



Appendix IV: Most important intended goals that are imposed from above SR Purchasing NL

Thales NL Vision	As a center of excellence for combat and radar systems technology within Thales, we aspire to be the preferred partner in creation of innovative, high quality solutions for naval and ground-based defense needs.
Thales NL Mission	Thales Naval Nederland, as part of Thales Nederland, wants to be a major contributor to the success and development of its customers and employees, and to the leading position of Thales in the areas of combat systems, radar- and sensor systems as well as industrial and logistic services. We do so by creating profitable and sustainable business, which is realized in a respectful way, based on the ability to develop and exploit customer-focused solutions and to attract and develop excellent people.
The BU-SR Vision	As the European leader, supply the worldwide market with innovative and reliable Radar solutions - Innovate in leading-edge technologies - Provide on time and cost-effective radars and sensors - Insure extremely high reliability and survivability of our products.
The BU-SR Mission	Surface Radar is a market driven supplier of radars and sensors to systems integrators and end users in naval and ground fields.
Thales Purchasing Organization Vision	Thales has the ambition to become a Preferred and reliable Partner for its Suppliers.
Thales Purchasing Organization Mission en Strategies	Together, Thales Purchasing and Operational teams and our Suppliers strive to implement the following specific strategies: - Performance measurement and continuous improvement - Joint Approach In optimizing the supply chain In managing risks and opportunities, based on transparency In sharing the efforts in the long run - Early involvement of selected Suppliers In the concept & design - Agreed action plans On time delivery On conformity delivery (to specifications) On conformity to the regulations (export control, environmental, social..) Costs Optimization

Appendix V: Assignment of intended goals to KPAs of the P-BSC

Source for intended goal	Intended goal	KPAs of the P-BSC
Mission	Proactive and customer-oriented attitude based on professional knowledge and skills	High Performing Workforce
Mission	Optimal purchasing of developments, products, goods and services	Purchasing Task Execution
Mission	Purchasing wants to achieve the highest possible contribution to the optimization of the results of SR in general	Surface Radar Satisfaction
Strategic Objective & Purchasing Objective 2008	Minimize total costs and risks with emphasis on cash management	Financial expectation of the BU-SR
Strategic Objective & Purchasing Objective 2008	Adequate and timely delivery	Needs and expectations of Internal Customers
Strategic Objective	Provide the right purchasing skills and experiences to business units	Purchasing Interaction
Strategic Objective	Explore purchasing markets and identify opportunities and risks	Purchasing Task Execution
Strategic Objective	Adequate supplier relation management	Purchasing Task Execution
Strategic Objective	Stimulate motivation and competencies of all Purchasing staff	High Performing Workforce
Strategic Objective	Adapt and improve purchasing activities, process and organization to a changing environment	Purchasing Task Execution
Purchasing Objective 2008	Dollar plan	Purchasing Task Execution
Purchasing Objective 2008	Improve supplier delivery performance	High Performing Suppliers
Purchasing Objective 2008	Implement supplier partner ships	Purchasing Task Execution
Purchasing Objective 2008	Elevation improvement program (Supplier Improvement Program)	Purchasing Task Execution
Purchasing Objective 2008	Improve usage of best suppliers in the Approved Vendor List	Purchasing Task Execution
Purchasing Objective 2008	Improve supplier performance	High Performing Suppliers
Purchasing Objective 2008	Implement soft vendor rating	High Performing Suppliers
Purchasing Objective 2008	Integration of Purchasing in SR	Organization Structure
Purchasing Objective 2008	Develop leadership and sub-contract management skills	High Performing Workforce
Purchasing Objective 2008	Steering and coaching outsourcing MPM	Purchasing Interaction
Purchasing Objective 2008	Sharing purchasing knowledge on a	Purchasing Interaction

	regular basis	
KPIs – Logistic dimension	Ability to meet operations schedule	Needs and expectations of Internal Customers
KPIs – Logistic dimension	Supplier delivery reliability	High Performing Suppliers
KPIs – Logistic dimension	Supplier cycle times	High Performing Suppliers
KPIs – Logistic dimension	Needed time for placing purchase order	Purchasing Task Execution
KPIs – Financial dimension	Program cost reduction against budgeted price & Program budgeted price	Financial expectation of the BU-SR
KPIs – Financial dimension	Integral cost reduction of purchasing department	Financial expectation of the BU-SR
KPIs – Financial dimension	Program cost reduction in negotiations	Financial expectation of the BU-SR
KPIs – Quality dimension	Quality of purchase file	Needs and expectations of Internal Customers
KPIs – Quality dimension	Percentage use of preferred suppliers & Spend with preferred suppliers	Purchasing Task Execution
KPIs – Quality dimension	Supplier reduction	Purchasing Task Execution
Extra KPI	Spend in dollars	Purchasing Task Execution

Appendix VI: Interview questions and Questionnaire (In Dutch)

Enquete: ' Bewustwording actuele performance positie'

Doel: Op een eenvoudige en snelle wijze bewust worden van meningen over de actuele performance positie van SR Purchasing NL.

Stakeholder groep:

Legenda
Strategische Belangrijkheid (B): 1 = Gering, 2 = Matig, 3 = Groot, 4 = Zeer groot en X = Geen mening
Actuele Prestatie (P): 1 = Slecht, 2 = Matig, 3 = Goed, 4 = Zeer goed en X = Geen mening

Deel 1: Noem de vijf belangrijkste factoren op, waarop volgens U inkoop goed moet presteren en geef ook aan hoe volgens U inkoop presteert op deze factoren.

Deel 2: Geef aan hoe inkoop volgens U presteert op de volgende factoren:	B	P
Strategie en Beleid		
de acceptatie van de belangrijkheid van inkoop door de andere bedrijfsfuncties?		
de acceptatie van de belangrijkheid van inkoop door het top management?		
het gebruik van een vast beleid en procedures bij het maken van een inkoopbeslissing?		
het ontwikkelen van een strategie per inkooppakket?		
het vaststellen van bestel- en voorraadbeleid?		
het aanpassen en verbeteren van inkoopactiviteiten, processen en de organisatie aan een veranderende omgeving?		
Organisatie en Personeel		
de inrichting van de inkooporganisatie?		
het toegang hebben tot informatie van andere bedrijfsfuncties?		
het participeren bij beslissingen van andere bedrijfsfuncties?		
het stimuleren van de motivatie en competenties van alle inkoopmedewerkers?		
het actief zoeken naar informatie ten behoeve van een **toekomstig** inkoopbeslissing (pro-actieve houding)?		
het functioneren van het inkoopmanagement?		
Informatie Systemen en ICT		
de beschikbaarheid van E-procurement oplossingen?		
het gebruik van informatiesystemen voor inkoop (Triton, Proquro, etc.)?		
het gebruik van informatietechnologie voor inkoop (Intranet, Internet, Mobility etc.)?		
Optimalisatie		
het pro-actief rekening houden met de lange termijn behoeften van inkoop?		
het gebruik van analyse technieken?		
het optimaliseren van het leveranciersbestand?		
het nemen van een besluit over inbesteden (zelf doen) of uitbesteden?		
het optimaliseren van product-/procesinnovatie en –ontwikkeling?		
het verbeteren van de leverancierspresteaties en het bewaken en vergroten van de kwaliteit?		
het toepassen van kostenmanagement door de gehele waardeketen?		

de kwaliteit van ingekochte goederen?		
de betrouwbaarheid van leveranciersleveringen?		
het onderzoek doen naar bestaande en nieuwe inkoopmarkten en het identificeren van kansen en risico's?		
het meten van prestaties en het continu verbeteren van prestaties?		
het verhogen van de productiviteit door het implementeren van 'lean projecten'?		
de hoeveelheid voorraad?		
de gemiddelde betalingstermijnen van Thales?		
het verbeteren van kwaliteit door middel van het bijhouden van het aantal defecten per item (vb. Fracas)?		
het op tijd en zonder problemen ontwikkelen van nieuwe producten?		
het rekening houden met kleine lokale leveranciers bij het inkopen?		
het gebruik maken van minder leveranciers?		
het efficiënt afhandelen van bestelaanvragen?		
het minimaliseren van de totale kosten en risico's van alle inkopen met betrekking tot ontwikkelingen, producten, goederen en, diensten met nadruk op 'cash management' (het effectief beheren van geldstromen)?		
jaarlijkse prijsreductie gebaseerd op contract prijzen voor zelfde of soortgelijke items (PACT)?		
het reduceren van materiaalkosten door middel van het verbeteren van ontwerp, proces, verpakking, enz.?		
Integratie & Interactie		
het ontwikkelen en managen van leveranciersrelaties?		
het integreren van leveranciers in het orderrealisatieproces? (het simplificeren, standaardiseren en synchroniseren van operationele processen)?		
het vroeg betrekken van geselecteerde leveranciers in de ontwerpfase?		
het gezamenlijk (afdelingen, leveranciers, business units, etc.) optimaliseren van de 'supply chain'?		
het gezamenlijk managen van risico's en kansen, gebaseerd op transparantie?		
het gezamenlijk delen van inspanningen op lange termijn (vb. demand organization)?		
het verbeteren van de kwaliteit door het vroeg betrekken van de inkoopafdeling bij de productontwikkeling?		
het verkorten van de tijd tot een product op de markt komt door het vroeg betrokken zijn bij de productontwikkeling?		
het reduceren van kosten door het vroeg betrokken zijn bij de productontwikkeling?		
Inkoopstappen		
de inkoopstap: 'Vaststelling van de behoefte'?		
de inkoopstap: 'Specificeren van de behoefte'?		
de inkoopstap: 'Leverancierssselectie'?		
de inkoopstap: 'Contracteren'?		
de inkoopstap: 'Bestellen'?		
de inkoopstap: 'Bewaken'?		
de inkoopstap: 'Evaluatie'?		
Interne Klant		
de interne klanttevredenheid?		
het leveren conform specificaties aan de interne klant?		
het leveren conform regels (sociale, milieu, export, etc.) aan de interne klant?		
het op tijd leveren aan de interne klant?		

Appendix VII: **Assignment of the emergent goals to KPAs of the P-BSC (In Dutch)**

Emergent goals	**Corresponding Area in P-BSC**
De acceptatie van de belangrijkheid van inkoop door de andere bedrijfsfuncties.	Purchasing Importance
De acceptatie van de belangrijkheid van inkoop door het top management.	Purchasing Importance
Het gebruik van een vast beleid en procedures bij het maken van een inkoopbeslissing.	Purchasing Task Execution
Het ontwikkelen van een strategie per inkooppakket.	Purchasing Task Execution
Het vaststellen van bestel- en voorraadbeleid.	Needs and Expectations of Warehousing and Distribution
Het aanpassen en verbeteren van inkoopactiviteiten, processen en de organisatie aan een veranderende omgeving.	Purchasing Task Execution
De inrichting van de inkooporganisatie.	Organization Structure
Het toegang hebben tot informatie van andere bedrijfsfuncties.	Purchasing Interaction
Het participeren bij beslissingen van andere bedrijfsfuncties.	Purchasing Interaction
Het stimuleren van de motivatie en competenties van alle inkoopmedewerkers.	High Performing Workforce
Het actief zoeken naar informatie ten behoeve van een toekomstig inkoopbeslissing (pro-actieve houding).	Purchasing Task Execution
Het functioneren van het inkoopmanagement.	Purchasing Task Execution
De mate van gebruik van E-procurement.	IT/IS Infrastructure
Het gebruik van informatiesystemen voor inkoop (Triton, Proquro, etc.).	IT/IS Infrastructure
Het gebruik van informatietechnologie voor inkoop (Intranet, Internet, Mobility etc.).	IT/IS Infrastructure
Het pro-actief rekening houden met de lange termijn behoeften van inkoop (forecasting, planning, leveranciersrelaties).	Purchasing Task Execution
Het optimaliseren van het leveranciersbestand.	Purchasing Task Execution
Het nemen van een besluit over inbesteden (zelf doen) of uitbesteden.	Purchasing Interaction
Het optimaliseren van product-/procesinnovatie en –ontwikkeling.	Purchasing Interaction
Het verbeteren van de leveranciersprestaties.	High Performing Suppliers
Het toepassen van kostenmanagement door de gehele waardeketen.	Financial Expectations of the BU-SR
De kwaliteit van ingekochte goederen.	Needs and Expectations of Internal Customers
De betrouwbaarheid van leveranciersleveringen.	High Performing Suppliers
Het onderzoek doen naar bestaande en nieuwe inkoopmarkten en het identificeren van kansen en risico's.	Purchasing Task Execution
Het meten van prestaties en het continu verbeteren van prestaties.	Purchasing Task Execution
De hoeveelheid voorraad.	Needs and Expectations of Warehousing and Distribution
De gemiddelde betalingstermijnen.	High Performing Suppliers
Het verbeteren van kwaliteit bij leveranciers door middel van het bijhouden van het aantal defecten per item (vb. Fracas).	High Performing Suppliers
Het op tijd en zonder problemen ontwikkelen van nieuwe producten.	Needs and Expectations of Engineering
Het gebruik maken van minder leveranciers.	Purchasing Task Execution
Het efficiënt afhandelen van bestelaanvragen.	Purchasing Task Execution
Het minimaliseren van de totale kosten en risico's van alle inkopen met betrokking tot ontwikkelingen, producten, goederen en, diensten met nadruk op 'cash management' (het effectief beheren van geldstromen).	Financial Expectations of the BU-SR
Jaarlijkse prijsreductie gebaseerd op contract prijzen voor zelfde of soortgelijke items (PACT).	Financial Expectations of the BU-SR
Het reduceren van materiaalkosten door middel van het verbeteren van ontwerp, proces, verpakking, enz.	Financial Expectations of the BU-SR
Het ontwikkelen en managen van leveranciersrelaties.	Purchasing Task Execution
Het integreren van leveranciers in het orderrealisatieproces? (het simplificeren, standaardiseren en synchroniseren van operationele processen).	Purchasing Interaction
Het vroeg betrekken van geselecteerde leveranciers in de ontwerpfase.	Purchasing Interaction
Het gezamenlijk (afdelingen, leveranciers, business units, etc.) optimaliseren van de 'supply chain'.	Purchasing Interaction
Het gezamenlijk managen van risico's en kansen, gebaseerd op transparantie.	Purchasing Interaction
Het gezamenlijk delen van inspanningen op lange termijn.	Purchasing Interaction
Het verbeteren van de kwaliteit door het vroeg betrekken van de inkoopafdeling bij de productontwikkeling.	Purchasing Interaction
Het verkorten van de tijd tot een product op de markt komt door het vroeg betrokken zijn bij de productontwikkeling.	Purchasing Interaction
Het reduceren van kosten door het vroeg betrokken zijn bij de productontwikkeling.	Purchasing Interaction
De inkoopstap: 'Vaststelling van de behoefte'.	Purchasing Interaction
De inkoopstap: 'Specificeren van de behoefte'.	Purchasing Interaction
De inkoopstap: 'Leveranciersselectie'.	Purchasing Task Execution
De inkoopstap: 'Contracteren'.	Purchasing Task Execution
De inkoopstap: 'Bestellen'.	Purchasing Task Execution
De inkoopstap: 'Bewaken'.	Purchasing Task Execution
De inkoopstap: 'Evaluatie'.	Purchasing Task Execution
De interne klanttevredenheid.	Internal Customer Satisfaction
Het leveren conform specificaties aan de interne klant.	Needs and Expectations of Internal Customers
Het leveren conform regels (sociale, milieu, export, etc.) aan de interne klant.	Needs and Expectations of Internal Customers
Het op tijd leveren aan de interne klant.	Needs and Expectations of Internal Customers
Het rekening houden met de integrale kosten.	Needs and Expectations ofAfter Sales
Het ontwikkelen van systemen a.d.h.v. een business model rekening houdend met techniek, kosten en time to market.	Purchasing Interaction
Het effectief communiceren tussen de afdelingen.	Purchasing Interaction
Het flexibel zijn in het afspreken van levertijden met de interne klant.	Needs and Expectations of Internal Customers
Het leveren van koopdelen met de juiste verpakking.	Needs and Expectations of Internal Customers
De mate van klantgerichtheid.	Needs and Expectations of Internal Customers
De mate van sterkte in commercie.	High Performing Workforce
De bezetting van het personeel.	Human Capital
De beschikbaarheid van 2nd source leveranciers.	Purchasing Task Execution
Het halen van schaalvoordelen met gunstige afbestelvoorwaarden door gebruik te maken van potentiele order intakes.	Purchasing Task Execution
Behoefte Naval Bids: Het rekening houden met off set verplichtingen bij het selecteren van leveranciers.	Needs and Expectations of Marketing and Sales
Behoefte Naval Bids: Het afdwingen dat grotere leveranciers zelfstandig offset invullen.	Needs and Expectations of Marketing and Sales
Het rekening houden met de hoogte van de dollar bij het selecteren van leveranciers	Purchasing Task Execution
Het delen van kennis	Purchasing Interaction
Het bijhouden van de inkoop parameters in het ERP systeem, zoals levertijden, prijslijsten, etc.	Purchasing Task Execution
Het rekening houden met overdekking.	Needs and Expectations of Warehousing and Distribution
De vakbekwaamheid van inkopers (vaardigheden en kennis).	High Performing Workforce
Het kwalifficeren van koopdelen.	Purchasing Task Execution
Het tijdig leveren van complete specificaties	Purchasing Interaction
Het onderzoeken van de klanttevredenheid	Internal Customer Satisfaction
Beschikbaarheid van inkoop informatie aan Nazorg	Needs and Expectations of After Sales
Lexus vrije systemen	Needs and Expectations of Marketing and Sales
Leveranciers Verbeterproject	High Performing Suppliers

Appendix VIII: List of KPIs from companies with outstanding PMSs in purchasing

Price/ Cost	▪ Target prices ▪ Cost reduction ▪ Rate of actual price change to market index rate of change ▪ Cost avoidance
Revenue	▪ Royalty revenues generated from supplier-buyer developed technology and patents initiated by purchasing/sourcing ▪ Supplier contribution as a reason for new business ▪ Return on licensing technology driven by purchasing/sourcing ▪ Number of patents that have lead to royalties ▪ Number of invention disclosure forms filed ▪ Number of patents granted ▪ Value of free samples from suppliers
Inventory	▪ Inventory turnover ▪ Dollar value of inventory ▪ Inventory value as a percentage of sale, COGS, budget, etc. ▪ Holding cost for inventory ▪ Inventory obsolescence cost ▪ Planned versus actual inventory ▪ Price protection ▪ Fill rate at line-item level ▪ On-time arrivals ▪ Inventory accuracy ▪ Number of consignment inventory programs / amount of inventory on assignment ▪ Number of supplier managed inventory programs
Availability	▪ Number of lines shut down by supply shortage ▪ To meet operations schedule ▪ To ramp up to meet customer initial demand ▪ To meet ongoing customer demand ▪ To meet internal client demand for complementary workforce ▪ To provide human resources in support of company service requirements ▪ To meet new technology requirements of new capacity ▪ Single source risk mitigation ▪ Supplier collaboration
Tech-nology	▪ Performance-against-date milestones for new supply systems in the NPI process ▪ Current estimated cost against target in NPI process ▪ Design for cost savings
Quality	▪ Percent and number of defects ▪ Defective parts per million (PPM) ▪ Percent and number of defect-free shipments ▪ Percent and number of complaint free materials received ▪ Customer quality incidents ▪ Factory quality incidents ▪ Dollars recovered from suppliers because of poor quality ▪ Percent of 'dead on arrivals' ▪ Impact/cost of defect ▪ External supplier survey results ▪ Internal customer satisfaction survey ▪ Quality system improvement ▪ Meeting human resource capabilities specifications for complementary workforce
Workforce	▪ Training hours ▪ Training plans met ▪ Internal morale and satisfaction survey ▪ Travel Costs ▪ Percent of team who are domain experts ▪ Percent of team staffed to plan ▪ Global commodity team functioning ▪ Leadership development pipeline ▪ Team measurement of team manager ▪ New employee survey ▪ Materials safety issues ▪ Employee attendance ▪ Employee completion of quarterly reviews ▪ Number of teams launched

Supplier	▪ Supplier quality ▪ Supplier delivery ▪ Supplier responsiveness/availability ▪ Supplier cost competitiveness ▪ Supplier technology and innovation ▪ Supplier cycle times ▪ Percent spend with preferred suppliers ▪ Company as a partner-of-choice survey with suppliers ▪ Availability risk ▪ Supplier capacity audits ▪ Supplier business continuity plans in place ▪ Supplier diversity ▪ Diversity spend, first and second tier ▪ Ramp-up readiness ▪ Performance against contract terms ▪ Supplier reduction ▪ Number of suppliers who are 'lean'
Operational	▪ Administration dollars to annual spend ▪ Administration dollars to headcount ▪ Number of purchase orders per headcount ▪ Number of international sites following internal rules and policies ▪ Number of negotiation plans approved ▪ Compliance with internal policies and processes ▪ Compliance with Sarbanes-Oxley requirements ▪ Contract price enforcement, contract price variance ▪ Audit results and severity of errors ▪ Payment terms in contracts ▪ Most favored customer clauses in contracts ▪ Not-to-exceed pricing in contracts ▪ Negotiation plans followed ▪ Approval rules followed ▪ Keeping pricing current in ERP database ▪ Errors caught by internal audit ▪ Number of certification surprises ▪ Maverick spend ▪ Spend in low-cost regions ▪ Strategic sourcing plans in place ▪ Benchmarks against external information ▪ Quality of contracts ▪ Shareholder representation on sourcing teams ▪ Audit time ▪ Project status ▪ Number of expired contracts ▪ Number of contracts – valid signatures ▪ Number of contracts – legal approval ▪ Number of contracts – spend authorization letter ▪ Number of contracts – supplier documentation ▪ Number of contracts – supplier diversity plan ▪ Dollars and percentage spend on Pos ▪ Dollar spend through reverse auctions by category ▪ Percentage of spend with preferred suppliers ▪ Spend by 'straight-through processing' ▪ Spend with top 10 suppliers ▪ Spend at suppliers by local, regional, global ▪ Spend with preferred suppliers ▪ Internal customer satisfaction ▪ PO cycle time ▪ On-time release of Pos/awards ▪ Quality of purchase file ▪ Aging of not fully defined contracts ▪ Internal customer satisfaction ▪ External customer performance assessment review ▪ Spend through reverse auctions ▪ Number of reverse auctions performed ▪ Value of reverse auctioned materials ▪ Savings from reverse auctions ▪ Volume e-catalog use ▪ Number of commodities mapped to UNSPSC

Customer Satisfaction	▪ Contract execution cycle time ▪ Contract satisfaction ▪ Contracting process satisfaction ▪ Contract pricing satisfaction ▪ Various measures of quality of goods/services provided ▪ Purchasing/client communications, responsiveness, and cooperation ▪ Purchasing knowledge and capabilities ▪ Overall procurement team performance ▪ Internal customer satisfaction surveys results ▪ External customer satisfaction surveys results