Timely integration of purchasing and R&D in the new product development process of Océ-Technologies b.v.

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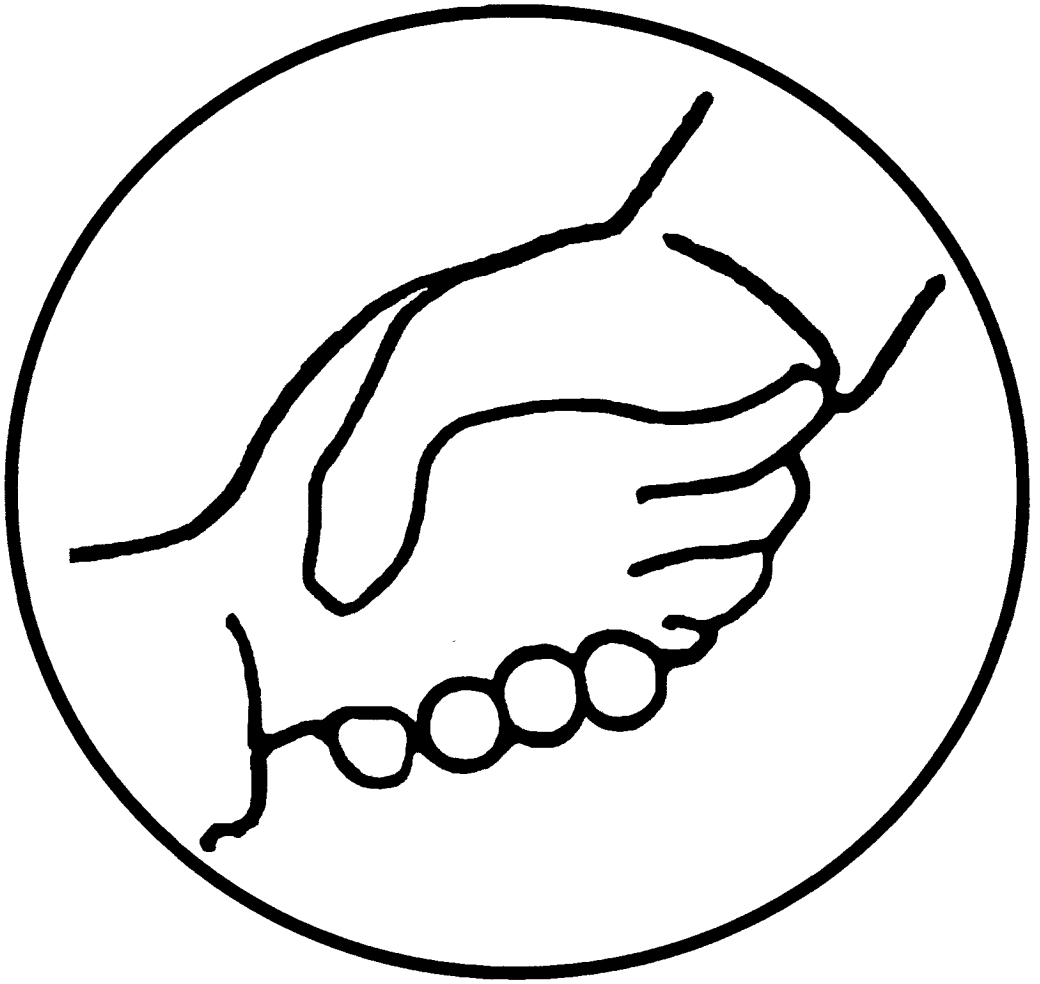

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Ron Heinen
December 2003

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Abstract

The goal of this study is to improve support and decision-making between R&D and purchasing in the NPD process. This goal has been fulfilled by identifying the right points in the NPD process to stimulate integration and proposing the selective use of three mechanisms: collocation, informal social systems, and joint reward systems.

Preface

This report presents my final thesis on purchasing – R&D integration in the New Product Development process. The study underlying this report was carried out from February till December 2003 at the Purchasing Consumables and Investments department of Océ-Technologies b.v. This study represents the final phase of my Industrial Engineering and Management Science study at the Technische Universiteit Eindhoven (TU/e).

The aim of this study is to provide Océ-Technologies b.v. with an in-depth insight into the improvement potential of timely integrating purchasing and R&D in New Product Development and mechanisms to tap into this potential.

I would like to thank the people of the Purchasing Consumables and Investments department - of which I have been part for the past months – for their support and fruitful discussions. A special thanks goes to Marc Janssen who has been my Océ supervisor for this study, and who gave me the freedom to shape the study to my own view. Also I would like to thank the members of the steering group for their critical comments and all of the interviewees who were willing to free up time to contribute to this study.

Next to all the people at Océ contributing to this study, I would like to thank Peter and Etienne for discussing the course of action in each of our study's, and Wendy for reading and commenting on my report. At the Technische Universiteit Eindhoven, I would like to thank Nicolette Lakemond and Hans van der Bij for their excellent supervision. Last but not least, thank you Ingrid for supporting me in this final academic undertaking.

Ron Heinen

Eindhoven, December 2003

Summary

Following the general market trends of fast and efficient New Product Development (NPD) and outsourcing, purchasing Consumables and Investments of Océ-Technologies aims at increasing its understanding of its required contributions to the NPD process. The initial problem definition that has been defined in consultation with Océ, is:

"Uncertainty exists as to the role of purchasing in early project phases and the way other departments perceive its role"

In order to answer this question, an orientation on the Océ organisation and the NPD process has been executed. This has provided a preliminary insight into the problems in the area of purchasing contributions to NPD.

Orientation

The NPD process that purchasing Consumables and Investments contributes to, concerns the development of the so-called Consumables. These subsystems of Océ products have some specific characteristics: they are critical for the functioning of the entire product, new applications of technologies are incorporated, and they often contain hidden specs. The hidden spec means that it is impossible to specify all matter that a material should not contain (pollution). The hidden spec makes it difficult to transfer information to suppliers, and may even prevent Océ from switching to a different supplier because specifications cannot be transferred.

In orientating interviews with purchasing, R&D, and project representatives, it appeared that the main problems with purchasing contributions to NPD concerns the fact that R&D receives insufficient support in the development phase (see figure 0.1 for an overview of the Océ NPD process). At that point, potential suppliers are searched for, and relations aimed at developing functionality are started with them. At this point in the NPD process - where decisions regarding suppliers are started -, there is no relation between purchasing and R&D.

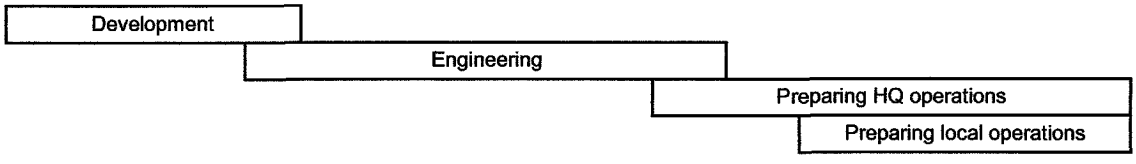

Figure 0.1 Phases of the Océ NPD process

Respondents from orienting interviews indicate that the insufficient purchasing support in development emerges from the fact that in that phase, purchasing is only involved indirectly (through the Manufacturing and Logistics project manager). There is no project structure in which purchasing is involved until the start of engineering. Due to the specific nature of Consumables, decisions are thus taken before purchasing is directly involved. Whereas there are some personal contacts between purchasers and R&D during engineering, there are hardly any contacts during development.

Problem definition

Using these results, the final problem has been defined in consultation with a steering group that has been established for this specific study (involving purchasing-, R&D-, and project management):

Current purchasing contributions up to engineering are solely focused on preparing purchasing activities in later phases. Purchasing lacks a focus on facilitating the development of functionality.

The overall goal of this study has been defined accordingly:

Define improvements to contributions of purchasing Consumables and Investments in development and engineering phases of the NPD process at Océ.

The focus of the study has been defined as to exclude supplier roles in NPD and leave out project phases other than development and engineering (which are led by R&D). Also, M&L disciplines and purchasing departments apart from purchasing Consumables and Investments are excluded, and only projects in which new Consumables are developed, are studied (no improvement projects).

In order to fulfil the overall goal in a structured way, five research questions have been defined:

1. What possible purchasing contributions to NPD should be considered;
2. How have these contributions been applied in Océ projects;
3. How do R&D representatives value purchasing's role in NPD;
4. What improvements are needed to purchasing's role in NPD;
5. How should the improvements be implemented in the Océ practice.

Below, these research questions are elaborated on.

Theoretical model

In order to provide a clear starting point for the analysis of purchasing in the NPD process, a literature review has been executed (research question 1, chapter 4). This literature review aimed at developing a model of purchasing contributions per phase of the NPD process. The model ensures that all potentially relevant purchasing contributions are taken into account (clearly, Océ might not be familiar with all potential purchasing contributions). The resulting model can be found in figure 4.4 on page 19. No such extensive research was available in literature.

In a feedback session with the steering group it was determined that the model not necessarily represents the exact situation of Océ. For that reason, it has not been applied to the Océ situation directly, but it has been used as a guideline for further analysis.

In-depth case analysis

The problem definition has been further analysed in a case study, using of the potential purchasing contributions from the theoretical model. The case study approach has been selected as it provides the possibility to analyse the problem without separating it from its environment (the project). The case has been defined as "the co-operation between purchasing and R&D in NPD", which is analysed within the context of two (sub) projects. To uncover problems that are inherent to the organisation (and not dependent on the time setting or specific attributes of a single project), two projects have been selected:

- the processdrum;
- the (Cobalt) printhead.

These are both multidisciplinary subassemblies at the core of new Océ products. The difference between both is the fact that the processdrum is analysed retrospectively (it was finished in 2001), whereas the printhead is currently being developed.

The case study interviews consisted of 33 theses that have been derived directly from the theoretical model. These have been propounded to 19 respondents from purchasing and R&D. First, their opinion whether purchasing had to take on the contribution was measured on a 5-point scale. Subsequently, their view on the application of that contribution in the project was measured on a similar scale and an explanation of the scores with examples from the project was asked. The respondents have fully co-operated in the interviews and all provided feedback on the elaboration of their interview. Research questions 2 and 3 have been dealt with in this way.

The results of the case study have been analysed and discussed in a feedback session with purchasers and the purchasing manager to uncover the major problem areas:
A. Purchasing is perceived as an obstacle in early development;
B. Lack of timely joint definition of supplier selection criteria;
C. No overview of past experiences with suppliers.
Figure 0.2 shows the phases in which these problems have occurred.

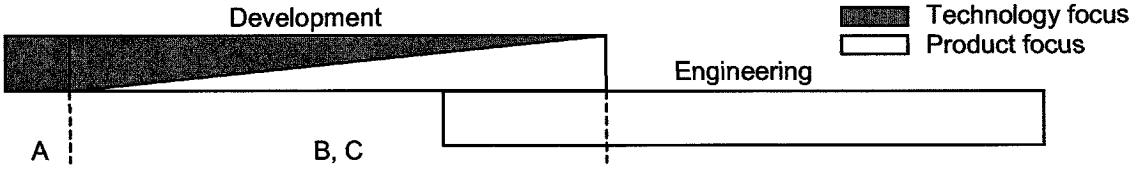

Figure 0.2 Indication of the timing of the major problems

Problem A concerns contacts between R&D and purchasing early in the development phase. As figure 0.2 shows, the focus here is entirely on developing functionality. Communication is limited to R&D sending ATB's (order requests) to purchasing for ordering test materials and parts. R&D expects purchasing to quickly deal with the administrative procedure involved. However, as R&D often agrees on the specifications with the supplier beforehand, they regularly send incomplete ATB's to purchasing. Purchasing subsequently contacts R&D for additional information (e.g. specifications), which R&D perceives as interference with their work and unwillingness to order from suppliers unknown to purchasing. A lot of time is spent on resolving these issues, leading to project delay.

Problem B occurs with the gradual shift in project focus from developing functionality to designing the final product. As mentioned just after the initial problem definition, Océ sometimes gets locked in with a supplier. This emerges from R&D co-operating with suppliers that have been selected on the basis of technological considerations only (so, without considering purchasing criteria). These are issues like the long-term financial solidity and its fit with Océ (e.g. can the supplier understand Océ's application). Later in the projects, a number of strategic suppliers appeared inappropriate from a purchasing perspective. Due to this, renewed supplier selection and joint development had to be done all over again with new suppliers (leading to extra costs and project delay).

Problem C refers to the lack of available information on supplier's demonstrated capabilities in previous and parallel projects. Whereas this has not led to clear problems, missed opportunities are assumed to exist. Respondents consider it essential that purchasing provides this information, but currently it is spread throughout the organisation.

Next to these major problems, some additional issues have been mentioned regularly in the case study interviews. These are issues that purchasing should pay attention to in NPD projects, but which have not led to major problems:
a. Provide open cost price calculations;
b. Facilitate communication between R&D and suppliers;
c. Challenge current suppliers to suggest alternatives for better functionality;
d. Encourage suppliers to suggest improvements.

As figure 0.2 clearly illustrates, the major problems occur in the development phase. The problems mentioned above arise from the lack of understanding and co-operation between purchasing and R&D in the phase where decisions are actually made and support is needed: development. In the projects, there appeared to be a lack of resolving differing interests and understanding each other's contributions in NPD.

Design

The case study has led to the conclusion that the causes of the identified problems lie in the lack of understanding and co-operation between purchasing and R&D. So, improvements should be targeted to improving the understanding (co-operation) between purchasing and R&D. Whereas initially the goal was to define purchasing contributions (writing down procedures), this does not tackle the causes of insufficient co-operation. For this reason the choice has been made to focus on designing mechanisms that improve understanding and co-operation (e.g. joint decision making when selecting suppliers).

As in purchasing literature, only little research has been done on integration mechanisms, marketing literature has been taken as a starting point. Here, a meta-analysis provides seven integration mechanisms, which have been compared with the fragmented findings from purchasing literature. For application in the Océ situation, the mechanisms have been evaluated based on their proven impact on integration, applicability to the Océ situation, and the improvement potential at Océ. Three mechanisms have been selected:

- collocation;
- informal social systems;
- incentives and rewards.

In early development, mutual understanding and open communication between purchasing and R&D need to be improved. The best mechanism to achieve this is the creation of informal social systems. As these do not emerge by themselves, temporary collocating (a) purchaser(s) with the R&D team is necessary to stimulate this (collocation 1 in figure 0.3). in order to judge what purchaser(s) will be collocated, and what purchasing contributions are required in a specific project, the purchasing manager should attend project kick-off meetings (see figure 0.3).

As later in the development phase, R&D and purchasing need to make joint decisions, they should be urged to jointly take on this responsibility. Evaluation of the integration mechanisms led to the conclusion that the most appropriate mechanisms is the creation of joint reward systems. In practice this means that purchasing and R&D jointly report to project management on supplier selection. As these decisions imply peak workload for identifying potential suppliers (collocation 2 in figure 0.3) and final supplier selection (collocation 3 in figure 0.3), purchasing and R&D should again be collocated temporarily.

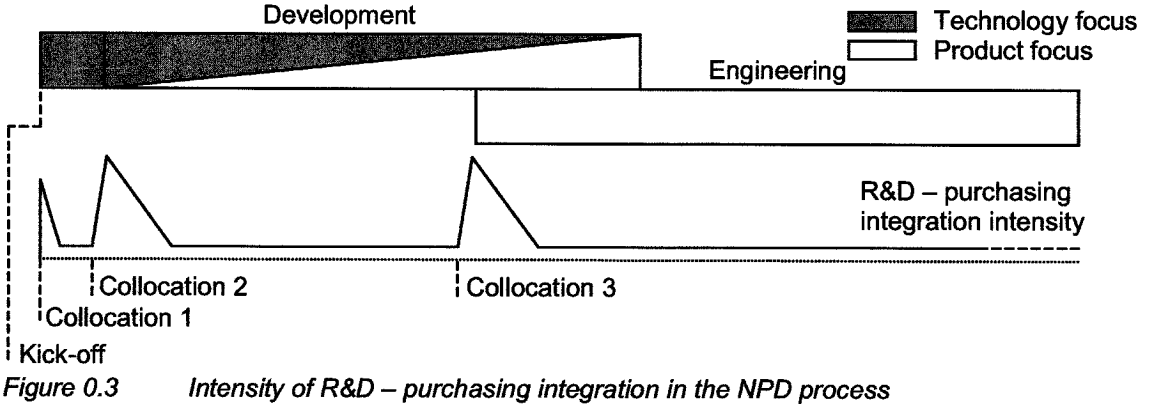

Figure 0.3 Intensity of R&D – purchasing integration in the NPD process

Implementation plan

In order to implement the design, the following steps need to be taken:

- formally invite the purchasing manager to project kick-off meetings;
- formally put purchasing and R&D jointly responsible for supplier selection;
- free up a number of desks in the project area to enable temporary collocation.

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Introduction

The title of this report – timely integration of purchasing and R&D in the new product development process of Océ-Technologies b.v. – reflects the outcome of this study. Integrating purchasing and R&D is no goal in itself. It is the conclusion after analysing purchasing processes from both R&D and purchasing perspectives. This analysis and the underlying model will be presented in the next chapters. Subsequently, the timing of applying mechanisms for achieving this integration and their implementation will be elaborated on.

The goal of this report is twofold. First, it should provide Océ-Technologies b.v. (where this study has been executed) with guidelines to improve future project performance by means of integrating purchasing and R&D in a timely manner. Additionally, it attempts to add to existing research by studying a broad range of purchasing processes in a coherent way. Previous researches have studied these processes in a rather fragmented way.

This report is of interest to all people at Océ-Technologies that are concerned with new product development (NPD) up to and including the engineering phase. Whereas purchasing and R&D representatives will find direct application of the results, other functions might benefit from the approach used to improve their processes in NPD too. Also, the report will be of interest to those at the Technische Universiteit Eindhoven (TU/e) who are engaged in research on purchasing involvement in NPD.

First, chapter 1 presents the initial assignment that has been defined in consultation with the manager of Purchasing Consumables and Investments, where the study has been conducted. Chapter 2 provides an orientation to the research context: Océ-Technology b.v. and its NPD process. Also, initial findings from orienting interviews will be presented. These form the basis of the final problem definition of chapter 3. Chapter 4 presents a model that has been based on previous researches. This model will be used as a basis of the analysis of chapter 5. This analysis leads to an overview of the major problems with purchasing processes in NPD at Océ-Technologies b.v. In order to solve these problems, in chapter 6 a number of integration mechanisms are identified and assigned to the point in the NPD process where they are needed. Subsequently, chapter 7 deals with prerequisites for implementing these mechanisms. Finally, chapter 8 reflects on the major findings and gives a final overview of the design.

Terminology that is specific for Océ-Technologies or new product development, is explained in the Glossary at the end of this report.

1 Assignment

In this chapter the research assignment is presented. Section 1.1 illustrates general trends that indicate the importance of research in the area of purchasing involvement in New Product Development (NPD). Next, the reason for Océ-Technologies to start this project in the same area is elaborated in section 1.2. Sections 1.3 shows the approach used for this study and the structure of this report.

1.1 General trends

As market pressures have been growing steadily during the past decades, the importance of introducing new products has increased. These market pressures range from the emergence of global competition, a higher rate of technological change, shortened product life cycles, and increased customer demands [6,7,9,17,34,35,38]. To compete under these pressures, the importance of fast *and* efficient New Product Development (NPD) has increased dramatically.

To achieve a timely introduction of a new product to the market, manufacturers have focused on "things they do best": core competencies. This again has to do with the increasing speed of technological change, as no single company can excel in all technological areas that are incorporated in new products [28,31].

By focusing on their core competencies, manufacturers have outsourced large amounts of their production. This has increased purchasing share in total product value from 30% to around 60% in a few decades. For electronics and automotive manufacturers, this figure currently even rises up to 80% [7,37]. Not only do manufacturers outsource large parts of production to suppliers, but even the development of entire subassemblies. Obviously, this has led to a reduced knowledge of these components at the buying organisation. For innovations on existing products and the development of new ones, a manufacturer has now become dependent on its suppliers to a large extent [6,7,24].

When combining the trend of outsourcing with the increased importance of NPD, it becomes clear that purchasing should play an important role in NPD [7,12,39,40]. That this currently goes further than just reducing costs, as to include innovations from supply markets and fulfilling end user needs, will become clear in chapter 4.

1.2 Océ research background

At Océ-Technologies, awareness of the increased importance of purchasing involvement in NPD has risen too. There are two main reasons for this (renewed) attention for NPD.

First, at the end of 2002 a new NPD project model has been introduced that sets clear milestones for each project phase. As a result of this recent change, the contributions of all functions (including purchasing) at the milestones should be formalised.

Second, in the past ten years some personnel changes have occurred in purchasing management. This has led to changes of purchasing focus concerning NPD. Whereas until 1997, NPD took an important position in purchasing activities, from that year on, purchasing took a pure commercial focus and neglected its role in NPD. The most recent change in purchasing management stems from 2001-2002. A new purchasing director, as well as a new manager for purchasing Consumables and Investments again put NPD projects in the centre of attention.

Also, in the past three years the purchasing organisation has been restructured [44]. All purchasing activities were placed under the responsibility of one purchasing director.

As current purchasing management wants to improve purchasing involvement in early (R&D) phases of NPD, clarity is needed as to the desired purchasing roles. Proving added value of purchasing to the development teams is regarded essential, as purchasing is dependent on R&D to become involved in a project.

For reasons mentioned above, the manager of Océ purchasing Consumables and Investments has started this project with the following initial problem definition:

"Uncertainty exists as to the role of purchasing in early project phases and the way other departments perceive its role"

This initial problem definition will be adapted (if needed) after a first orientation on the problem area. The approach to this orientation and the subsequent steps to be taken is given in section 1.3.

1.3 General approach and structure of the report

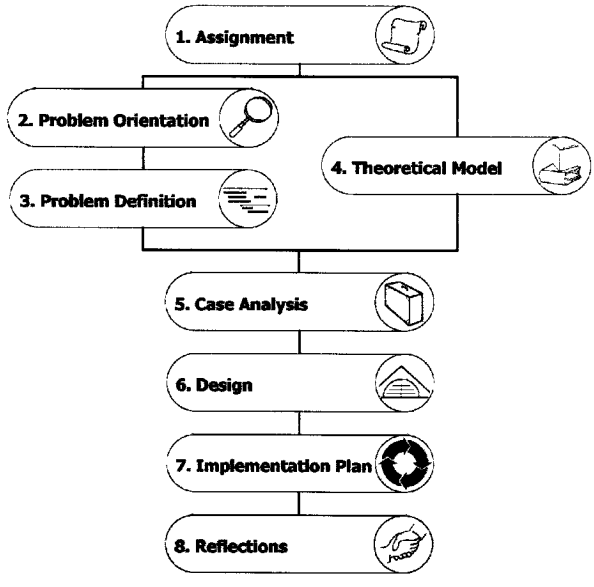
in general, three main phases have been identified in this study. After the orientation in chapter 2, the approach for the remaining phases will be discussed more in-depth. The three overall phases are:

- Orientation;
- Analysis and design;
- Implementation.

The orientation phase provides input for decisions on the direction of further research. This is presented in chapter 2, which has been based on desk research and interviews (which have been structured using Emans [13]). Subsequently, the final problem definition and the approach for the remainder of the study will be elaborated in chapter 3.

The analysis and design phase forms the core of this study. First, previous researches on purchasing and NPD are analysed to set up a theoretical model (chapter 4). Using that model as a basis, in chapter 5 the analysis of two projects is presented. This leads to a design for improving purchasing involvement in NPD which chapter 6 presents.

Finally, chapter 7 shows a plan for implementing the results of chapter 6. As implementation largely depends on the organisation where the study is executed, this phase will be dealt with to a limited extent. A final wrap up of the results and suggestions for further research are given in chapter 8.



The project not only has an impact on purchasing, but on R&D and the project organisation too. Also, a process perspective on NPD is taken (rather than a functional perspective on purchasing). Due to these reasons, it is considered insufficient to have company supervision solely by the purchasing manager. For this reason, a steering group has been formed involving R&D heads from the two major project phases and project leaders from R&D and M&L (which will be elaborated in section 2.2). Appendix 1.1 shows the names of the steering group members.

In the remainder of this report Océ-Technologies will be referred to as "Océ".

2 Problem orientation

This chapter provides an overview of the company where this study has been executed, Océ-Technologies b.v. It is part of the Océ N.V. organisation that will be described in section 2.1. Subsequently, section 2.2 focuses on Océ-Technologies b.v. The process that is in use for developing new products is given in section 2.3. Finally, section 2.4 explores problems and areas for improvements in the selected research area.

2.1 Océ strategy

As stated in the Océ N.V. annual report [27], "Océ helps companies control their document flows, within the enterprise and to the outside world". To achieve this, Océ offers a range of professional hardware (printers, copiers, scanners), software (document management, archiving) and services.

Whereas Océ has focused on manufacturing office equipment in the past, during the 1990's pressure increased on prices of office equipment. An explanation for this is the maturity of the market and thus emphasis on price competition. Large manufacturers like Xerox, Canon and Ricoh could offer lower prices because of economies of scale in mass manufacturing [19]. Instead of choosing to invest in these markets, Océ decided to change its strategy and focus on professional markets with their specific requirements. This has condensed to a new structure for the Océ organisation at the end of 2002, consisting of two Strategic Business Units (SBU):

- Digital Document Systems (DDS), serving print markets that require high volumes and speeds, such as newspaper printing and copy shops
- Wide Format Printing Systems (WFPS), serving markets that require wide format printing, such as engineering offices, and exhibition constructors

As Océ focuses on these "high-end" markets, it is insufficient to make use of generally available technologies. For this reason, Océ N.V. has its own organisation for developing new technologies and products: Océ-Technologies b.v.

Client-specific services and software currently represent around 65% of turnover. This is expected to increase to 80% by 2005 [27]. However, hardware still forms the core of these products. Next to software and services, maintenance of this hardware is a third cornerstone that determines Océ profit.

2.2 Océ-Technologies organisation

The strong technology oriented background of Océ is reflected in the magnitude of the Océ-Technologies organisation with 1.950 people active in Research and Development (R&D) and around 2.800 in Manufacturing and Logistics (M&L). The largest part of Océ-Technologies is located in Venlo, the Netherlands. Océ has a matrix organisation in place, which means that people from (functional) disciplines are assigned to projects. Figure 2.1 shows the functional axis of the Océ organisation.

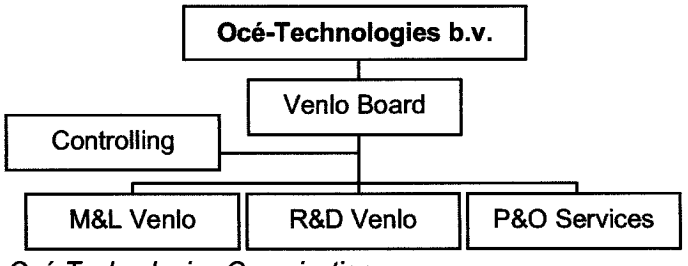


Figure 2.1 *Océ-Technologies Organisation*
Based on: Océ Venweb intranet site 18/11/03

R&D is the part of the Océ organisation that is responsible for developing new technologies and products that incorporate these. The main R&D departments for NPD are Research (GRT), Development (DV) and Engineering (EP, ME, EI). The Research department provides new technological possibilities without being focused at specific development projects. The Development (mainly physicists and chemists) takes this as a basis for application in new products. Engineering (various technical disciplines) elaborates on the work of DV to construct a product that meets (time, cost, quality) targets. An overview of the R&D organisation is shown in appendix 2.1.

M&L handles the purchasing, production and delivery of Océ hardware. Its main function is not production, but the "orchestration" of processes to generate Océ products. Illustrative for the high degree of outsourcing is the fact that only 5% of manufacturing activities is actually executed by Océ itself [27]. Only Consumable production and final assembly are done in-house as Océ considers these too critical and specific to outsource. As production of Consumables requires different competencies than assembly (namely clean-room production), different parts of the M&L execute this: M&L Consumables and M&L Machines. An overview of the M&L departments is shown in Appendix 2.2.

One of the departments of the M&L Organisation is Purchasing Consumables and Investments. As this study has been initiated at this department, the following section will describe its focus and activities. The other departments of M&L will not be elaborated as they are outside the scope of this report.

2.2.1 Purchasing Consumables and Investments

At Purchasing Consumables & Investments the tactical purchasing of all parts, materials and production equipment is done for the so-called "Consumables".

Historically, Consumables are products such as toner and OPC (organic photo conductors). The name stems from the fact that Consumables are consumed during the use of a product. A characteristic for these products is their chemical background (and the same goes for Océ as a whole, see appendix 2.3). For Océ, the Consumables are of vital importance as they incorporate large part of the quality and specificity of the Océ technologies. For example, the OPC determines the sharpness of a copy to a large extent (appendix 2.4).

Whereas new Consumables have become multidisciplinary subassemblies, their chemical background is still obvious. This is illustrated by the processdrum, which is the most important strategic development of Océ in the past ten years (exhibit 2.1).

Exhibit 2.1 Processdrum

The so-called processdrum is the heart of the new colour technology, which took Océ more than ten years to develop. In the processdrum thousands of individual tracks can be controlled electronically and be developed with toner (ink powder). With the drum, constant quality of prints is guaranteed, it is environment friendly and requires less service costs and ink.

Océ M&L director, N. Koole cited: "Océ only produces the processdrum itself, the heart of the printer. The frame for the printer is delivered all ready by suppliers. We only build in the processdrum. This we keep in-house, just like the production of toner, as these are strategic components."

Source: Dagblad De Limburger 22/8/01[11] See also: Appendix 2.5

As should be clear from the processdrum example, Consumables nowadays are not necessarily consumed during use (in contrast to, for example, toner). The name currently indicates that the parts are produced by M&L Consumables, of which purchasing Consumables and Investments is a part.

Whereas Océ outsources largest part of production, this is not true for Consumables. For example, Océ itself adds around 50% of the total value of a processdrum. The main reason for this is the fact that these require very specific processes and Océ wants to protect from "piracy" by mass producers. So, Océ does large part of the development and final production of Consumables in-house. However, the goal of Océ is to outsource as much as possible to suppliers that have their core competencies in a key area of a Consumable (high level outsourcing). This is illustrated by the fact that suppliers that Océ uses for Consumables development and production, are mostly bottleneck or strategic suppliers [37, 47]. This means that they have a high impact on the final product and respectively low and high impact on total product costs. Therefore, purchasing plays a very important role as an interface between Océ and its suppliers.

As ordering is either automated or handled by the Logistics department, Purchasing Consumables and Investments only deals with initial purchasing (determining specifications, selecting suppliers and contracting) [37]. Four purchasers in total deal with these activities for Consumables. In addition to this, two purchasers within the same department handle the purchasing of investment goods for R&D, and production. In the purchasing Quality Management System [48], the objective for purchasing is defined as:

"(purchasers) have to be informed about the actual developments in the supply market and have to be the ears and eyes of other departments. Co-operation with others is key. Working together with R&D for instance and involving suppliers in product development is a key task with which we ensure the availability of specific supply market know-how."

The above quotation shows that purchasing can be seen as an internal service provider of supply market information to the other departments. Also, whereas purchasing is connected to M&L, its co-operation with R&D in product development is mentioned explicitly.

2.3 Océ project organisation and NPD process

As the central problem concerns the NPD process, figure 2.4 shows the recently introduced NPD process that is in use at Océ. Appendix 2.6 shows the extensive model.

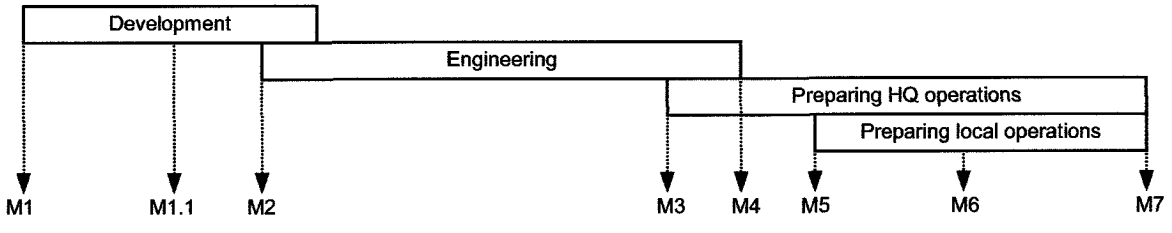


Figure 2.4 *Phases and milestones of product development projects at Océ*
Source: Océ Horizon project manual [46]

In this project phasing, goals are defined per milestone (M1 through M7). Below, a short overview is given of the activities in each phase. For more detailed information on the deliverables at each of the milestones, see appendix 2.7.

Development
At M1, a multidisciplinary Project Committee (PC) is installed to lead the project. Under the PC, R&D (mainly developers, DV), takes the lead of the project. In this phase, the functionality for the new product is elaborated, which means that the application and interaction of technologies is studied. A first prototype is built to prove product functionality. Toward M2, engineers become involved to develop a second prototype together with developers. M&L disciplines (quality assurance, purchasing, and logistics) are involved at M1.1 to ensure producibility of the new product.

Engineering
In this phase, the individual subsystems, parts and materials are selected (for standard parts) or specified and tested (for new parts). This is done in such a way that the resulting product satisfies the functionality that has been defined during development. Thus, engineering is much more focused at final project targets of time, quality and cost whilst preserving functionality.

Preparing HQ operations
From this stage on, M&L gradually takes the lead of the project. The technical product documentation is transferred to M&L, which allows them to start investing in production equipment and training. From M4 on, product tests at customer sites are started.

Preparing local operations
Introduction of the product at the OPCO's (sales organisation) is started.

As figure 2.4 shows, there is an overlap between subsequent project phases. This facilitates the transition to the next phase, which usually requires new functions (and new people) to become involved.

As mentioned in section 2.2, Océ has a matrix organisation in place, meaning that people from the functional organisation are assigned to the project organisation. The project organisation structure is shown in figure 2.5.

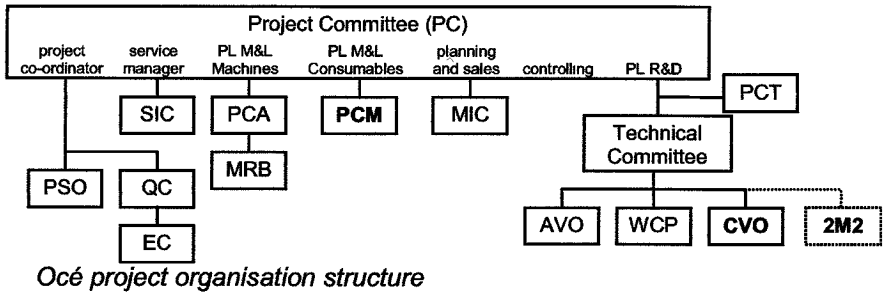


Figure 2.5 *Océ project organisation structure*
Source: internal presentation on project organisation

The building blocks of this model represent regular project meetings. To improve purchasing roles in the NPD process, these should be dealt with in one of the meetings in this model. The meetings in which purchasing Consumables is involved are bold-faced: the Product Committee Materials (PCM), the Consumables Progress Meeting (CVO), and the 2M2 (a newly introduced early project meeting for the Cobalt project). The other abbreviations will be explained when necessary. The main responsibilities of the various project levels are given below.

The PC is the actual cross-functional team that is in charge of the project from start to finish. Here, the M&L project leader (PL) represents (among others) purchasing, Quality Assurance and logistics. The PC does not interfere with decision making of a technical nature, but controls the project budget and timetable. The meetings shown under the PC report to it biweekly.
A project is usually split up into various subsystems which are all overseen by a "function responsible" (FV). The function responsibles for these systems meet in the Technical Committee (TC) where the interaction of the subsystems is discussed. The actual product development work is done under supervision of the FV. To enable cross-functional discussion on (technical) product issues (e.g. purchasing), a number of meetings have been defined. These are shown under the TC.

For the Cobalt project, the 2M2 meeting has been started toward M1.1. This is a biweekly meeting with six R&D and three M&L members (purchasing, production, and equipment engineering). Here, the decisions of the TC are prepared by considering the various perspectives to the project. In contrast, in the CVO only operational issues are discussed,

like the progress of a supplier in meeting the targets set. The CVO is not started until the start of engineering. Finally, when the transition to production is ongoing, the CVO is disbanded. Subsequently, the PCM meetings are started so M&L disciplines can provide input to production.

This description of both the functional and the project axis of the matrix organisation at Océ shows that this approach to projects leads to complex interactions between M&L and R&D disciplines.

2.4 *Preliminary findings*

This section describes the results of the orientation phase of this project. The problems in the area of purchasing involvement in NPD that have been mentioned in the interviews will be elaborated here. These orienting interviews have been held with R&D, project management and purchasing representatives. The interviewees, their function, and the topics dealt with are shown in appendix 2.9.

2.4.1 Main problems

The orienting interviews indicated that purchasing insufficiently supports the project team during development and engineering in dealing with supplier relations (finding and evaluating possible suppliers, facilitating contact between R&D and suppliers). Whereas purchasing becomes involved before the start of engineering, their activities are solely focused at preparing purchasing activities in later phases. Purchasing focus on facilitating the development of functionality is lacking.

First, this forces R&D to search for suppliers by themselves, solely based on technological considerations. This has regularly led to ending up with a supplier that does not satisfy purchasing criteria (which are usually more focused on the long term: reliability, financial stability). Second, the project might miss out potential suppliers with which purchasing has experience from previous or parallel projects. Because for Consumables, tight supplier relations are started in the development phase, this problem mainly arises in this early phase of NPD.

Exhibit 2.2 Examples of the main problems

For transferring data to the processdrums in the CPS700, slip ring technology was applied at some point in the project. This slip ring had to be used, as the drums rotate. The supplier who had been selected (without purchasing involvement) supplied these components to tram manufacturers. As this is a totally different market than copiers, the copiers that Océ had already sold had to be repaired due to bad functioning. During the regular production phase, a new supplier (which did fit with Océ as a customer) was selected.

For the connection of hardware and software in a new production process, the development team had issued specifications for purchasing to search for a supplier. Because the project approached the end of engineering, there was a lot of time pressure on purchasing. As a result, a supplier was selected who in the end appeared not to have sufficient knowledge for this application. Little later, the team encountered a supplier from a different part of the same project who did appear to satisfy the needs, even at much lower costs. If purchasing had been involved earlier, more time would have remained to find the right supplier the first time.

Before the actual start of an NPD project and during the development phase, R&D uses materials and prototype parts to quickly explore technological possibilities. As some development employees mentioned, "you do not exactly know yet, what you're looking for". In this phase, R&D needs to "get past" purchasing to order test materials, parts and equipment, whereas the R&D team-budget is concerned. In this way, purchasing hinders R&D from quickly exploring possibilities, as they first evaluate the supplier in terms of long-term possibilities.

Source: interviews (for participants, see appendix 2.9)

As there is no formal project structure in which purchasing is represented during the development phase, purchasing can only provide input before the engineering phase through personal contacts. So, only if there are personal contacts between R&D representatives and purchasers, R&D will find the right purchasing contacts. A structure that was used to provide R&D with purchasing support in early phases was the "procurement engineering" initiative (exhibit 2.3).

Exhibit 2.3 Procurement engineering

As R&D has a lot of interaction with suppliers in pre-project and early project phases, two procurement engineers had been installed. These operated as a staff function under the purchasing department. The procurement engineers created "entry points" with suppliers, so R&D could focus on technical discussions. To do this, the procurement engineers spotted technological possibilities in supply markets.

With the procurement engineers, R&D had a clear "window" for their supply issues. Because it was clear to R&D who to approach, they formed an obvious contact toward purchasing. The procurement engineers also served as a memory of past experiences with suppliers.

The main problem with the procurement engineers was the fact that the link with purchasing activities in later phases was too weak to tune activities in early- and pre-project phases to activities in engineering and industrialisation phases. For this reason, the procurement engineering initiative has been stopped.

Source: interviews (for participants, see appendix 2.9)

Purchasing Consumables in general works according to the ODS400-C (M&L) standard, which defines the involvement of M&L disciplines in the NPD process (appendix 2.10). Here it is stated that purchasing should be involved from the engineering phase on (former phase 3, see appendix 2.8). Due to the fact that purchasing works according to this standard, it is not fully known to purchasers what project teams expect them to do in the development phase. The fact that purchasing focuses on contributing from the engineering phase on is confirmed in exhibit 2.4.

Exhibit 2.4 Purchasing project approach

Some of the activities that purchasing representatives have defined for their deliverables at the first three milestones are shown below:

M1.1	action plans to realise M2 (cost targets set, cat. 1 items defined: cost and risk reduction, make or buy: plans for final decision ready)
M2	cost estimations and risks clear, indication of continuity risks, action plans (selection of cat. 2/3/4 suppliers, ESI)
M3	risk assessment of actual cost versus target, and of continuity risks for selected suppliers

Source: purchasing project manual [45]

So, whereas in practice purchasing has moved upstream in the NPD process (being involved earlier than the ODS400-C standard defines), its upstream activities are focused on preparing purchasing activities in later phases. This means that purchasing is aimed at reaching cost and reliability targets (risk reduction) with preserved functionality (exhibit 2.4). In contrast, the development phase is aimed at developing functionality (which is insufficiently supported by purchasing, as was illustrated at the start of this section).

2.4.2 Factors influencing the main problems

A factor that makes it even more crucial for purchasing Consumables to become involved early in the NPD process is the so-called "hidden spec".

The hidden spec means that it is possible to specify what materials (and its concentrations) should be included in a product, but it is impossible to specify all of the materials that should not be included (pollution). Consumables thus can never be specified to the full extent (which would be ideal for outsourcing purposes, and is

common in mechanics and electronics). This leads to increased importance of the purchasing perspective in the development phase, as then the functionality of a Consumable is developed in co-operation with suppliers.

Exhibit 2.5 Early co-operation with suppliers

As Océ wants to outsource the assembly of a complex part of the Cobalt printhead (the actuator), a partner has been selected to take over this activity. Océ currently develops parts for the actuator in close co-operation with suppliers. As the final assembly operation contains some chemistry, it cannot be specified entirely (hidden spec). For this reason, the supplier that will do the final assembly of the actuator has already started assembly tests on-site for Océ (before the start of engineering). This supplier will also build and operate the final assembly line.

Source: tour through prototype production facility

The existence of the hidden spec has been elaborated by Beers [4], and has been conformed by chemical engineers within R&D and purchasing.

Also, each Consumable is based on technologies that are new to Océ. For this reason, they are developed in co-operation with suppliers. The purchasing strategic plan [47] shows that 80% of all suppliers fall into either the strategic or the bottleneck segment. As the technology, as well as the product is entirely new, Océ has to deal with a high degree of uncertainty (new task situation [37]). Due to the high level of uncertainty, extensive cross-functional problem solving is required [37], pointing to a need to involve purchasing from development on.

Despite of these problems, it should be clear from the fact that a new purchasing project manual has been drawn up and this study has been started, that purchasing Consumables starting to focus more on adding value to the entire NPD process.

3 Problem definition and methodology

The preliminary findings from the orienting interviews in the previous chapter have been presented to the steering group that has been formed for this project. This has led to setting a final problem definition and roughly defining a route for the rest of the project. This is shown below. Section 3.1 presents five main research questions and the approach used to answer each question. Section 3.2 shows the coherence of the various activities needed to answer the research questions.

Following the responses presented in chapter 2, the final problem has been defined in a discussion with the steering group:

Current purchasing contributions up to engineering are solely focused on preparing purchasing activities in later phases. Purchasing lacks a focus on facilitating the development of functionality.

The main problem concerns the joint decision-making process between purchasing and the R&D team. This is illustrated by the problems that occur with final supplier selection (see exhibit 2.2). It has become clear that selected suppliers in the end appear not to have sufficient "fit" with Océ (e.g. with a focus on high volume market segments). With joint decision making between R&D (technological issues), purchasing (long-term relation) and other disciplines (e.g. quality assurance and logistics), these problems would have been prevented.

As the focus of this project is on the relation between purchasing and R&D, the central goal of this study condenses to:

Define improvements to contributions of purchasing Consumables and Investments in development and engineering phases of the NPD process at Océ.

3.1 Structure of the study

This section elaborates on the approach for the remainder of this report. The goal is to describe the assignment in terms of research questions with a clear goal and methodology.

6. *What possible purchasing contributions to NPD should be considered*

Next to the problems and improvements that have been identified in chapter 2, there may be contributions that are currently unknown to Océ. As the goal is to uncover all main problems with purchasing contributions to NPD, first an understanding will need to be created as to the possible purchasing contributions to NPD (chapter 4).

As a lot of research has been done in both areas of NPD and purchasing, literature review seems the best approach. It provides a reliable and fast way to collect information. A potential drawback of applying this method is the fact that the circumstances of the source studies might differ from the target environment [36]. For this reason, the results from the literature review will not be applied directly to the Océ situation, but will be used as a guideline for further analysis (in chapter 5).

7. *How have these contributions been applied in Océ projects, and*
8. *How do R&D representatives value purchasing's role in NPD*

After an overview of purchasing contributions has been developed, the link with the Océ situation should be established. This is done by means of analysing the actual problems that have occurred with potential purchasing contributions in NPD projects (chapter 5). As the analysis cannot be done outside the context of specific projects, the case study

approach seems the best way to answer these research questions [42]. It allows a study that retains the holistic and meaningful characteristics of real-life events [7]. The case thus is the co-operation between purchasing and R&D, with a number of projects as entities of analysis. Yin [42] supports the choice for first executing a theoretical orientation (question 1), as it provides an explanation of key issues and highlights issues that require special attention.

As the research questions show, the case study should shed light on the actual course of action in Océ projects, but also on the opinion that R&D representatives hold on purchasing roles in the NPD process. After all, their opinion is key because R&D is the "internal client" of purchasing (as the purchasing Consumables and Investments manager indicated). For this reason, representatives of purchasing and R&D (development and engineering) will be interviewed on the actual events in the projects (2) and their personal opinion (3). To increase reliability of the study, multiple respondents from each function have been interviewed. A more detailed description of the case study and its results is presented in chapter 5.

Some other approaches have been considered for doing the in-depth analysis: observation and analysis of documentation (e.g. meeting reports, evaluations). However, as many people are involved in a single project (around 40 for the printhead), observation is impractical. Also, little documentation on the selected cases is available, as the scarce resources that exist are unavailable due to reasons of confidentiality.

In order to make an in-depth analysis of the extensive projects that Consumables are, only a limited number of projects can be studied. As it is considered essential to include a recent project (to reflect the current situation), the printhead of the Cobalt project is the first entity to be analysed. The printhead is a very critical, multidisciplinary part that forms the core of the new inkjet printing technology that Océ currently develops.
Not only recent problems, but also problems that are inherent to the way of working at Océ, are of major interests. So, a second – retrospective – project has been searched for that is comparable to the Cobalt printhead (to exclude any differences due to technological inconsistencies). In consultation with the Océ supervisor, it has been determined that this will be the processdrum (see appendix 2.5), which has been developed between 1990 and 2001.

9. What improvements are needed to purchasing's role in NPD

Based on the case study outcomes and purchasing's reaction to these, a design will be made that deals with solving the main causes of the problems from the case study. This design will be presented in chapter 6.

As they are supposed to work with the final results, the results of the case will be discussed with the manager and the project-oriented purchasers from purchasing Consumables and Investments. This way, decisions on changes in purchasing's will be made, that are supported by the end users. For example, the purchasers may feel that they cannot influence all of the improvements that are suggested by R&D.

As chapter 6 will show, it is considered insufficient to just define the contributions that purchasing should implement in the NPD process. In order to enable Océ to improve the co-operation between R&D and purchasing, a number of integration mechanisms will be defined.

10. How should the improvements be implemented in the Océ practice

Finally, the design should be implemented in the Océ practice to actually change the role of purchasing in NPD. The most important aspect of implementation is to communicate the results to the decision-makers for new projects (purchasing management, R&D management, project management). Also, the interviewees need to be posted of the

results, so they will learn the reasons for changing the way of working with purchasing. Chapter 7 shows the elaboration of the implementation plan.

As the research questions still leave quite some room for digression, the following demarcation has been defined:
- As the focus is on co-operation between purchasing and R&D, the role of suppliers in the NPD process is not included;
- Only the R&D-led phases of NPD are taken into account, as here the main problems are expected. As noted in section 2.4.3, supplier selection for Consumables is largely determined in the development and engineering phases;
- The role of M&L functions other than purchasing (e.g. Quality Assurance, Logistics) will not be studied;
- Purchasing departments other than purchasing Consumables and Investments will not be included to provide sufficient focus on the specific situation;
- Projects other than Consumables that incorporate new technology will be disregarded (e.g. improvements to existing products).

3.2 Research model

Figure 3.1 shows the steps that are to be taken to realise a design that improves purchasing's role in the NPD process. The model serves as a guideline for the entire study. This does not mean that it is a project plan with sequential steps, but more of a thought model, allowing iterations (unlike the model in section 1.3)

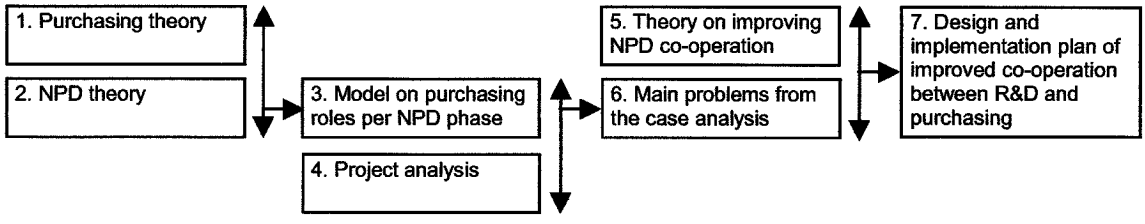


Figure 3.1 *Research model*
Based on: Verschuren en Doorewaard, 1995 [36]

Roughly speaking, chapter 4 deals with building blocks 1,2 and 3. In building blocks 1 and 2, purchasing and NPD literature is studied respectively. From this, a theoretical model has been developed (building block 3). Block 4 represents the project analysis. Block 6 relates to the results of the project analysis, which will be presented in section 5.6. Finally, block 7 represents the design and implementation plan that should be used for solving the main problems (chapter 6). As the design requires additional expertise, literature on improving co-operation in NPD is included in block 5 (section 6.3).

The model in figure 3.1 defines the main steps to be taken in order to build the design. As mentioned in section 1.3, an implementation plan will be set up in order to implement the design. However, as the implementation is up to Océ to implement, it has been left out of the research model.

The steps in the research model will be illustrated at the start of each chapter, so the reader can easily link the chapters together, and major choices in the transition to the next building block become clear.

4 Theoretical model

This chapter presents the results from a literature review that has been set-up to provide a thorough understanding of the possible purchasing contributions to NPD (research question 1). It aims at constructing a model that assigns possible purchasing contributions to individual phases of NPD. For literature on both areas, the Science Direct and ABI/Inform Global journal databases have been used. Next to this, references from articles and subject-related journals have been used. Literature review seems the right approach for answering these research questions, as the separate research fields of purchasing and NPD have been researched thoroughly before.

4.1 Introduction

Previous research shows that, in order to influence decision making in an NPD project, early involvement is key. Figure 2.1 shows that when (technical) specifications are already determined, only minor influence on the product design is still possible [6].

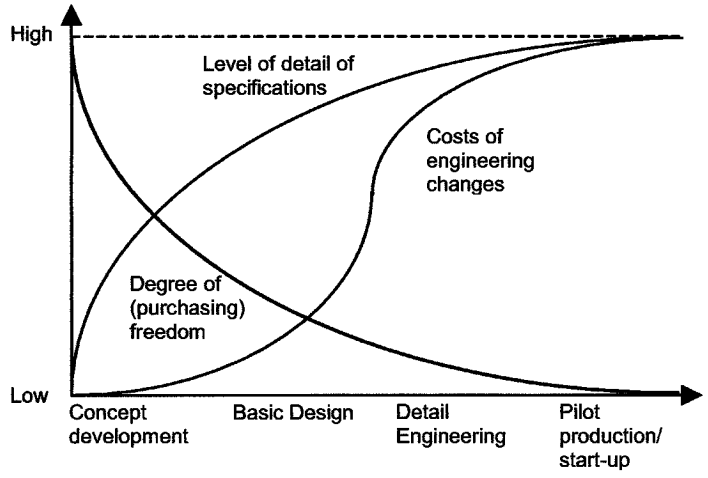


Figure 4.1 *Purchasing's ability to influence product design*
Source: [37] pp. 172

Therefore, purchasing contributions for the largest part should be implemented early in the NPD process. Urban and Hauser [35] illustrate this by mentioning that "...up-front investments pay back handsomely. An up-front strategy means that you take your risks when less is at stake. By the time you get to gamble with the really big investments (testing and launch) you have reduced your risks substantially" (pp.67).

However, whereas many NPD phasing models have been proposed and implemented in practice, the exact timing for individual purchasing contributions remains unclear [25]. Many authors go no further than identifying possible contributions and mentioning that purchasing should be involved "early" in the process [6,8,12,15].

Two different types of sources have been used: the first one on purchasing and its contributions to NPD and the second on managing the NPD process. A detailed insight into the model and its construction is given in the literature review that has been executed simultaneously with this study [18].

4.2 The changing role of purchasing

The purchasing function has gone through major changes in the past decades. From being a department that fills in order requests and contacts suppliers to check delivery of goods, it has become a more strategic function. This means that purchasing now is generally considered to be a function that adds value to an organisation, instead of just

being a reactive clerical function [8]. Trent and Monczka [33] even state that whereas purchasing was ones regarded a "reactive activity capable only of neutral or negative contribution, the procurement and sourcing process at leading firms is at the forefront of responding to and creating change" (pp.2).

In graphical form, figure 4.2 shows the purchasing process model [37]. Whereas the order function illustrates the classical role of purchasing, purchasing has started to widen its scope to cover the entire spectrum from determining specifications to evaluation, and managing internal and external relations.

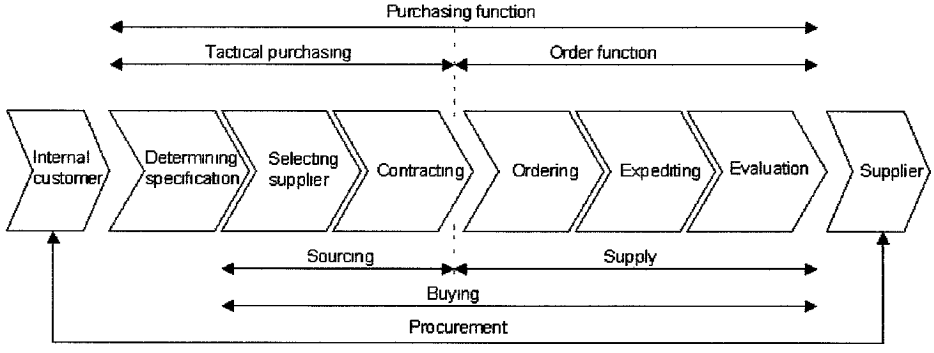


Figure 4.2 *Purchasing process model*
Source: Van Weele [37]

Whereas supplier relations are an important aspect of purchasing activities, as Wynstra et al. [39] note, "there's more to purchasing involvement than calling the assistance of suppliers. It's about bringing a purchasing perspective to the NPD process" (pp.130). This study takes the same focus, and thus considers not only supplier involvement, but mainly the (prerequisite) purchasing involvement in NPD.

4.2.1 Purchasing contributions to NPD

In recent years, quite some research has been done in the area of purchasing involvement in NPD [15,22,24,39,40,41]. This section will try to give a convergent view of the contributions for purchasing that have been identified in literature. It will thus form the basis for the purchasing axis of the model to be presented at the end of this chapter.

Most previous research on purchasing involvement in NPD does not go any further than listing possible purchasing contributions. One article however, shows a clear division of purchasing contributions into four management areas encompassing both project- and non-project related activities [39]. This model will be used as a basis for structuring purchasing contributions that have been identified by a broad range of researchers.

The four categories of purchasing involvement in NPD which have been identified by Wynstra et al. [39,41] are shown below:

- Development Management: encompasses decisions which influence the division of work between the manufacturer and its suppliers in developing and maintaining technological knowledge
- Supplier Interface Management: deals with the management of supplier relationships as an ongoing activity, and aims at exploiting their capabilities. It is the link between the long-term activity of development management and short-term activities of project and product management
- Project Management: managing (steering) an actual product development project
- Product Management: Activities that contribute to the content of a development project. For example, determining specifications falls into this category

Another issue that Wynstra et al. mention, is to discern between extending and restrictive activities in the Product Management area. "Restricting" activities are aimed at reducing

the degrees of freedom for the product development team, whereas "extending" activities enlarge the degrees of freedom for the team. As this division can be questionable for some activities (e.g. making cost estimations), these categories have been merged.

Table 4.2 Overview of purchasing contributions to NPD (extension of [39])

Areas	Activities
Development Management	- Develop guidelines for supplier and purchasing involvement in NPD - Develop guidelines for the involvement of research and development partners - Co-define core competencies, strategic outsourcing decisions, and level of internal knowledge build-up - Create awareness internally of the importance and position of suppliers in NPD - Start part and material testing programs - Develop formalised risk and reward sharing agreements - Promote a long-term focus on supplier relations
Supplier Interface Management	- Create an environment where suppliers are committed to be creative and take risks - Initiate partnerships with suppliers to align technologies - Continually scan supply markets for new technological possibilities and disruptions - Build a database containing suppliers' technical and design expertise, and past innovations aimed at exploiting their technological capabilities - Facilitate communication (e.g. communication systems linking) - Define supplier selection criteria - Share technical and customer requirements with suppliers - Start a supplier development program - Sharing education, personnel and facilities with suppliers
Project Management	- Determine whether, when and to what extent to involve suppliers: make the trade-off between efficiency and learning - Co-determine non-product related (general) objectives for suppliers - Analyse and evaluate develop/make or buy decisions and identify "buy" candidates; - Make cost estimations of subsystems if sourcing them - Suggest possibilities for new ways of organising supplier relations - Take a leadership role in cross functional teams using the most suitable organisation - Evaluate, select and contract suppliers and communicate their capabilities internally on behalf of new product (technology) ideas and final supplier selection - Facilitate direct cross-functional inter-company communication - Reconsider make or buy decisions and adjust outsourcing levels when needed - Co-ordinate the transition to actual production
Product Management	- Provide information on specific components, parts, materials, and suppliers - Evaluate engineering changes - Plan, initiate and control the supply of prototypes - Bring in alternative suppliers, techniques and products leading to better or more innovative parts - Secure long-term supplier commitment for critical parts - Execute value analyses of parts, materials, processes and conceptual solutions - Influence specifications and tolerances to meet functional specifications and increase the match with supplier' processes - Suggest part standardisation (interchangeability) and simplification - Suggest part or materials substitution - Determine part exclusion - Advise and support suppliers in meeting targets and encourage them to pro-actively offer cost reductions and process improvements

In short, this overview of purchasing contributions shows that next to the classical aspects of Quality, Cost, and Time (efficiency), purchasing also should take into account Innovation (effectiveness) as a factor of major importance in their decisions. Roughly, Innovation efforts can be compared to extending activities, whereas Quality, Cost, and Time match restrictive activities. This is illustrated by the following contributions (from table 4.2):

- Communicate supply market capabilities internally to develop new ideas and select suppliers;
- Bring in alternative suppliers, techniques and products leading to better or more innovative parts;

We can compare these activities to a citation by Cooper [10]: "Your customer probably has your next new product idea!" (pp.23). When translating this to supply markets, we might say that "your supplier probably has your next new technology idea!"

This new focus does not mean that the more classical purchasing targets for costs and reliability are to be discarded. For these classical viewpoints are also included in the model:

- Secure long-term supplier commitment for critical parts
- Suggest part standardisation (interchangeability) and simplification

In the purchasing decision making process, all of the factors that purchasing should consider have to be integrated. This integration is also visible in table 4.2 from the following example:

- Execute value analyses of parts, materials, processes and conceptual solutions.

As here the trade-off is made between cost and performance [5].

4.3 New product development

This section aims at giving a general project phasing model for NPD projects. This model will consist of project phases with deliverables for each individual phase. To provide a sound basis for a general model of NPD, a number of models from literature have been studied [18].

The classic model for NPD projects has a sequential nature, which leads to a high segmentation of functions. As scientists and practitioners saw the flaws of this approach, a new, integrated process for NPD has emerged in the 1980's. This approach emphasises the use of multidisciplinary teams to NPD and an overlap of subsequent phases.

Takeuchi and Nonaka [32] and Eisenhardt and Tabrizi [14] show that some companies have even taken integration of project phases a step further. They describe an "experiential" approach in which a highly flexible team with a high degree of autonomy develops a product in an uncertain environment. However, as this type of organisation does not match the Océ NPD process, this section has been based on the "normal" integrated NPD process.

As the goal of this study is to determine the purchasing contributions per phase, a quite detailed NPD process phasing is shown in figure 4.3 and elaborated below.

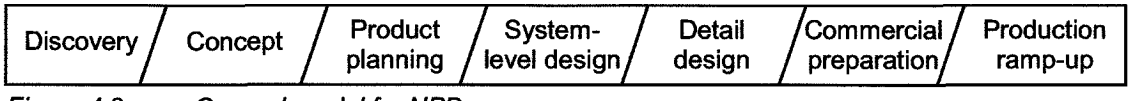


Figure 4.3 *General model for NPD process*
Source: Heinen [18]

Discovery
Whereas most NPD models do not explicitly include a "discovery" phase, the choice has been made to include it in this model. The reason for this is the fact that focus is on developing highly innovative new products. For these, it is considered important to explicitly manage new product ideas: the Discovery phase [10]. In the Discovery phase, new ideas are generated and a preliminary market assessment is executed.

Concept
Next is the concept phase. First, product concepts are developed that fulfil the desired specifications. Next, the feasibility of the concepts should be tested and one (or a few) concepts are to be selected for which the customer wishes are translated into a technically and economically feasible and attractive solution.

Product planning
As the name of the phase indicates, in this phase no developments to the actual product take place. Here, expected sales volumes, project budget and a development timetable are set.

Next comes the actual design of the product and its production process. Most authors make some kind of split into preliminary-detail design or product-process design. Whereas the names of these phases vary, the content is more or less the same for each author. In both phases the product as well as the process are developed in parallel (but with focus on the product in the first, and on the process in the second phase). For this general model, the choice has been made for the names "system-level design" and "detail design", as these reflect the activities and deliverables best. After all, the system level design reflects an almost complete product design, which is elaborated (detailed out) in the detail design phase, based on process capabilities.

System-level design
In this phase, the product and its production process are designed concurrently. Whereas the product is designed almost entirely (except for detailed specifications), only a high-level description of the production processes is made (based on the product design).

Detail design
Here, detail product and process design is performed (materials, geometry, tolerances and suppliers) and production tasks and testing procedures are defined

Commercial preparation
In this phase the product is tested in the customer setting (functionality, fit, performance and reliability). If needed, refinements are made to the product or its production process.

Production ramp-up
Here, the work force is trained, initial results from the production process are evaluated and problems in the production process are solved to meet targets for quality and cost.

Subsequently, the new product is ready for launch (market introduction). During regular production and sales, improvements to the product and process might prove necessary.

4.4 Assigning purchasing contributions to NPD phases

This section gives an answer to the following question: at what phase of NPD should the purchasing contributions be implemented for purchasing to add value to the NPD process. It thus makes use of the results from sections 4.2 and 4.3. In practice this assignment might prove otherwise, section 5.1 illustrates that the model will not be applied directly to the Océ situation.

In order to assign the purchasing contributions of table 4.2 to NPD project phases, below the deliverables of each phase are elaborated [18]. In order to satisfy these deliverables, purchasing needs to have performed some activities first. Some of the major purchasing contributions are illustrated with each phase.

Deliverables for the discovery phase are:
- desired product specifications (quantified, functional) are set;
- target market(s) defined.

As at this point new ideas are developed, new ideas from suppliers should be identified. Also, to facilitate the discovery of new possibilities, test equipment might be needed, for which suppliers need to be selected.

Deliverables for the concept phase are:
- basic product concept (final specifications) defined with proven feasibility;
- authorisation granted to develop product prototypes.

In developing concepts, supplier involvement may be needed if the supplier delivers entire subsystems. So, at the start of the concept phase choices need to be made as to the involvement of suppliers. Together with the analysis of supplier involvement the decision is made whether to develop parts of the product in-house or outsource them, based on the respective costs.

Deliverables for the Product planning phase are:
- thorough financial analysis made and budget approved;
- empowered, cross-functional core team installed and target introduction date set;
- supply chain strategy chosen.

To define the supply chain strategy, procurement alternatives should be evaluated. Also, the choice needs to be made whether purchasing will be part of the team.

Deliverables for the System-level design phase are:
- product prototype built (functionality and architecture);
- make or buy decision for subsystems made;
- manufacturing approach determined (assembly scheme).

In order to build an overall prototype, prototypes of parts should be obtained. The make or buy decision should be made, based on a selection from the available candidates. As next to specific parts (of which prototypes are needed), standard parts can also be used in the prototype, information on standard part should be available.

Deliverables for the Detail design phase are:
- specifications set for unique parts and tooling/ equipment, standard parts identified;
- production and assembly process plan ready.

As the detail design phase largely resembles system-level design. The purchasing contributions resemble those of the previous phase.

The deliverables for the Commercial Preparation phase are:
- pilot production run under final conditions (except volumes);
- production costs entirely clear.

As the activities of this phase mainly concern marketing, no purchasing contributions have been defined here.

Deliverables for the Production ramp-up phase are
- production system ready for ongoing volume production.

During production ramp-up, it should be ensured that suppliers are also ready for ongoing production.

Based on the deliverables and purchasing contributions mentioned above, figure 4.4 (on the next page) shows the overall theoretical model. This model serves as input to the case analysis of chapter 5.

From the descriptions of the different types of purchasing contributions in section 4.2 it should be clear that the contributions in the "development management" and the "supplier interface management" categories cannot be assigned to phases of NPD project models. These are ongoing activities that enable purchasing to contribute to NPD. For example, if no awareness is created of the importance of purchasing involvement in NPD, there is little chance that purchasing will actually become involved in the NPD process. Also, for the specific use of the model (i.e. in the analysis of two projects), no ongoing activities will be included.

Thus, the activities from the "project management" and the "product management" areas have been assigned to NPD project phases as shown with the description of each phase in section 4.4. To prevent confusion, the project management level as identified by Wynstra et al. [39,41], is named process management, as project management refers to managing the overall NPD project as done by the project committee (section 2.3).

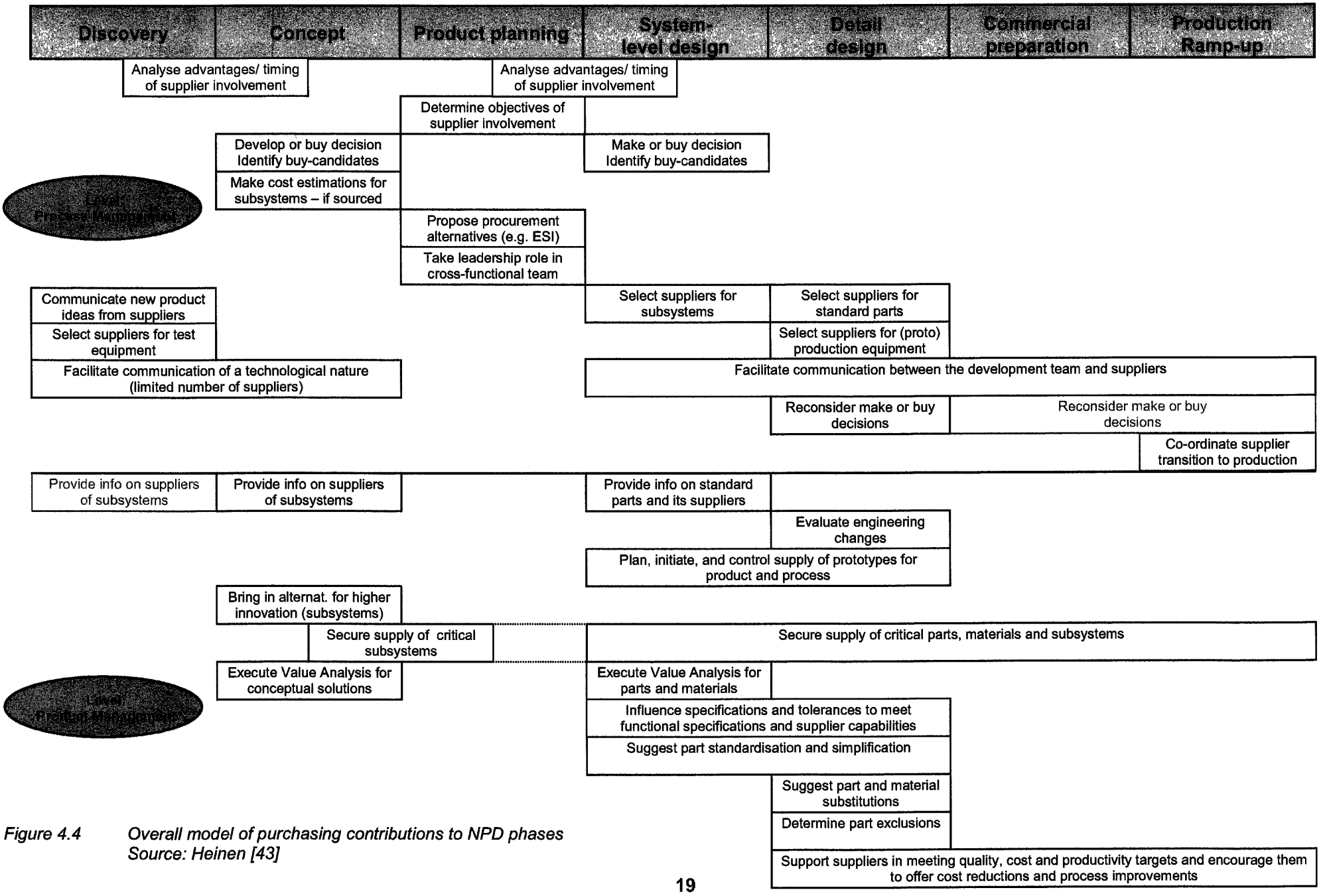


Figure 4.4 *Overall model of purchasing contributions to NPD phases*
Source: Heinen [43]

5 Case analysis

Using the model from the previous chapter as a guideline, this chapter presents the in-depth analysis of two projects. Section 5.1 gives a comparison between the theoretical model and Océ practice in order to simplify the model. Next, the structure of the case analysis is given in section 5.2. Then, after a description of both analysed projects in sections 5.3 and 5.4, the results are presented in section 5.5. Finally, in section 5.6 conclusions are drawn. The results from this chapter will serve as a basis for the redesign of chapter 6.

5.1 Confronting the general model with Océ practice

As shown in chapter 4, purchasing involvement in NPD can increase both project effectiveness and efficiency. As the contributions in the theoretical model are a collection of many studies, it should be obvious that not all of the identified factors may have been or should be implemented by Océ.

When comparing the project phases of the model with the Océ project plan [46], there is much similarity. However, some differences occur in the first few phases of the model:

- The discovery phase is not explicitly mentioned in the Océ model as this takes place before the actual start of a project. Chapter 4 however mentioned that most companies do not define this as a phase of NPD.
- Product planning at Océ takes place at the start of a project (that is, before concepts are elaborated). The reason for this is the fact that Océ does not develop technologies and products in separate projects. So, we might expect that the development phase at Océ is much more focused at reaching project targets.

Next to these differences between the theoretical model and Océ practice, there are some specific characteristics for Consumables. The hidden spec (see section 2.4.3), combined with the fact that functionality is jointly developed with a supplier leads to a situation where supplier switching is impossible. After all, if one cannot fully specify a component, the design cannot easily be transferred to a new supplier. Choosing a new supplier would thus lead to renewed testing and experimenting. So, from development on the team becomes dependent on the suppliers with which they co-operate. The theoretical model however suggested that supplier selection would not occur before the start of engineering (system level design). These differences lead to the conclusion that the theoretical model should not be applied directly to the Océ situation.

Whereas the project from the start is aimed at developing a product (for market introduction at a certain moment), at first some development of functionality occurs. As Océ defines it, the goal of development is to prove feasibility of applying certain technologies. During engineering, the product is further developed to meet all targets with given functionality. Finally, the transition to actual series production takes place. These three steps are illustrated in figure 5.1. As the focus of this study is on the R&D led phases of development and engineering, the general project phase is reduced to these two phases.

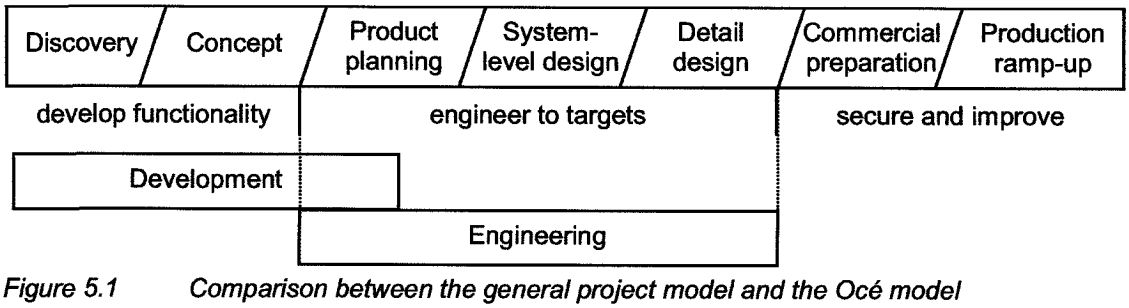


Figure 5.1 Comparison between the general project model and the Océ model

5.2 Case study protocol

In order to execute the case study interviews in a structured way, a protocol has been developed that is based on the theoretical model of chapter 4. This is considered essential as it calls attention to all potential purchasing contributions, instead of only to those known to the respondents. However, as illustrated in figure 5.1, the theoretical model has been simplified to include only those phases that Océ has identified. This increases the manageability of the model, as interviewing people using the model from chapter 4 would be very time consuming.

As noted in section 3.1, the processdrum and the printhead have been selected as the entities of analysis in the case study. These are both multidisciplinary subassemblies (including chemistry, mechanics, and electronics) at the core of a new Océ product. Also, both projects satisfy the criterion of being a technology development project. The main difference lies in the retrospective nature of the processdrum, whereas the printhead is currently developed (and approaches the end of the development phase).

In the case study protocol, each purchasing contribution from the model in section 4.4 is formulated as these. For example: "*purchasing should* identify candidates for the (make or) buy option". In total, 33 of these theses have been propounded to the respondents (19 in total). These interviews have been semi-structured: the questions are fixed but the answers are partly open-ended. The answer consists of three parts: first the respondent's opinion whether purchasing should occupy with the given activity (5-point scale). Then, a judgement of the situation in the project (5-point scale) has been asked. Finally, the actual course of the project has been discussed, taking differences between the opinion and the project score into account. Both scores are only used to provide a starting point to the discussion and to get a quick overview of the most problematic issues. The results will not be interpreted statistically. The case study protocol that has been draw up is included in appendix 5.1 (in Dutch).

Next to interviewing key project participants, for both projects purchasing plans (which describe the purchasing situation and future actions in the project) are used as a source. Also, the printhead project area and the processdrum production facility have been visited for an insight into the complexity of both entities.

Both the processdrum and the printhead are developed under a R&D "coach" or "function responsible". He is the chairman of the TC and reports to the R&D project leader on the progress of that specific part of the new product (see figure 2.5). Under the coach, several other coaches have been designated, as these are large teams (around 50 R&D team members). Initially a list of coaches for each project has been drawn up together with the steering group. At each interview, the list has been reviewed with the respondent to ensure that the most important project members had been included. Also, the purchasers for both projects have been interviewed. An overview of the respondents for each project is included in appendix 5.2.

All of the selected coaches responded positively to participate in the case interviews. This reflects the fact that this subject is also valued within R&D. After the interview (which lasted one and a half hours), feedback was sent to the respondents. All respondents gave their feedback (corrections and additional information) at short notice. The results have been "piled" [21] to analyse the results in a structured way.

5.3 Processdrum

The processdrum of the OS-115 (which is the name of the overall project) represents an entirely new technology that Océ has developed between 1990 and 2001. As depicted in appendix 2.5, seven processdrums and a so-called intermediate drum form the heart of

the Océ digital colour technology. On each processdrum, the entire image for a single colour is composed.

During the project, the processdrum has been split according to process steps:
- sputtering the various materials on the drum in layers
- cleaning the drum and the epoxy resin (layer on the drum)
- positioning and sourcing the (aluminium) drum
- electronics that determine what track of the drum is charged (thus attracting toner to the right area of the drum

Apart from interviewing project team members, a tour has been organised through the processdrum factory. Also, the working of a processdrum unit has been demonstrated.

In the development of the processdrum a lot of problems have occurred. For the electronics, many concepts have been developed in co-operation with suppliers that each time proved unsuitable. Only after three years of engineering (in May 1997) the project team concluded that with that concept, no cost-effective production would be possible. The electronics, epoxy and sputtering were either too expensive, or could not be applied in series production at all. So, a major turnaround was initiated to develop large parts of the processdrum all over again, using new suppliers.

5.4 Printhead

Cobalt is a prestigious project at Océ as it makes use of a newly developed inkjet technology for wide format colour printing. This project has been started in 1993 and will be ready around 2006. The project can be split up into three parts: engine, ink, and printhead. The printhead incorporates large parts of the new technology (piezo technology). Also, the choice for hotmelt ink has an impact on the design of the printhead (interaction; differences in channel forms and ink composition defines the print quality).

In the Cobalt project, the printhead has been split up into three complex parts:
- Actuator: piezo-electric component that controls the channels through which the ink is jetted to the paper.
- Base- and nozzle plate in which the ink droplet is formed.
- Electronics for generating the signal for the printhead and the printhead control.

Next to interviews with project team members, a tour through the project area and pilot assembly has given a clear impression of the printhead.

During the course of the case analysis, the Cobalt project approached the end of the development phase. So, not all problems may be uncovered, as is possible for the processdrum (which is retrospective). However, currently there is a lot of co-operation between the coaches and purchasing through the biweekly 2M2 meetings and personal contacts. For this reason, both R&D and purchasing have a clear idea whether "this time the project is on the right track" when comparing it to the processdrum. Also, many of the R&D project members (including coaches) have participated in the processdrum. So, they have a lot of experience in co-operating with other disciplines and suppliers.

Whereas it seems like this co-operation between R&D and purchasing would have solved all problems which did occur with the processdrum, this is not entirely true. The main reason for this seems to be the fact that the 2M2 meetings have only been started at the beginning of 2003.

Section 5.6 will show a comparison between the two projects. Here it will become clear that also for the printhead, many of the same problems in the processdrum still play a role.

5.5 *Analysis of the main problems*

5.5.1 Introduction

This section presents the results form the in-depth analysis. The issues to be presented in this chapter have been selected on the basis of their impact on the project(s) (delay, extra costs, project effectiveness) and their recurrence. Other issues which have proved important, but which have not led to actual problems, will be presented separately in the next section. Responses, indicating areas that purchasing should not interfere with, and with which purchasing does not interfere in practice, have not been included in the discussion. It is assumed that these do not require change.
The results of the case study have been fed back to all respondents, and a final feedback session has been organised with purchasers involved and the purchasing Consumables and Investments manager. Relevant comments have been included at each issue in the next section.

An overview of the respondents is included in appendix 5.2. An elaboration of the major case study results is given in appendix 5.3 (processdrum) and 5.4 (printhead). There, references are made (in red) to the main issues that will be presented in the next section.

5.5.2 Main problems

The main issues that have been identified in the case study are (see figure 5.2):
D. Purchasing is perceived as an obstacle in early development;
E. Lack of timely joint definition of supplier selection criteria;
F. No overview of past experiences with suppliers.
These will be further discussed in the remainder of this section. References to the case study reports are made by showing the corresponding question number in {brackets}. In appendix 5.3 and 5.4, answers in the case study reports are labelled to show its connection with a specific issue.
Following these three issues, four minor issues (a - d) that have also arisen from the case study will be discussed.

Taking the model from figure 5.1 as a basis, figure 5.2 shows the gradual transition from a project focus on developing functionality (A and partly during B-C) to a product focus. As expected, Océ starts focusing on project targets (and from a purchasing perspective: supplier relations) during the development phase. Issue I and II will further illustrate this gradual transition. Issue III should provide purchasing with a basis for adding value in NPD.

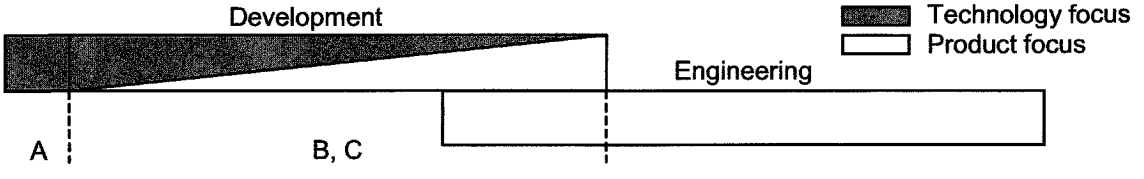


Figure 5.2 Indication of the timing of the major problems

A. Purchasing is perceived as an obstacle in early development
Early in the development phase of both projects, R&D (mainly DV) and purchasing communicated through order requests (ATB). These were initiated for materials and parts (samples), as well as for equipment. Due to the high pace of technological developments in this phase of the project, R&D expects these order requests to be dealt with very quickly. A few weeks of delay in the process might render the order request irrelevant due to new developments.

The DV respondents note that purchasing delays the development process in processing order requests {head 14}. They do this by "trying to limit the supply base" and "focusing

too much on non-technological issues". From their perspective, purchasing is the last hurdle to be taken after all arrangements (specifications, conditions) have already been made with the supplier. Any interference by purchasing is considered unnecessary as "there is little money to gain, but much time to loose" and "purchasing cannot distinguish between supplier relations with GRT/DV and with engineering/M&L.

Exhibit 5.1 Delay of ATB's in early development

During development, a partner was searched for supplying a measurement method (aimed at short-term results). R&D pushed the supplier to provide it within two months. However, it took a month before the order request (ATB) had been approved and processed by purchasing.

Case protocol questions that reflect this are:
- 1a,c: the DV respondents give negative scores to early purchasing involvement and joint decision making on the timing and extent of supplier involvement;
- 2a: the DV respondents again give negative scores to the involvement of purchasing in develop or buy decisions;
- 3: spotting ideas for new technologies and products from supply markets is considered mainly a responsibility of R&D. The contribution that purchasing may make to this, is spotting new ideas developed by current suppliers (and their competitors) and commercial breakthroughs in supply markets;
- 4: the respondents mainly give negative scores to the selection of suppliers for test equipment by purchasing. Functionality and quick availability are considered much more important than costs and (long-term) service.

Clearly, this s problem that specifically applies to the development phase as all of these issues fall into the "development of functionality" category in the Océ NPD process.

When discussing this topic with purchasing representatives, it becomes clear that R&D regularly places ATB's which are not fully filled in. For example, specifications are not included as "these have already been agreed with the supplier". Purchasing needs this information in order to place an order.
Whereas purchasing does not add too much value by processing ATB's, it is necessary to place these through purchasing, as without a registered order payment is impossible.

When taking all viewpoints into consideration, the source of the problems seems to lie in a misperception of each others interests and responsibilities. Whereas DV knows what they want from a supplier, and the project budget has been approved, the ATB is a barrier that has to be taken after all has been arranged. From the DV perspective, the relevance of this administrative procedure is unclear, and ATB's are filled in incompletely. Subsequently purchasing has to contact R&D to ask for full information on the ATB. R&D (DV) sees this as interference by purchasing: "it seems like they do not want to enter new suppliers into the system". As seen from the purchasing perspective, purchasing cannot enter the new supplier without full information.

Consequences:
- Backdoor selling/ maverick buying by R&D. This means that R&D makes arrangements directly with suppliers which may interfere with long-term relations a supplier has with other parts of Océ.
- R&D team members carry bad experiences from this project phase with them to later phases, in which joint decision-making is essential (see issue B). Also in later phases, they see purchasing as an administrative function.

The following issue will indicate the fact that soon after this "exploration of technological possibilities, collaboration should be set up between R&D and purchasing to enable effective collaboration with suppliers. As figure 5.2 indicated, issue A will mainly be relevant in a very early stadium of development.

B. Lack of timely joint definition of supplier selection criteria
The choices for a technological concept and a partner to co-develop this concept are strongly interrelated. For this reason, suppliers during development are mainly selected on the basis of technological considerations. As issue A showed, it might be right for R&D to exclude non-technological issues at the start of development and focus solely on developing a technological concept.

However, as Océ develops a technology and a product in a single project, decisions that are taken during development set the basis and determine the direction for supplier relations in later phases {1a}. The fact that this is not taken into account during development is clear from examples in the processdrum (Alcatel-Isola, Epson, Stemmann). These illustrate that R&D goes on too long with a pure focus on technology without considering non-technological issues. This leads to lengthy development and engineering routes with the wrong suppliers (from a total project perspective). Consequently, the project is delayed and purchasing, as well as R&D end up with a lot of rework (reselect suppliers, and redo development and engineering work with these suppliers).

Non-technological issues from a purchasing perspective mainly concern a supplier's "fit" (or "match") with Océ. Whereas fit includes non-tangible elements (e.g. personal factors), some tangible elements which lacked for a number of supplier relations, can be identified:
- a suppliers' market focus on different segments than Océ is in (e.g. high-volume segments like Alcatel and Epson), and
- an unusual application of the sourced part (e.g. Stemmann).

These observations are confirmed by the following case study answers:
- 7b: evaluating concepts is considered mainly a technological R&D issue. Purchasing should be consulted to evaluate the impact a concept choice has on supplier selection
- 8a,b: all respondents (including engineer N) agree that purchasing should co-decide on the involvement of suppliers in the transition to engineering. In this process, purchasing should set non-technological requirements to suppliers (a solid basis for long-term co-operation and costs) together with quality assurance, logistics, and R&D (target costs).
- 11a: the make or buy decision at the start of engineering is considered irrelevant as "the project becomes dependent on the supplier with which R&D co-operates during development".
- The answers to question 12 confirm the fact that R&D, purchasing, and other M&L functions should jointly decide on the (criteria for) actual supplier selection.

This joint decision-making is also defined in the Océ ODS400-C standard (appendix 2.10), which requires purchasing to do a supply portfolio analysis at the start of engineering. This means that parts and processes are rated according to their impact on costs and risk. This way, a differentiated approach can be implemented to (joint) supplier selection. Purchasing has actually made this classification in both projects but subsequently has not exerted sufficient influence on (criteria for) the actual supplier selection. Examples of this are the processdrum epoxy (influenced too late) and the processdrum electronics (insufficient interference: no clear negative signals given).

R&D responses indicate that for the processdrum, purchasing has not contributed sufficiently on these issues (1a: "purchasing has been too much facilitating"). Also, the difference in educational level between R&D and purchasing was judged too large, and "purchasing (in development and the start of engineering) was not interested in project involvement".
Current purchasing representatives note that R&D does not involve purchasing timely, as purchasing only becomes knowledgeable about new projects and relevant supplier issues through ATB's and informal contacts. For the Cobalt printhead, purchasing now is earlier

involved (through 2M2) with matching competencies. A problem that has remained is the fact that purchasing still is too much facilitating (and should set stricter demands to co-operation with suppliers).

From an analysis and discussion of the case study results, it has become clear that the main cause of this problem overlaps with the main cause of issue A. At the start of a project, R&D does not want purchasing to interfere. Subsequently, R&D starts supplier relations without involving purchasing. This does not seem to match the fact that R&D does think that purchasing should be involved for non-technological issues early in development. Clearly, R&D is reluctant to involve purchasing as they might intervene with other issues as well (which seems to be a result of the bad experiences from issue A).
So, at some point during development, the exploration of technological possibilities should pass into a situation where joint decision making should be implemented.

The main consequences of the resulting belated discussion on non-technological issues are relations with the wrong suppliers (missing fit). These suppliers thus are not prepared to satisfy specific Océ requirements (e.g. Alcatel-Isola) or are not able to tune their products to Océ needs (e.g. Stemmann). The following examples show the resulting delay and waste to which this may lead.

Exhibit 5.2 Processdrum electronics example

For the electronics, R&D has switched technology and its respective supplier several times during development. Every time, the fit with the selected supplier appeared insufficient to start engineering successfully.

One example is the co-operation with Alcatel in developing the arrays that lasted for seven years. This supplier was selected on strategic basis: Alcatel was a large client of Océ copiers. For this array, Alcatel used a specialty base material that was supplied by Isola. As Isola is a large organisation, and Océ does not fall into its core business, Isola was not prepared to satisfy the distinct requirements that Océ placed.
At the same time, R&D has co-developed the asics (for use with the array) with Epson. However, Epson used to apply this technology for LCD displays that require much lower product reliability than the Océ processdrum. Also, Epson usually supplied the asics in much larger quantities. So, Océ was no interesting customer for Epson, and as well was not prepared to satisfy the Océ requirements.

Because of the resulting problems that occurred during engineering, R&D has shifted the helm in May 1997. A new concept was developed in co-operation with Celestica (arrays without any specialty base materials) and Thesys (asics for automotive applications). This put the project back to development, which has successfully been done with these suppliers.

However, purchasing did not support the choice for Celestica to the full extent, as it is much larger than Océ (balance of power). As purchasing could not offer any alternatives that satisfied R&D requirements (co-development) and purchasing requirements (fit), it was jointly decided to stay with Celestica.

Exhibit 5.3 Stemmann example

For transferring information from the machine (fixed) to the processdrum (rotating), R&D chose for optical communication during development. Subsequently, a supplier was searched to supply this technology. As the technology selection was not made in coherence with the supplier selection, the supplier appeared not to be able to satisfy technological expectations.

Subsequently, the technology and its supplier have been chosen in connection, but without purchasing involvement: slip ring technology with Stemmann. Stemmann usually supplied these to tram manufacturers, which have different demands as to reliability and tolerances. Due to this lack of fit, Océ products broke down during use.

Eventually, during production a new supplier has been selected in consultation with purchasing, R&D, and M&L: Litton. This supplier proved to satisfy all Océ requirements.

Next to the joint definition of supplier selection criteria, the responses indicate that purchasing should also be involved in determining the outsourcing level. As engineer N mentions, "Purchasing should intervene more actively ... by communicating the advantages of involving suppliers in development."

Exhibit 5.4 Epoxy example

From the start of development until late engineering, R&D has developed and produced (on a small scale) epoxy resins itself as a specialty (and critical) material. This has lasted for some ten years with two to three people. Finally, in the course of engineering a purchaser suggested to explore possibilities to outsource these materials at a higher (product) level (using the supplier's knowledge). In the end, Océ and the supplier have co-developed the epoxy resins from scratch (making use of some of the knowledge that Océ had gained in the internal efforts). If this had been decided earlier, a lot of time and money would have been saved. After all, the internal development could have largely been omitted.

C. No overview of past experiences with suppliers

As the examples with the previous issue showed, Océ should try to take advantage of learning from previous projects to improve future project performance. One area of learning concerns experiences with suppliers in previous projects. Also taking advantage (e.g. economies of scale or technological advances) of supplier relations in parallel projects can add to project performance. As issue A indicated and engineer E points out: "purchasing should identify potential suppliers from previous and parallel projects. New suppliers have to be identified by R&D based on technological considerations".

Whereas the responses from the case analysis show that there is a need for information on previous experiences with suppliers and current relations, this information is not generally available. Thus, learning from negative (and positive) experiences with suppliers only takes place at a personal level. This means that the project team might make the wrong choices, as this information can not always be found. The only way to obtain this information is by randomly contacting individual R&D employees and purchasers. The response of engineer Q confirms this: "there is no overview of (preferred) suppliers. Experiences with suppliers are not centrally recorded, and even dispersed over individual purchasers".

This issue has arisen from the following case study questions:

- Identifying potential suppliers {2c, 11b}: purchasing cannot sufficiently indicate what knowledge/ experience is available within the supply base to serve the project;
- Information on preferred suppliers is not available {6}. It is considered a purchasing responsibility to provide projects with information on preferred suppliers (16 green, 1 orange).

Purchasing endorses this observation and supports the development of a system to facilitate central sharing of experiences and evaluations. To enable this, R&D, purchasing and other M&L disciplines need to agree on criteria (general and per-project) for evaluating these experiences. Also, purchaser A mentions that R&D has to share its technology roadmap for the long term. This way, the long-term strategy of Océ and the supplier can be matched.

In order to enable setting up a central system for information sharing on experiences, openness on both sides (R&D and purchasing) is crucial. After all, each function has its own specific demands to suppliers (R&D cannot rate a supplier's financial stability, purchasing cannot judge over technological competencies). As projects are autonomous organisational entities and purchasing supervises supplier relations for the long term, purchasing seems the right function to manage this information.

As information has not been centrally stored, it is often unknown what suppliers have been involved in projects despite of bad experiences in the past.

5.4.3 Other issues

This section discusses issues that have arisen from the case study interviews, but which have not led to significant problems. These are, however, issues that should be paid continuing attention to considering the responses.

a. Provide open cost price calculations

R&D determines the target costs. All respondents agree that purchasing should subsequently provide insight into the cost when choosing to buy a component {2b} and the probability that a supplier will meet the target {8b}. They should do this by urging suppliers to provide open cost price calculations {2b}. This way, the team knows what factors to adapt in order to reduce total cost in the most effective way. This is illustrated in exhibit 5.5

Exhibit 5.5 Open cost price calculations

For the actuator in the Cobalt printhead, a breakdown of the cost with CFT (prototypes) has been made (material value, investments, and labour). Whereas the material seemed to be the most important factor, it turned out that the largest part consisted of labour. Subsequently, the requirements could be adapted in order to reduce costs.

b. Facilitate communication between R&D and suppliers

"Purchasing should facilitate communication, as Océ should appear to the market as a single company, not as 50 separate projects" {5}. Purchasing should tune project interests and company interests, as these can be conflicting. Setting up initial contacts should include:

- ensuring that the right people are in contact (at Océ and at the supplier's side)
- communicate the project planning and volumes (provide transparency from what moment revenues may be expected)

After the initial contacts have been made (in co-operation with the project team), subsequent contact should take place directly between R&D and the supplier. After all, most discussions concern technology (which is a R&D issue). It is also noted that R&D should keep purchasing informed of the progress.

Exhibit 5.6 Facilitate communication

For the printhead nozzle plate, GRT and DV co-operated with Stork Veco. Next to this, there had been an initial contact with Elmicron. At a certain point, GRT team members needed prototypes quickly. For this, they approached Elmicron, which gave them the impression Océ might award them final production for this part. When afterwards it appeared that there would be no follow-up to this order, it was a disappointment to Elmicron. As purchasing acts in interest of Océ as a whole, they would have prevented this disappointment by Elmicron (e.g. by paying them on a per-hour basis) as it may be a suitable supplier for future projects.

To facilitate efficient communication, all respondents agree that purchasing could suggest alternatives for organising the co-operation {8c}. Purchasing does not yet pay attention to this issue, which is mainly seen as "nice to have".

c. Challenge current suppliers to suggest alternatives for better functionality

To the question whether purchasing should challenge suppliers to improve functionality, most respondents agree {7a}. This should however be restricted to challenging existing suppliers and pushing R&D to set functional specifications (which in turn, challenges suppliers to develop the best possible solutions).

d. Encourage suppliers to suggest improvements

All respondents indicate that purchasing should support suppliers in reaching targets, and encourage them in making process improvements and cost reductions {19}. It is noted that in order to do this, purchasing should first obtain open cost price calculations.

5.6 Conclusions

The case study results that have formed the basis of the previous sections show that the theoretical model has provided a good basis for uncovering the main problems. This has also been confirmed by the respondents, and illustrated by the fact that they had only little additional suggestions at the end of the interviews.

In accordance with the assumption from section 5.1, the case study results have shown that for Consumables some major purchasing activities should be implemented earlier than the theoretical model suggests. The most obvious example is the finding that in the studied projects, suppliers are already involved during development. After that, switching is usually not done anymore (as indicated in section 5.1). The theoretical model however suggested that actual supplier selection would not occur before engineering. These outcomes support purchasing involvement from early development onwards.

The results show some differences between both projects. Whereas in the earliest project (processdrum) quite some substantial problems have occurred, this is not true for the printhead. One explanation may be the fact that the printhead is not finished, and problems have not surfaced yet. Nevertheless, it is very clear that co-operation between R&D and purchasing has improved. 2M2 meetings with R&D and purchasing representatives have been set up, and (due to these meetings), informal contacts have grown between R&D and purchasers. These contacts have grown more easily as many R&D team members had experience in co-operating with purchasing from the processdrum project.

However, both projects show that the main problems remain. R&D (DV) starts co-operating with suppliers from the start of development without a purchasing review, there are no clear purchasing contacts for R&D, and experiences with suppliers are dispersed over many R&D and purchasing personnel.

Also, and even more importantly, the causes for these problems are still present. From the beginning of development, there is a distance between DV and purchasing, with DV even perceiving purchasing as a barrier toward fast exploration of technological possibilities. This is not necessarily a physical distance, but more of a lack of resolving their differing interests, goals, and contributions in NPD. Also, the progress that has been made in resolving this (by setting up meetings and personal contacts) relies on ad-hoc, individual initiatives.

Whereas the initial goal from chapter 3 seems to have been reached (defining purchasing contributions), the case analysis showed that the main problems can only be solved by tackling their causes. Regarding these causes, the design should urge R&D and purchasing to deal with their diverging interests in a timely manner. Only then, the consequences presented in the previous sections can be prevented in future projects.

6 Design

As the previous chapter showed, there is a major distance between R&D and purchasing during development which continues – in a more limited sense – during engineering. However, purchasing support in initial development and subsequent joint decision making requires co-operation between R&D and purchasing. This chapter provides mechanisms for establishing this co-operation, enabling Océ to deal with contradictory interests between both functions in an effective way. First, section 6.1 clarifies the starting points for the design. Subsequently, in section 6.2 past research is reviewed to identify mechanisms that support co-operation, serving as a guideline for the design. Finally, section 6.3 selects suitable mechanisms to be applied in the various stages of NPD.

6.1 Design assignment

The design in this chapter should tackle the major cause of the problems from chapter 5: there is too large a distance between R&D and purchasing to enable sufficient co-operation R&D and purchasing in the development phase (and continuing during engineering). Co-operation is needed in order to facilitate the sharing of past experiences and joint decision making on supplier selection and relations.

Preceding the design to be presented in this chapter, some other approaches for improving co-operation between R&D and purchasing have been considered. These are the definition of purchasing responsibilities in NPD and a purchasing project organisation. However, writing down procedures and structures does not ensure actual co-operation as it tackles the problem (insufficient joint decision making and sharing of experiences), instead of its causes (the distance and willingness to co-operate).

An approach that does improve co-operation between various functions has been extensively researched in marketing literature. There, integration mechanisms have been identified and tested that reduce barriers and enhance understanding between functions in NPD [16]. As this chapter deals with reducing this distance between R&D and purchasing, such mechanisms will be evaluated, and applied to the specific situation of R&D – purchasing integration at Océ. Before summarising these mechanisms (section 6.3), section 6.2 defines integration as a means to achieve co-operation.

6.2 Defining integration

Many authors have been struggling to define integration [16,20,29]. Whereas there is no consensus, they usually define two interrelated aspects that constitute integration:

- Some form of information exchange between departments by means of meetings, phone calls, memoranda, and the flow of standard documentation (called interaction, communication or information sharing).
- A shared process with departments working together, having mutual understanding, a common vision, shared resources, and collective goals (labelled collaboration, co-operation or interdependency). This aspect clearly emphasises working together (including some form of "esprit de corps" [20]), and thus entails much more than just exchanging information.

Whereas literature does not give an unambiguous definition of integration, Kahn [20] shows that just implementing the first aspect does not significantly relate to NPD performance. The second aspect however did prove to positively relate to NPD performance [20]. For the remainder of this report, the following definition has been developed: Integration is a way to put two or more organisation-entities up to jointly enter into a process with interdependent tasks and shared responsibilities. Communication is indispensable in executing these interdependent tasks, but no sufficient condition for bringing this process to an end successfully.

6.3 *Selecting integration mechanisms*

The aim of this section is to collect integration mechanisms that have been identified in previous research. Whereas little research has been done on R&D – purchasing integration in NPD, mechanisms for integrating marketing and R&D have been studied extensively. Especially the frequently cited meta-analysis of Griffin and Hauser [16] provides an appropriate starting point for collecting such mechanisms as it analyses previous results in a coherent way. The six integration mechanisms that they have identified are:

- relocation and facilities (named collocation here);
- personnel movement (named job rotation here);
- informal social systems;
- organisational structure;
- incentives and rewards;
- formal integrative management processes.

In a more recent study, Leenders and Wierenga [23] added a seventh mechanism: ICT.

For the largest part, purchasing's position in NPD seems to resemble that of marketing as being a non-technology-focused function. To ensure that possible differences between purchasing and marketing are taken into account, the fragmented research findings on purchasing – R&D integration will be compared to these integration mechanisms.

When mechanisms for integrating R&D and purchasing have become clear, each is evaluated on its applicability to the Océ situation to select those that will serve as a guideline for the design. Section 6.4 links these mechanisms to the phase of the NPD process in which they are needed.

6.3.1 Collocation

Collocation of personnel from different functional groups facilitates communication by reducing physical barriers [16]. Previous researches have however not been conclusive on the effect of this mechanism (even a distance of more then 10 metres may have no more effect) [23].

Findings in purchasing literature conclude that close physical location of purchasing to the customer (R&D) leads to informal communication, which positively relates to meaningful involvement [26,30,40].

As section 6.2 showed, increasing communication does not affect NPD performance. So, collocation seems no viable mechanism. However, the "informal social systems" mechanism will elaborate on the important role that collocation plays in building informal contacts. Full-time collocation will not be possible, as purchasers are involved in multiple projects simultaneously. Purchasing and R&D are currently located some kilometre apart.

6.3.2 Job rotation

Job rotation leads to an increased understanding of decisions made in other functional areas and increases interaction. If skills cannot be matched sufficiently to rotate personnel, temporary transfers can be considered [16].

Purchasing literature confirms the positive effect of job rotation on purchasing integration by facilitating communication and improving a purchaser's skills and credibility [2,3,40]. However, purchasing literature also points to other personal factors that increase integration. These are experience in engineering [2,3,40], level of education [2,3,40], perceived technical ability (e.g. reading blueprints) [2,26,30,40], and purchaser pro-activeness [3,26,30,40]. In this context, pro-activeness relates to the risk-taking propensity within purchasing, as opposed to a short-term cost-reduction focus [40].

Currently, personal factors of purchasers enable them to be integrated in NPD, so no improvements in this area are needed. They often have a R&D background and technical education at levels comparable to R&D. Also, pro-activeness seems to be sufficiently present as personal contacts are partly started and maintained by purchasers. Obviously, purchasers should not interfere in the technological content of a project, as there is no need for an additional R&D team member in projects.

6.3.3 Informal social systems

Informal visits (meetings) may partly replace the need for formal systems. It can be a powerful mechanism by encouraging open communication, leading to easier identification of contacts and keeping people in touch with work progress in other functions. As informal meetings are likely to emerge from collocation, these mechanisms are closely related. Recreational activities also stimulate the emergence of informal contacts [16].

Stuart [30] confirms the importance of informal social systems and its relation to collocation by noting that "The nature of the research center was largely one of informal information flows and interaction with colleagues". In order for purchasing to be part of this, close location is needed (pp.34).

Whereas for the processdrum, informal social systems have been established in the engineering phase only (following CVO meetings), for the printhead they have already been established during development (2M2 meetings and resulting personal contacts). As for the printhead this has led to higher levels of integration (and better project performance), creating such systems should be stimulated in future projects (e.g. by collocation).

6.3.4 Organisational structure

A cross-functional project team is the most obvious form of organisational structure in NPD. It forms the basis to discuss important issues, define clear responsibilities, and encourage co-operation by "providing a forum in which conflicts are solved without intervention from management" [23] pp.308.

The internal organisation should support purchasing involvement by organising around processes (i.e. projects) instead of functions (departments) [26,40]. This should not come as a surprise, as most studies report the widespread use of cross-functional teams.

A cross-functional team for managing the progress of the project is already in place at Océ. There, the M&L project leader represents purchasing. At the project execution level, it is the aim of this design to improve the cross-functional organisation. However, as indicated in section 6.1, this design goes a step further back by solving the causes of insufficient co-operation instead of forcing departments to co-operate.

6.3.5 Incentives and rewards (joint reward systems)

Many previous researches have shown the major effect of joint reward systems on functional integration [23,29]. However, R&D is often rewarded based on the number of patents whereas marketing is rewarded based on increases in market share [16]. As these functionally oriented incentives are not connected to project goals, they may discourage integration.

The importance of joint reward systems is confirmed in purchasing literature. A reward system should reward team results, as well as individual performance [20,26,30]. Putting pressure on cost reductions encourages purchasing to focus on operational, rather than strategic purchasing activities (in the NPD process) [3].

Reward structures for purchasing Consumables and Investments are currently solely aimed at cost reductions. There is no formal recognition for purchasing achievements in

NPD projects. These do not necessarily refer to financial rewards, but this can also be formal recognition of achievements. Establishing rewards for joint achievements leads to improvements in the second aspect (shared process) of integration and thus impacts NPD performance.

6.3.6 Formal integrative management processes

A formal process means that activities are coupled to a structured process. Phase review boards usually form the basis for these processes.

As formal integrative management processes are an overall prerequisite for a structured process (that might include some of the other integration mechanisms), no specific purchasing-related comments are given. Management support for integrating disciplines will be dealt with in chapter 7.

Océ has a formal integrative management process that defines the deliverables at each project milestone [46].

6.3.7 Information and communication technology

This category contains ICT mechanisms, such as e-mail, internet/intranet, and video-conferencing that facilitate contacting people and sharing information [23].

In purchasing literature the use of supporting ICT systems is confirmed [26,40]: "... part of the success and efficiency of purchasing involvement often seemed to rely on the availability of up-to-date information on aspects like component specifications and supplier capabilities". Also: "The registration of and access to these various types of information can be facilitated by information technology" [40] (pp.132).

As Océ has not tightly linked R&D and purchasing ICT systems, information sharing (project progress, drawings) depends on personal contacts (supported by e-mail). Whereas ICT systems would facilitate communication, they are very expensive to implement and do not provide a sufficient solution (like the organisation structures mentioned in section 6.1) to improve co-operation between R&D and purchasing.

6.3.8 Conclusion

Evaluating the mechanisms mentioned above, the most appropriate ones should be selected for application at Océ. The appropriateness includes its proven impact on integration, its practical applicability for Océ and its improvement potential at Océ. Considering the results of the previous sections, the best mechanisms are (temporary) collocation of purchasers with the R&D team, establishing informal social systems and adopting joint reward systems as these can bring departments closer together.

6.4 Mechanism design for application at Océ

Figure 6.1 shows the purchasing project model (see also section 5.5.2). As mentioned in that section, purchasing contributions change in the course of a project. This requires a differentiated approach to defining the appropriate integration mechanisms to be applied at the right point in the NPD process.

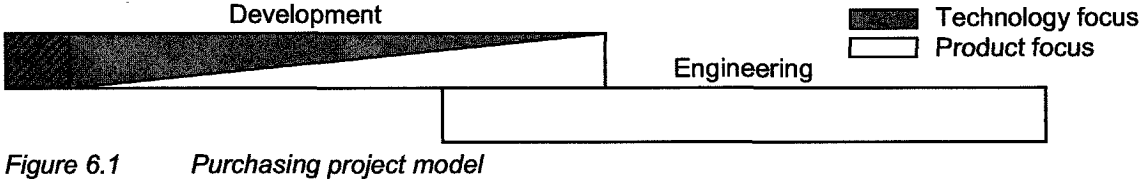


Figure 6.1 Purchasing project model

Below, the application of the selected integration mechanisms will be illustrated shortly. Subsequently, sections 6.4.1 and 6.4.2 deal with the two parts of this process in-depth.

The shaded area in figure 6.1 shows the early development phase where technological concepts succeed one another at high pace. Miscommunication on ATB's (order requests, which are the main communication medium at this point) makes R&D perceive purchasing as a barrier toward fast development.
Whereas personal attributes enable purchasers to become integrated (see section 6.3.2), the interpersonal distance still has to be reduced. The most appropriate mechanism to do this, is the establishment of informal social systems. Informal contacts lead to fast identification of the right purchaser for placing ATB's, reducing the time needed to route an ATB through the organisation. Also, open communication (as a result of informal contacts) leads to an exchange of views on reciprocal interests in an ATB and the urgency of individual ATB. The resulting faster handling of ATB's increases the overall speed of the NPD process.

As the case study showed, in the remainder of the development phase purchasing and R&D do not jointly make decisions early enough. As relations with strategic suppliers start here, this joint process is crucial for establishing successful supplier co-operation.
As section 6.2 showed, the "shared process" aspect of integration includes common objectives. As the joint decisions to be taken resemble the shared process, some form of common objectives should be considered. The joint reward systems mechanism matches with this. Putting purchasing and R&D equally responsible for supplier selection urges them to take up this joint responsibility. As this will lead to improved (first time right) supplier selection, the total development time will be reduced.
Next to joint reward systems, temporary collocation of a purchaser with the R&D team is very helpful, as the decision-making process requires intensive peak interaction between R&D and purchasing. Collocation leads to short communication lines, enabling both to share their views efficiently and fast. Once these decisions have been made, both return to their functional area, now being able to work further based on the joint decision.

6.4.1 Early development: informal social systems and temporary collocation

Informal social systems have been selected as the most appropriate mechanism for improving the relation between purchasing and R&D in the early part of the development phase. Figure 6.2 shows this specific part of the NPD process. This is especially an important point in the process to improve relations, as here the basis is formed for R&D – purchasing integration in the entire NPD process. The elaboration of this mechanism is given below.

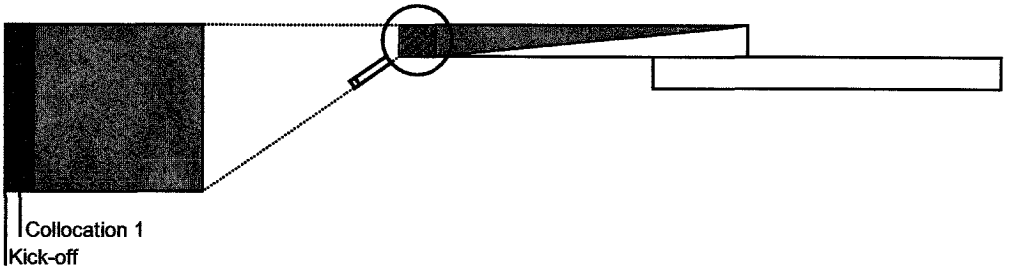


Figure 6.2 Mechanism application in the early development phase (enlarged)

At the earliest part of the development phase, R&D and purchasing have no joint activities. Considering the selected mechanisms from section 6.3.8, this means that joint reward systems (stimulating shared processes) should not be applied. Activities that do require improvement, is the availability of information on past experiences and clearer communication on ATB's. The cause of problems with ATB's (as shown in section 5.6) lies in the personal distance, and a lack of clear contacts for placing ATB's. The integration mechanisms from section 6.3 show that the best way to improve relations between departments, are informal social systems. In order to facilitate informal social systems, collocation provides the best lever (collocation 1).

The most important consequence of creating informal social systems is the exchange of views on the requirements to, responsibilities in, and the importance of individual, ATB between R&D and purchasing. The team member that places the ATB can directly indicate what the ordered goods will be used for, its urgency, and its likeliness of ending up in the final product (supplier selection). In other words, creating informal social systems leads to richer communication than just sending a standardised form. Recall the first aspect of integration in section 6.2, where it was indicated that the sole exchange of information has no (or even a negative) effect on NPD performance.

In practice, informal contacts have already proven effective, as the establishment of the 2M2 meetings have led to personal contacts. However, these are aimed at improving the relation between engineers and purchasers. At this point, the relation between purchasing and developers needed improvements. Starting meetings like 2M2 would not provide a suitable solution, as there are no collective matters to be discussed between purchasing and development.

To provide an optimal start for the relation, the first opportunity should be seized for setting up the relation between R&D and purchasing. This would be the project kick-off meeting. The purchasing manager needs to attend this meeting to decide the most appropriate purchaser(s) to be involved. The purchasing manager will introduce him to the team, so the purchasing contact is known from the start. Also, arrangements should be made on the date, time, and place for the first visit (e.g. reserving a desk).

The actual collocation should take place immediately after the kick-off. As purchasers are supposed to build a relation with team members (no peak workload), the collocation should be spread over some weeks. A purchaser with sufficient technical experience (see section 6.3.2) should be located in the project area, for example for 1 day per week. The number of collocation days should depend on the complexity and size of the project.

It should be clear that this design is not complete without a definition of the activities that purchasing should execute in this part of the process. After all, collocation without any guidance to the activities will probably not be implemented.

First, purchasing needs to provide information on past experiences with suppliers. This gives purchasing a solid basis for becoming involved in the process (as R&D attaches a lot of importance to this, and also has the lead of the project). Thus, involvement depends on the added value that R&D perceives.

Second, purchasers know the right contacts at suppliers that can serve as fast entry points for R&D requests. This reduces the time needed to build contacts with a supplier and the response time for R&D requests.

Finally, purchasing can support R&D in setting up market research. While R&D identifies new technological possibilities, purchasing should evaluate market trends (e.g. mergers). Also, in setting up this market research, purchasing can evaluate whether it is best to include suppliers or to focus on research institutes. After all, most suppliers are only interested in development if they have a chance of obtaining the final contract. As product development can last some ten years, most suppliers will be hesitant to co-operate in this early phase.

An additional advantage of these early contacts is in determining the transition to joint decision making. As argued in section 5.5.2, it is impossible to identify beforehand the moment at which the joint decision-making process should start. As that moment should be determined jointly, the relation started here increases the likeliness of determining this moment jointly.

6.4.2 Development and engineering: joint rewards and temporary collocation

During the development phase, R&D and purchasing jointly have to decide on supplier selection and the organisation of supplier relations. R&D has made major technological choices, and the focus gradually changes to developing these in co-operation with suppliers (as the gradual change from grey to white indicates in figure 6.3). In order to improve joint decision making between R&D and purchasing (during the development and engineering phase), joint reward systems combined with temporary collocation have been selected as the most suitable mechanism.

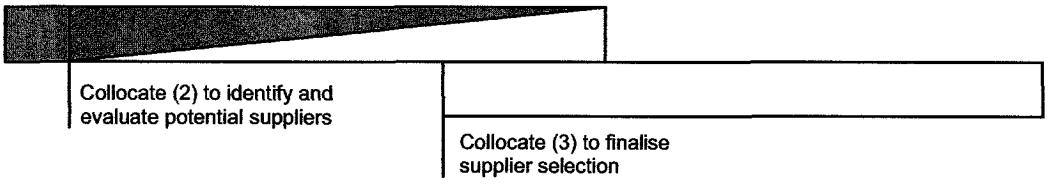


Figure 6.3 Mechanism application in development and engineering phases

Changing rewards for R&D and purchasing team members into a joint system puts more emphasis on jointly executing the decision making process. This is needed, as both only feel partly responsible for this process, leading to postponement of joint decisions. Next to these, purchasing should retain partly focused on cost reductions as large savings can be achieved (due to the large sums involved). Currently, both R&D and purchasing have their own goals. R&D focuses on the development of new products that satisfy targets, whereas purchasing is rewarded on the basis of cost reductions. Joint rewards should be based both on the basis of the execution of the joint process and its outcome (i.e. a supplier choice that is based on a set of requirements from both perspectives). This way, both technological and non-technological requirements will be taken into account earlier in the NPD process. Consequences as illustrated in section 5.5.2 (with supplier relations being ended after years of co-operation because of late consideration of non-technological requirements) will be prevented.

This joint decision making process requires peak attention from purchasing and intensive communication between both functions some months after the start of development. This is the reason why temporary collocation (2) is again needed for executing the process of identifying and evaluating potential suppliers fast and efficiently. Subsequently, R&D can start to co-operate with the supplier. At the start of engineering final supplier choices are made, which again requires intensive co-operation between R&D and purchasing. This leads to a third period of temporary collocation (3).
Also toward industrialisation, collocation may be needed again. However, as this collocation would be focused at developing relations with M&L team members and preparing M&L decisions, it is outside the scope.

The joint reward system does not match the current project structure (with purchasing reporting to the M&L project leader). Joint efforts require joint reporting, so purchasing and R&D should be jointly responsible for attaining targets regarding suppliers (e.g. cost price targets), and they should jointly report these to the Project Committee. This way, the matrix structure also becomes reality for purchasing. Next to regular purchasing criteria (like financial solidity and the share of business Océ has with a supplier), purchasing should ensure that criteria from quality assurance and logistics have been included. This co-ordinating role of purchasing has been explicitly mentioned in the case study.

When comparing collocations 2 and 3 to the initial collocation (section 6.4.1), these require more intensive contacts (peak workload). This means that a purchaser (that satisfies the criteria from section 6.3.2) should spend more time with the project team, depending on the magnitude and complexity of the project.

7 Implementation plan

This chapter describes the activities that need to be executed in order to implement the integration mechanisms of chapter 6. The aim is to provide Océ with some starting points for improving purchasing's role in the NPD process. Apart from these implementation steps, this report will be sent to case study participants and the steering group. Also, the report will be put in the Océ library database to ensure future availability.

In order to establish the selected mechanisms from chapter 6, a number of structural changes are needed:

- Formally invite the purchasing manager to the project kick-off meeting in order to determine the appropriate purchaser(s) to involve and the workload to be expected;
- Formally put purchasing and R&D jointly responsible of supplier selection and jointly reward them on the basis of the results. Official reporting should be done jointly to the PC (instead of to the R&D and M&L project leader separately);
- Free up a number of desks in the project area for collocating purchasing (and other disciplines like quality assurance and logistics whenever needed).

In order to realise changes in these areas, management support is a prerequisite, as rewards and assigning people to new tasks requires management to free up capacity. For purchasing and R&D to co-operate on the project level, management of both functional areas needs to agree on the joint responsibilities and rewards. This was already noted in the development management category of table 4.2. There, activities were identified like the development of guidelines (which has been done in this project) and creating awareness of the importance of supplier (purchasing) involvement in NPD.

Apart from management, support from the groups of people that have to work with the solution is needed (purchasers and R&D team members, the "users"). The users group has been involved in the case study, so the results have been partly based on their opinion. For R&D, these have been the FV, who oversee a group of R&D team members. For purchasing, the group of purchasers from both projects has been involved. Their willingness to participate in the extensive case study interviews already indicated their involvement with the subject.

The management of both groups has been involved through the steering group. So, their opinion has been used (in an intermediate presentation and face-to-face discussions) to shape the approach of this study. The most important area of change is purchasing Consumables and Investments, as here purchasers will have to deal with new responsibilities regarding projects. As the manager of this department has been the initiator and supervisor of the study, his co-operation has been assured.

Furthermore, both the case study respondents and the steering group will receive a copy of the report. In order to reach other stakeholders and future project team members, the report will be available in the Océ (digital) library.

After first results have become available, an evaluation of the approach used should be held in order to adapt it if necessary.

8 Reflections and suggestions for further research

This chapter reflects on this report by reverting to the initial research questions of chapter 3 and providing an overview of the major findings of this study. This is presented in section 8.1. Subsequently, section 8.2 gives suggestions for future research at Océ-Technologies b.v.

8.1 Reflections

As the research questions from chapter 3 aimed at providing a clear structure for the report, this chapter reverts to these initial questions and evaluates to what extent they have been answered. The research questions are repeated below:

1. What possible purchasing contributions to NPD should be considered;
2. How have these contributions been applied in Océ projects;
3. How do R&D representatives value purchasing's role in NPD;
4. What improvements are needed to purchasing's role in NPD;
5. How should the improvements be implemented in the Océ practice.

Research question 1 has been answered in chapter 4 with the model of purchasing contributions that have been identified in previous research. In the case study interviews, it appeared that these contributions provided sufficient hold to uncover the main problems in the co-operation between R&D and purchasing. Thus, the model has proven suitable, and the research question has been fulfilled.

Research questions 2 and 3 have been dealt with coherently in the case study presented in chapter 5. The direct answers to these research questions have been presented in appendix 5.3 and 5.4. After analysing these results, the major problem areas have been identified. In short, these condense to too large a distance between purchasing and R&D in the development phase and insufficient timely joint decision making between R&D and purchasing. Additionally, creating an overview of past experiences with suppliers increases value adding by purchasing.

The results of questions 2 and 3 indicate that it is possible to reduce development time and –costs by preventing from rework. Next to these efficiency improvements, more effective co-operation is possible when selecting the best possible supplier, considering all relevant perspectives. However, as these effectiveness improvements are in the technological area, these are hard to demonstrate from a purchasing perspective. The efficiency improvements can be realised by integrating purchasing at the right point in the NPD process, which figure 8.1 (repeated from 4.1) confirms. Here it is illustrated that, in order to prevent engineering costs from sky-rocketing, purchasing should be involved at the point where decisions are actually made.

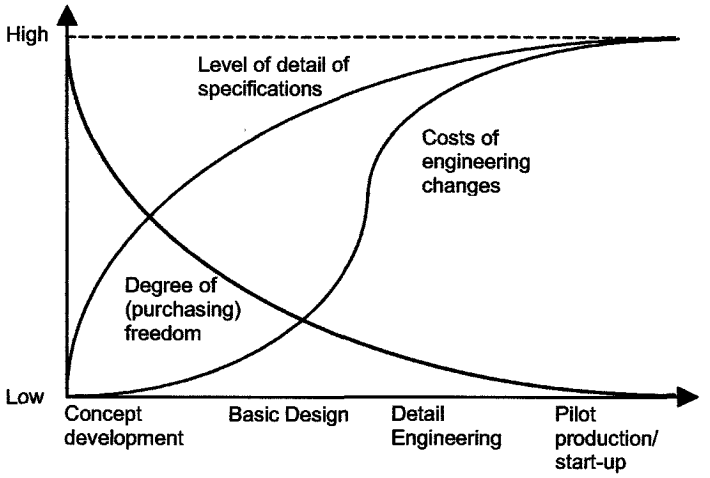


Figure 8.1 *Purchasing's ability to influence product design*
Source: [37] pp. 172

Using these results as a basis, question 4 has been answered in chapter 6. As at some points in the NPD

process, peak attention from purchasing is required, collocation and informal social systems have been suggested. Next to these, creating joint rewards for purchasing and R&D puts more emphasis on joint efforts. To provide a quick overview of the results, figure 8.2 shows the points in the NPD process at which peak attention is needed.

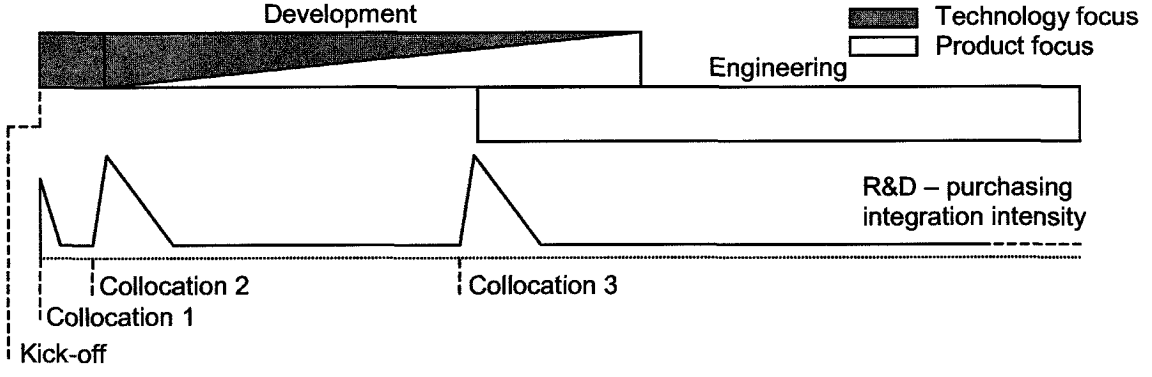


Figure 8.2 Intensity of R&D – purchasing integration in the NPD process

In-between these moments of high integration, both should revert to their own functional area, using the joint decisions as a basis. These mechanisms increase the direct involvement of purchasing, and root its responsibilities in NPD.

The mechanisms mentioned will reduce future probability of selecting suppliers that do not satisfy relevant criteria from both R&D (technological) and purchasing (non-technological) perspectives. Also, the mechanisms stimulate purchasing involvement at the points where they should provide R&D with past experiences in working with suppliers.

Obviously, implementing these mechanisms may increase workload at purchasing Consumables and Investments. However, in the long run investments in purchasing capacity in NPD will pay off. After all, as figure 8.1 showed, up-front investments in purchasing integration pay off, as high costs due to engineering changes (and rework in supplier selection) are prevented.

Finally, research question 5 has been answered in chapter 7, where the implementation plan has been presented.

8.2 Suggestions for further research

As next to purchasing, many other functions are involved in NPD, Océ should consider starting a program for defining functional integration. Just like this study, these should be related to the project model (milestones) that is in use with Océ. Using this study as a pilot can lead to fast and efficient development of a program that covers all functions contributing to NPD.

In order to share experiences with suppliers, multiple perspectives should be included, as suppliers have an impact on many disciplines. So, in order to share experiences with projects, a tool should be developed that structures supplier evaluation criteria. Results from using this tool should be made available to future projects (e.g. by means of an intranet site).

As R&D respondents noted that ATB processing is not fast enough, a system should be developed for faster and more efficient processing of ATB's. This reduces the workload of purchasing, thus leaving more room for implementing the suggested improvements.

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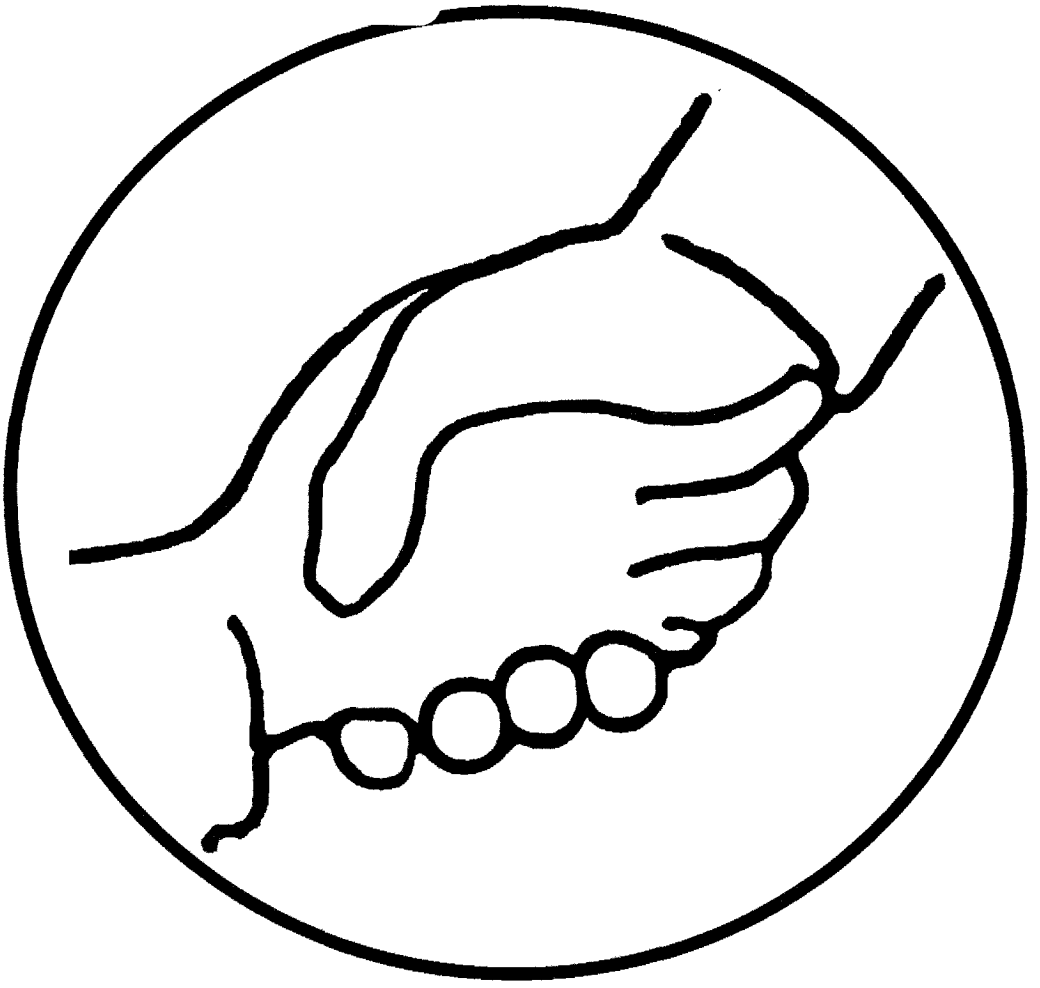
Glossary

2M2	Name for the preliminary consultation meetings that have been started in the course of the development phase in the Cobalt project
Actuator	Piezo-electric component for the Cobalt printhead that controls the channels through which the ink is jetted to the paper
CVO	Consumables Progress Meeting. Meeting that is always started in the engineering phase of a Consumables project
Cobalt	Project name for new WFPS printer containing new inkjet technology.
CPS700	Colour printer that contains the new (processdrum) technology. Project name: OS-115
DDS	Digital Document Systems, Océ SBU
DV	Development department of R&D, focused on elaborating technological opportunities for use in a project. DV employees are mainly involved before and at the start of a project (development phase)
EE	Equipment Engineering, M&L department that designs special (production) equipment and/or adapts existing equipment
EI	Electrical engineering, R&D department that develops and engineers parts of new technologies and products that meet (quality, time and cost) targets (electrical engineers)
EP	Engineering products/ processes, R&D department that elaborates parts of new technologies and products that meet (quality, time and cost) targets (mainly chemists and physicists)
EPT1	Engineering Prototype 1: aimed at proving the functionality of a new product concept
EPT2	Engineering Prototype 2: aimed at reaching desired functionality with use of parts that will also be incorporated in the final product
Function	complex part or subassembly of a new product. A function is developed under supervision of a FV
FV	Function Responsible: R&D representative who oversees the development of a specific part in new product development projects
Industrialisation	preparation of product and process for final production
ME	Mechanical engineering, R&D department that elaborates parts of new technologies and products that meet (quality, time and cost) targets (mainly mechanical engineers)
Milestone	Fixed moment in the NPD process, at which the progress is measured according to a fixed format
NPD	New Product Development
ODS400-C	Océ Document Standard 400-C, procedure that defines M&L contributions to NPD at Océ
OPC	Organic Photo Conductor, used for transferring the image to the paper
PC	Project Committee, multidisciplinary team dedicated to oversee a product development project
PDP	Product Documentation Package, R&D documentation which describes the technical specification of the product
Processdrum	device that composes the ink on its surface before transferring it onto the paper
SBU	Strategic Business Unit
TC	Technical Committee, meeting of the FV of a project
WFPS	Wide format printing systems, SBU at Océ



Appendixes

To:

Timely integration of purchasing and R&D in the new product development process of Océ-Technologies b.v.

Ron Heinen, December 2003

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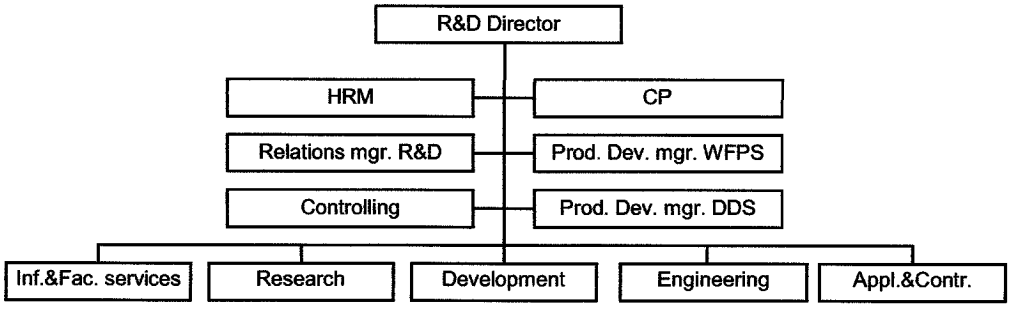
Appendix 1.1 Steering group members

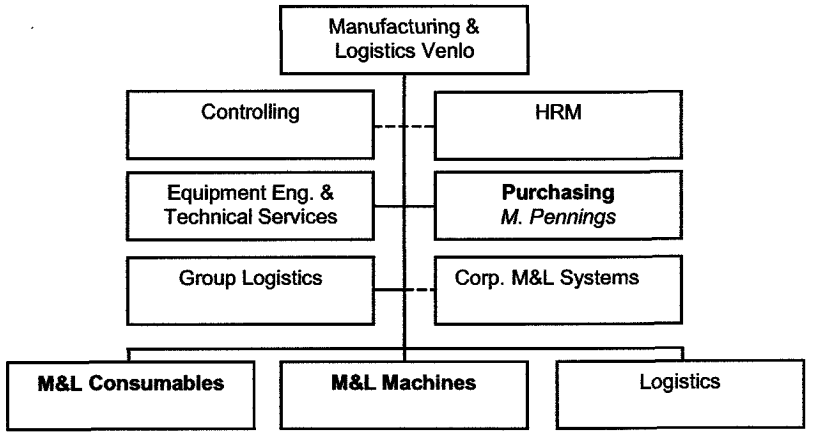
Wim Draai	EP2 head
Sjaak Janssen	Cobalt M&L project leader
Aart Polderman	DV1 head
Henk-Jan Zwiers	Cobalt R&D project leader

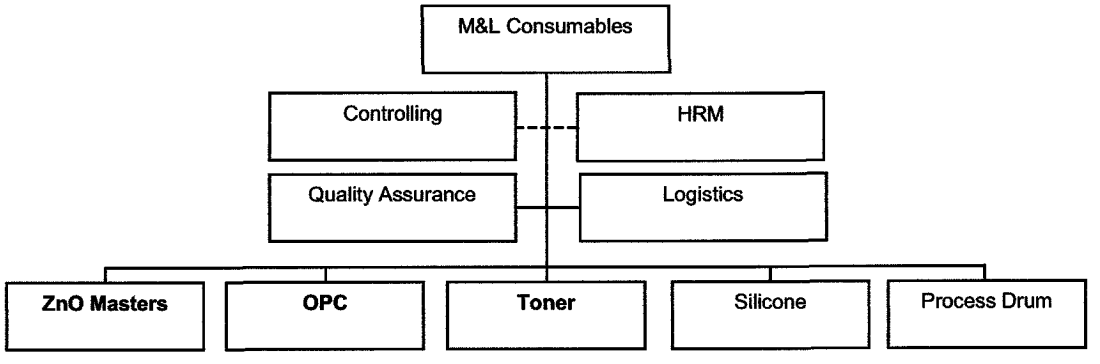
Appendix 2.1 Océ Research & Development organisation



Source: Océ Venweb intranet site 18/11/03

Appendix 2.2 M&L and M&L Consumables organisation charts





Source: Océ Venweb intranet site 18/11/03

Appendix 2.3 Océ history

The history of Océ goes all the way back to 1877 when Lodewijk van der Grinten – being a pharmacist – expanded his activities to the production of butter colouring. When business declined around 1918, his son decided to use his knowledge on pigments to research blueprint materials. As the market became more demanding and Diazo-technology for making "positive" copies became available, Van der Grinten approached a German company – Kalle & Co – which held the patent for Diazo technology. As Kalle refused cooperation, Van der Grinten developed his own Diazo process, unique enough to withstand legal action by Kalle. In 1930, the three grandsons of Lodewijk van der Grinten brought this technology to the market under the name Océ.

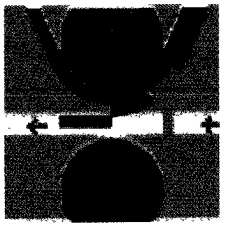
Following growing demand in the office market in the 1960's, Océ van der Grinten (as the company was then called) introduced a plain paper copier in 1973. In 1983, Océ introduced the first large format printers for drawing offices. To follow the trend of digitalisation in the 1990's, Océ introduced its first digital copier/printer in 1996 [43].

Appendix 2.4 Océ specific technologies – Copy Press

At the heart of every Océ-developed copier and printer is the proprietary Océ Copy Press system, the only real alternative to xerography. We developed Copy Press because we were dissatisfied with xerography's performance and thought we could do better. We were right. Today, the Océ Copy Press system is the basis for all our new developments, including the Colour Copy Press machines.

The Océ Copy Press system is so revolutionary that when Buyer's Lab tested our copiers, they called them "amazing" and "unmatched in the industry". The six unique components of the Océ Copy Press system produce copies and prints that always get rave reviews.

1. Masterbelt ensures sharp and accurate images
The super-sensitive Océ masterbelt produces a very sharp and accurate latent image. And a clear latent image generates clear impressions. Copy after pristine copy.



2. Monocomponent developing means less toner contamination
The Océ Copy Press system's self-developing toner brings several advantages:

- Less mess in your machine
- No toner residue on your documents, for cleaner copies and prints
- Low temperature fusing so you can print on heat-sensitive materials, like transparencies. Low temperatures also mean less energy consumption
- No developer to dispose of so your document production is more environmentally considerate

3. TTF gives near-offset quality reproduction
The Toner Transfer Fusing technology, found only in the Océ Copy Press system, actually "presses" toner into the paper, cleanly and neatly, just like offset printing.

In contrast, xerographic technology uses a powerful electrostatic charge to make toner "jump" from the photoconductor to the paper. This can cause toner contamination on the paper and the machine.
Furthermore, Océ's dual-belt toner-transfer system means the paper never touches the masterbelt, so there's no risk of damage to the photoconductor.

4. Short paper path makes jams practically impossible
The triumph of the Océ Copy Press system begins with the paper path—one of the shortest on the market. With conventional xerographic technology, the paper must make a long and tortuous journey into the machine to receive the image.
Océ Copy Press, on the other hand, transports the image to the paper. So the paper has hardly any time to get tangled in the machine. And paper jams rarely occur even with heavy stock.

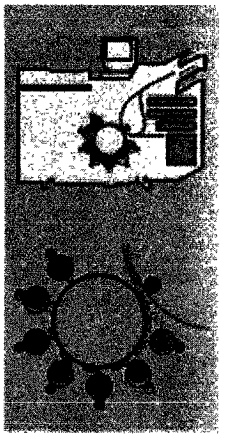
5. Single corona unit means less ozone contamination
The pin-array corona unit produces a consistently high-quality image. It's also environmentally considerate, generating ozone emissions far below competitive systems and the threshold limit value. The single charge also reduces static electricity to practically nothing, thus eliminating another cause of paper jams.
Xerography, on the other hand, uses several electrical charges at different places to make a copy. The resulting heat and static electricity increase the likelihood of paper jams.

6. One-pass duplexing increases reliability
Most Océ Copy Press copiers and printers also provide Océ one-pass duplexing, making double-sided imaging as easy and reliable as single-sided. By eliminating the auxiliary duplexing tray common to other machines, this feature also eliminates static build-up, a common cause of paper jams. In the unlikely event of a jam, job recovery is also easier than in machines with an auxiliary tray.

Source: Océ corporate website,
http://www.oce.com/en/about/Technologies/CopyPress.htm 15/4/03

Appendix 2.5 Océ specific technologies – CPS700 colour technology

New technology for new performance. Existing colour printing systems are often temperamental, expensive to run and have fluctuating print speeds. And because they're unstable, you have to adjust them constantly whilst they waste your work.



Introducing the Océ CPS700 (Colour Production System)
A fundamentally new seven-colour system that's fast, right-first-time, easy to use and highly productive. This innovative process ensures high-quality, reliable images are produced at a constant speed, across a wide range of materials. And Océ Direct Imaging technology provides rock-solid stability without the need for constant calibrations.

Direct Imaging in one quick reliable step
At the heart of the Océ CPS700 is Océ's unique Direct Imaging technology. In this truly digital process, seven Direct Imaging units (processdrums) transfer base colours onto an intermediate drum. So the complete toner image is compiled in one go without using a developer. The process isn't affected by temperature and humidity variations either, meaning you don't have to keep recalibrating. And all of this with no ozon emissions.

Océ Colour Copy Press produces great colour every time
The Océ CPS700 takes Océ's proven reliability one step further. Its stable engine is the only one that allows optimum and easy colour management. Enhanced Océ Colour Copy Press technology actually 'presses' the toner image onto the paper. Giving you stable colour quality on a wide range of media. The low fusing temperature means no paper curl either. And the short paper path practically eliminates paper jams. Even when you're duplexing. So consistent output and high productivity are guaranteed.

Flawless reproduction with Océ Image Logic®
With innovative printing technology you expect exceptional image processing. That's why Océ Image Logic® is a vital part of the Océ CPS700. You won't find a more advanced system for scanning and converting analogue information into digital data. Océ Image Logic® differentiates text, photos and graphs in a single image, enhancing the print quality of your documents.

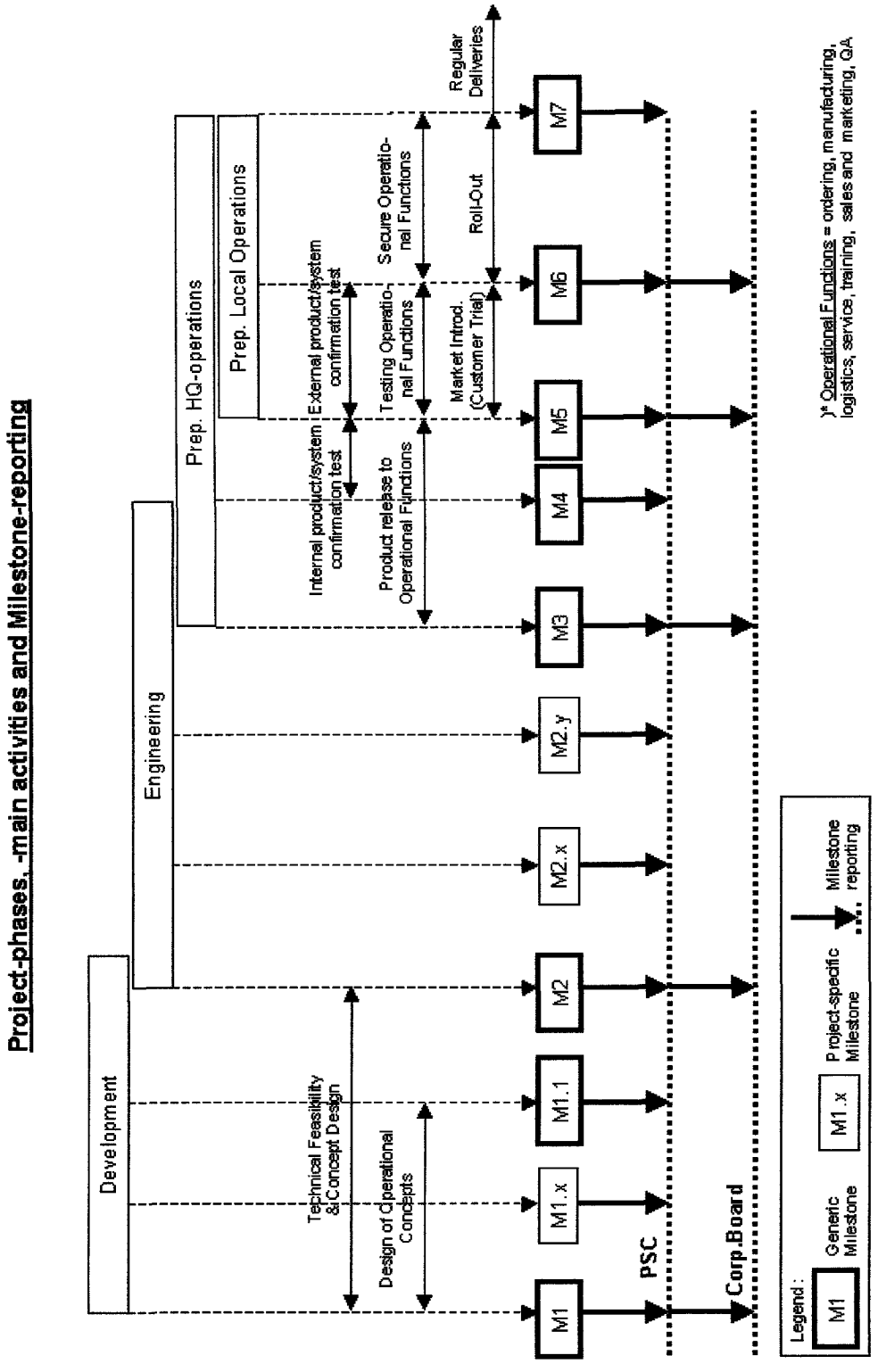
Solutions that streamline your workflow
Workflow starts with your application. So the Océ CPS700 has an open interface that's compatible with all major types of data flows and formats. And then there's the set memory. Entire jobs can be temporarily stored in the high-capacity memory while another print run is in progress. You can programme jobs and manage queues via the intuitive user interface. Scanning, printing and RIP-ing can all be done concurrently, whether you want single prints, multiple prints or multiple sets. This multi-tasking capability eliminates the need for manual sorting, cuts down on operator time and steps up your document flow.

Monocomponent toner for trouble-free prints
Traditional technologies use a number of steps to get toner onto the paper, which can affect print quality and handling. The Océ CPS700 is different. Océ's unique monocomponent toner is transferred directly to the paper in a single layer via the intermediate drum and fused at a lower temperature. What's more, because the system uses very little silicon oil, there's no excessive surface shine. Your prints come out with an offset look and feel and without that static cling.

A powerful combination that's easy to use
Océ's green button approach means all your jobs are printed right first time, without the need for constant adjustment and fine-tuning. So with the Océ CPS700 you've got a colour production system that's fast, stable, highly productive and easy to use. All in all, a powerful combination that's going to completely change the way you use colour in your business documents.

Source: Océ corporate website, http://www.oce.com/en/about/Technologies/CPS700colour.htm *15/4/03*

Appendix 2.6 Océ project phasing



Source: Océ Project Manual [46]

Appendix 2.7 Project milestones at Océ

Source: Océ Project Manual [46]

M1. Start of the Project
Project Definition approved, including product requirements, marketing/business plan, technical specification, a project schedule and a project calculation; feasibility questions defined.

M1.1. Product requirements from the operational disciplines are made explicit
Here the operational concepts are developed that might influence the product design (both HW and SW) and of which the consequences on the product should be clear well before starting
the Engineering phase:

- Manufacturing concept: assembly-units, make/buy, etc.
- Service Concept: service-units, diagnostics, etc.
- Commercial (/delivery-) concept: commercial configurations, upgrade policy, number of counters, licensing policy, etc

M1.1. includes a written document specifying the Operational product requirements and serving as one of the inputs for detailed technical specs that mark the start of Engineering. It should be noted that feasibility questions are not by definition of a technological nature only, but might also include statements on the timely availability of the needed expertise/resources in the operations.

M2. "Contractmoment": the program is defined and fixed.
Start of Engineering. Feasibility should be proven. On possible remaining feasibility issues a calculated risk assessment should be available, including fallback scenarios ("What if not"). Product requirements should be specified to such a level of detail that a realistic plan can be made. (Note that this requires engineering people to participate in the project well before M2).
The Project specific milestones within the Engineering phase should be defined. Plan, timing and resources required to execute the plan should be committed by the PSC.
M2 is the "contract" moment between the SBU and the R&D-centre. A Product Agreement is committed upon, containing the final product requirements, a marketing/business plan, additional technical specifications, the committed project schedule and a profitability calculation. The format is standardised within Océ.

M3. Transfer to operational functions
Technical Product Documentation is released to the operational functions, allowing them to start investing in equipment, tooling, facilities, development of training etc. where appropriate. Initial
purchase orders are committed to suppliers. (Note that depending upon the nature of the project, the weight of this milestone might differ substantially from one project to another)
M4. Contract met.
Marks the end of Engineering. Transfer of the product documentation to the operational functions is ongoing. Internal product/system confirmation tests will start here. These might
include Beta-tests (non-commercial placements at customer sites, under responsibility of the Project Committee), certification tests, QA, etc. Essentially these tests are executed by independent bodies (non-project team members).

M5. Market introduction and start of the Customer Trial.
The trial is executed with a limited number of products, in a limited geography, under the responsibility of the Project Committee, however through applying the existing operational functions (Opco's, HQ). The purpose of the Customer Trial is twofold:

- an external product/system confirmation test with limited units at selected customers under commercial conditions in a limited number of operating companies (presumably one or two),

- a verification of the operational -structures, -systems and - working procedures to successfully manufacture, deliver, sell and support the product/system in a regular way.

Note that both a Beta-test and a Customer Trial are "instruments" of the Project Committee to secure its goals.

M6. Evaluate Customer Trial and the start of Rollout to other Operating Companies.
Results of the Customer Trial are processed into further fine-tuning of the operations. The Customer Trial limitations with respect to number of opco's and number of units are dissolved.
Introduction activities in new opco's take place and while the availability of units might still might be limited, the Project Committee allocates the available units to opco's in accordance with these.

M7. Start of regular deliveries.
The operations (ordering, manufacturing, logistics, service and support, training, sales and marketing) are ready and equipped to handle the product through their regular organisation. The project team is dismissed and dissolved.

Appendix 2.8 Océ former project phasing (in Dutch)

Source: Océ Venweb intranet site 18/11/2003

Een project start formeel na goedkeuring door de Raad van Bestuur van de project definitie. Deze project definitie wordt opgesteld onder verantwoordelijkheid van de Task Force en vormt de basis voor de ontwikkeling van het Product Specificatie Document door het Project Committee

In de life-cycle van een product / markt combinatie is de volgende fasering te onderscheiden:
Fase 1
Aantonen van technische haalbaarheid op functioneel niveau middels haalbaarheids-studies en - experimenten
Fase 2
Aantonen van proces- en product concept haalbaarheid op systeemniveau, resulterend in een labmodel
Fase 3
Engineering van een integraal product, resulterend in een PDP en aangetoond middelséén of meerdere EPT's en voorbereiding van productie
Fase 4
Vrijgeven van het Product Documentatie pakket en het inrichten en opstarten van productie
Fase 5
Customer trial en overdracht naar de regulaire productie organisatie

Na de formele afsluiting van fase 5 bevindt het produkt zich in de regulaire produktie. De laatste stap zal uiteindelijk het afvoeren uit het assortiment zijn.

Appendix 2.9 Orientation interviews at Océ

Name	Function	Main topics
A. Polderman	DV1 head	DV responsibilities in NPD, decisions and activities in development phase. General perception of purchasing involvement in NPD.
H. Habets	EP1 head	EP responsibilities in NPD, position of the functional organisation compared to projects. General perception of purchasing involvement in NPD.
W. Draai	EP2 head	Insight into the specificity of Consumables. Differences and similarities between engineering departments. General perception of purchasing involvement in NPD.
M. Kusters	ME3 head	Differences and similarities between engineering departments. Project organisation. General perception of purchasing involvement in NPD.
J. Logister	R&D member (EP2)	Problems and successes with purchasing involvement in the development of the processdrum.
H. Zwiers	Cobalt project leader R&D	NPD project phasing. Problems and successes with purchasing involvement in the development of the processdrum and printhead. General perception of purchasing involvement in NPD.
S. Janssen	Cobalt project leader M&L	Project organisation. General perception of purchasing involvement in NPD. Problems and successes with purchasing involvement for the Cobalt printhead. General perception of purchasing involvement in NPD.
R. Leus	Cobalt printhead function responsible	Insight into the specificity of Consumables. Project organisation and – phasing. General perception of purchasing involvement in NPD.
J.van het Ooster	Manager strategic planning	Importance of introducing new technologies to the market, project start-up and organisation
J. Stoevenbelt	former procurement engineer	Activities of the procurement engineers, reason for stopping the initiative. General perception of purchasing involvement in NPD.
M. Pennings	purchasing director	Position of purchasing in the Océ organisation. Need for improving purchasing contributions to NPD. General perception of purchasing involvement in NPD.
E. Beers	purchaser Consumables	Chemical background of Consumables, hidden spec. problems and successes with purchasing involvement in NPD projects.
R. de Bruijn	purchaser Consumables	Specific characteristics of Consumables, hidden spec. General perception of purchasing involvement in NPD.
M. Broeren	purchaser Consumables	Problems and successes with purchasing involvement in the development of the processdrum and printhead. General perception of purchasing involvement in NPD. Organisation of purchasing in NPD.
H. Speerstra	purchaser Investments	Investments-related purchasing activities in NPD. Organisation of purchasing in NPD. General perception of purchasing involvement in NPD.
B. Pothast	purchasing Machines project coach	Organisation of purchasing Machines in NPD. Differences with purchasing Consumables. General perception of purchasing involvement in NPD.

Appendix 2.10 Océ ODS400-C standard (in Dutch)

1. INLEIDING
Deze standaard beschrijft de stappen, die moeten worden genomen in de ontwikkeling van de PDP objecten voor Consumable Parts, uiteindelijk resulterend in de vrijgave van het PDP.

2. DOEL EN GELDIGHEID
Deze ODS is een aanvulling op ODS 00400, die het proces beschrijft voor de Parts die noodzakelijk zijn voor de industrialisatie van de printer. Voor Consumable Parts is de werkwijze op enkele punten verschillend van de overige R&D disciplines. Dit wordt veroorzaakt door het feit, dat het aantal koop-parts veel minder is en het feit dat er ook processen voor de fabricage van deze Consumables moeten worden ontwikkeld èn overgedragen. Deze processen worden eveneens beschreven middels het PDP. De kwaliteit-stappen gelden zowel voor de grondstoffen, de tussen/eind Parts als voor de fabricageprocessen afzonderlijk.

3. BEGRIPPEN
Industrialisatie De industrialisatie van Consumable Parts start bij project fase 3 en eindigt bij afsluiting fase 5. Het betreft de industrialisatie van zowel de Fabricage Processen als van de Consumable Parts. De industrialisatie ontwikkelingen van deze fabricage processen doorloopt in hoofdzaak drie stappen.
In hoofdstuk 4 zijn deze stappen en de bijbehorende workflow schematisch uitgewerkt.
In hoofdstuk 5 zijn de industrialisatie activiteiten binnen de stappen, gerelateerd aan de workflow en bijbehorende kwaliteitontwikkeling status van het fabricage proces, nader uitgewerkt.

Labmodel equipment:
Met dit equipment kunnen functioneel goede Parts worden gemaakt, maar het equipment behoeft nog een opschaling ten aanzien van bijv.
- Stabiliteit,
- Eenduidigheid, (minder instel mogelijkheden)
- Operator gevoeligheid,
- Output.

Het equipment wordt gebruikt om de functionele werkgebieden in kaart te brengen en hoeft nog niet de juiste schaalgrootte te hebben.

Engineering equipment:
Dit equipment is de basis voor de fabriek en is zonder industrialisatie en op de juiste schaalgrootte (geen functionele risico's) direct door M&L/C toe te passen. Eventuele aanpassingen die naderhand door M&L/C kunnen worden uitgevoerd hebben betrekking op zaken zoals, procesbesturing, ergonomie, servicebaarheid etc.

Productie equipment:
Dit is equipment, dat geheel voldoet aan de criteria voor een beheerste productie, M&V aspecten, servicebaarheid, up-time en kostprijs.

Opschaling
Met opschaling wordt de overdracht van R&D naar M&L/C bedoeld en alle aspecten die nodig zijn voor een beheerste productie.

Progress Level
De voortgang van de ontwikkeling van het kwaliteitsniveau van de PDP-objecten.
Proto process Dit is een proces, dat in beheer is gegeven en de potentie heeft voor een industrialisatie. Het is een proces, waarmee (over het algemeen met lab model equipment) Parts gemaakt kunnen worden voor het EPT. De functionele parameters (werkgebieden) van het proces zijn nog niet volledig bekend.

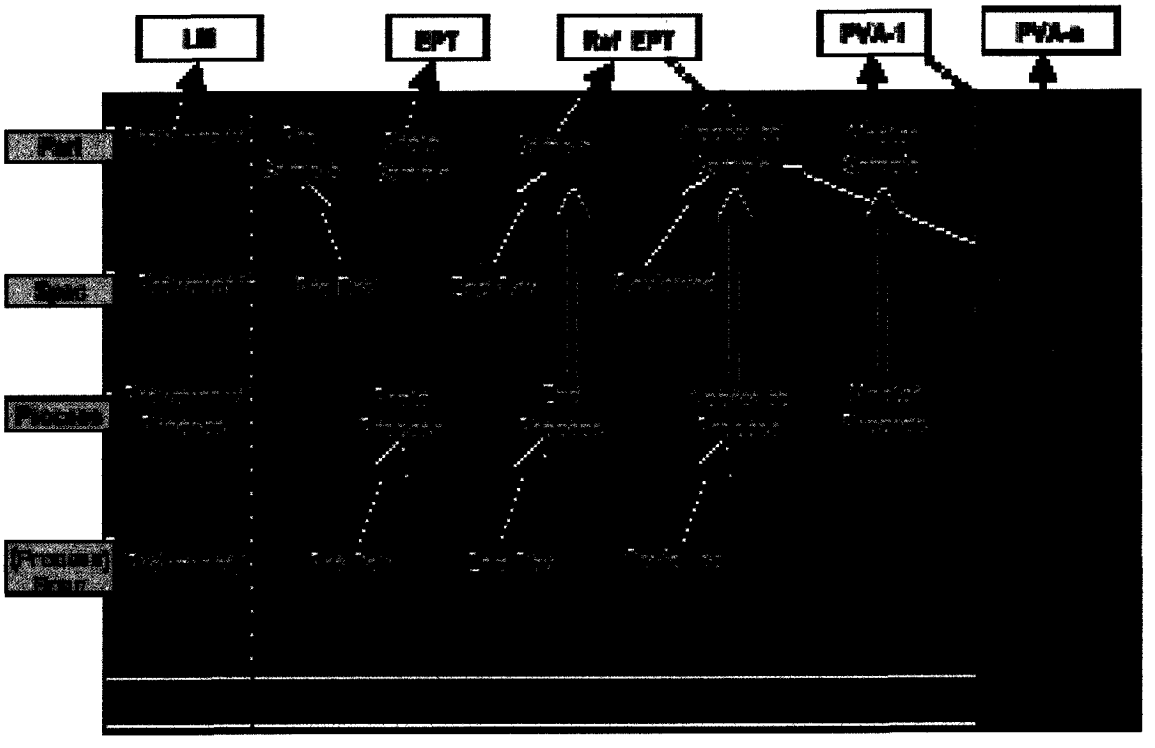
Engineerings process
Dit is een proces waarmee de engineers van R&D op basis van Eng Rev Specs aantonen, dat hiermee Parts gemaakt kunnen worden die functioneren in het EPT. Werkgebieden zijn in kaart gebracht.

Approved process
Dit is een proces, dat uitgevoerd wordt met engineering-equipment, waarmee de engineers van R&D en M&L/C aangetoond hebben, dat op basis van Reviewed Specs Parts gemaakt zijn die functioneren in het Ref-EPT en dat dit proces industrialiseerbaar is. Tevens is het proces in samenhang met de overige processen (m.b.t. de interacties) getest.

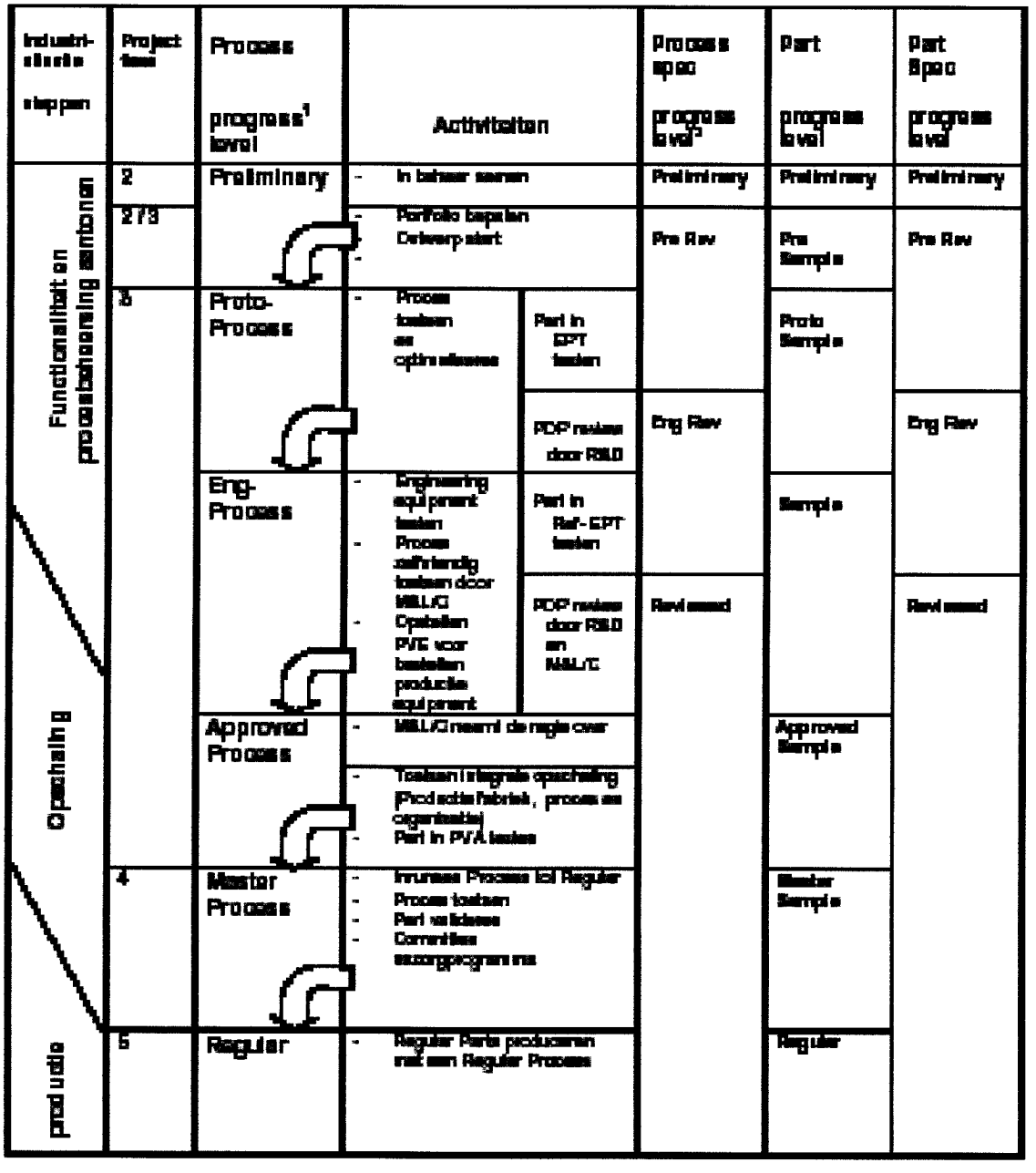
Master process
Dit is een proces, dat M&L/C geheel zelfstandig heeft uitgevoerd en waarmee Parts worden uitgeleverd die zijn gefabriceerd met eigen middelen, met de juiste technologie en op de juiste schaalgrootte.

Regular process
Dit is een proces, dat zowel met M&L/C middelen als –mensen wordt uitgevoerd, waarvan de afgesproken criteria zijn gerealiseerd.

4. WORKFLOW



4.2 De kwaliteits-levels Consumables en randvoorwaarden



Appendix 5.1 Case study protocol

inleiding
Initiële vraagstelling: onduidelijkheid in de rol van inkoop in product ontwikkeling.
Doel: inzicht geven in problemen op dit gebied en definiëren welke bijdragen inkoop zou moeten leveren per fase van productontwikkeling om deze te voorkomen (verbeteren).
Focus: inkoop Consumables.

voorlopige conclusie:
Huidige inkoop bijdragen tot aan engineering zijn volledig gericht op het voorbereiden van inkoopactiviteiten in latere fasen (bijvoorbeeld een portfolio analyse). De gerichtheid van inkoop op het faciliteren van de ontwikkeling van functionaliteit, ontbreekt.

model uit literatuur
Om een volledig beeld te ontwikkelen van inkoopbijdragen aan alle fasen van product ontwikkeling heb ik een theoretisch model gebouwd (obv literatuuronderzoek).

testen van model in 2 projecten
Nu in aantal interviews nagaan hoe bijdragen uit dit algemene model terug komen in projecten binnen Océ: procesdrum (OS115) en het printhead van Cobalt.
Vragen bestaan uit twee delen, beide ter beoordeling op een 5-punts schaal:
- algemeen: wat is uw mening over het belang/ de toegevoegde waarde van elke bijdrage
- vervolgens alleen voor het specifieke geval van *PD/Head* hoe u deze factor heeft gewaardeerd in het project, en de achterliggende redenen voor deze waardering per cluster van bijdragen

Beoordeling per bijdrage op twee vlakken:

mening algemeen	*toepassing in project*
● volledig mee oneens	● zeer slecht
● mee oneens	● slecht
● neutraal	● neutraal
● mee eens	● goed
● volledig mee eens	● zeer goed

Dit is een vrij uitgebreide lijst. Indien u geen mening heeft over bepaalde bijdragen (of geen ervaring ermee heeft), dan slaan we deze over.

ontwikkelen functionaliteit ~ development fase

		oneens slecht				eens goed
1	inkoop moet meebeslissen over de mate en de timing van betrokkenheid van leveranciers in de development fase	p				
	inkoop moet voordelen (bv. toegang tot technologieën) die het betrekken van leveranciers in het algemeen tijdens development heeft, intern communiceren	p				
	inkoop moet deze zaken inbrengen vroeg in de development fase	p				
2	inkoop moet mede develop or buy beslissingen maken	p				
	inkoop moet inzicht geven in de kosten van de "buy" optie	p				
	inkoop moet kandidaten identificeren voor de "buy" optie	p				
3	inkoop moet een belangrijke rol spelen in het spotten van nieuwe product- en technologische ideeën van leveranciers (markten), en deze vervolgens naar R&D communiceren	p				
4	inkoop moet zorg dragen voor de selectie van leveranciers van test-equipment (t.b.v. experimenten GR-DV)	p				
5	inkoop moet communicatie faciliteren tussen R&D en leveranciers	p				
6	inkoop moet zorg dragen voor informatievoorziening over leveranciers (oa. preferred suppliers)	p				
7	inkoop moet leveranciers uitdagen om alternatieve technieken/ materialen/ onderdelen in te brengen die tot betere functionaliteit leiden (dus niet alleen lagere kosten)	p				
	inkoop moet concepten mede evalueren: afwegen van toegevoegde waarde van technieken/ materialen/ onderdelen in vergelijking met de kosten ervan	p				

overgang development – engineering

		oneens slecht				eens goed
	inkoop moet meebeslissen over de mate en de timing van betrokkenheid van leveranciers	p				
8	inkoop bepaalt in hoge mate de niet-technologische eisen aan leveranciers (eisen opstellen voor selectie: betrouwbaarheid, prestatiemeting)	p				
	inkoop moet alternatieve mogelijkheden voor leveranciers-relaties aangeven (ESI, residential engineering)	p				
9	inkoop moet een centrale rol innemen in het ontwikkelteam	p				
10	inkoop moet bij M2 levering van kritische componenten zeker stellen	p				

beheersbaar maken KTK ~ engineering fase

		oneens slecht				eens goed
	Inkoop moet mede make or buy beslissingen maken	p ○	○	○	○	○
11	inkoop moet kandidaten voor de "buy" optie identificeren	p ○	○	○	○	○
	inkoop moet in de gaten houden of make or buy beslissing aangepast moet worden bij ontwerpwijzigingen	p ○	○	○	○	○
	inkoop moet zorg dragen voor leveranciersselectie voor materialen en onderdelen	p ○	○	○	○	○
12	inkoop moet zorg dragen voor leveranciersselectie voor proto productiemiddelen	p ○	○	○	○	○
	inkoop moet zorg dragen voor leveranciersselectie voor productiemiddelen	p ○	○	○	○	○
13	inkoop moet de overgang bij een leverancier naar serie productie coördineren en ingrijpen wanneer nodig	p ○	○	○	○	○
14	inkoop moet zorg dragen voor informatievoorziening over standaard onderdelen en hun leveranciers	p ○	○	○	○	○
15	inkoop moet ontwerpwijzigingen evalueren om in te kunnen schatten wat de impact is op kosten en verkrijgbaarheid	p ○	○	○	○	○
16	inkoop moet de levering van prototypes plannen en sturen	p ○	○	○	○	○
17	inkoop moet levering van kritische materialen en onderdelen zeker stellen	p ○	○	○	○	○
	inkoop moet een belangrijke stem hebben in "waarde analyse" van materialen en onderdelen: afwegen van toegevoegde waarde in vergelijking met de kosten	p ○	○	○	○	○
18	inkoop moet hierbij invloed op specificaties en toleranties uitoefenen (voldoen aan functionele specificaties en leveranciers-mogelijkheden)	p ○	○	○	○	○
	inkoop moet standaardisatie en vereenvoudiging van onderdelen voorstellen	p ○	○	○	○	○
	inkoop moet substitutie van materialen en onderdelen voorstellen (bv. met betere verkrijgbaarheid en zelfde functie). Ook part exclusions (hard)	p ○	○	○	○	○
19	inkoop moet leveranciers ondersteunen in het halen van targets en hen aanmoedigen procesverbeteringen en kostenreducties door te voeren	p ○	○	○	○	○

Overige

- zijn er eventueel nog andere project leden die input kunnen leveren
- zijn er nog zaken van belang die niet aan bod zijn gekomen
- heeft u nog suggesties

- ik zal zo snel mogelijk terugkoppeling van dit gesprek toesturen. Graag even controleren en waar nodig aanvullen
- heeft u interesse in een overzicht van de uiteindelijke resultaten van dit project

Appendix 5.2 Case study participants per project

Cobalt printhead

- R. Leus — FV printhead
- J. Coppus — FV actuator
- M. Kremers — FV actuator
- V. Peters — FV actuator
- L. Westland — FV base- and nozzle plate
- P. Klerken — FV base- and nozzle plate
- M. Nillesen — FV electronics
- M. Broeren — Purchaser Consumables
- H. Speerstra — Purchaser Investments

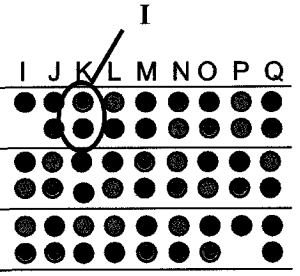
Processdrum

- J. Hillen — Project leader processdrum
- S. Lenczowski — FV processdrum
- R. Leus — FV sputtering
- R. Pannekoek — FV positioning and sourcing
- R. v.d. Meer — FV electronics
- R. de Bruijn — FV drum-cleaning and epoxy
- H. Opbroek — Purchaser Machines (electronics)
- A. Nijkamp — FV electronics
- M. Broeren — Purchaser Consumables
- H. Speerstra — Purchaser Investments

Appendix 5.3 Case study results processdrum

I J **inkoop**
K **DV (development)**
L M N O P Q **engineering (EI, ME en EP)** N.B. engineers zijn ook al tijdens development betrokken

Tijdens development fase



1.

a inkoop moet meebeslissen over de mate en de timing van betrokkenheid van leveranciers in de development fase

b inkoop moet voordelen (bv. toegang tot technologieën) die het betrekken van leveranciers in de development fase heeft, intern communiceren

c inkoop moet deze zaken inbrengen, vroeg in de development fase

Vooral R&D besliste over het al dan niet betrekken van leveranciers; inkoop was teveel faciliterend (bijvoorbeeld het organiseren van de reis naar een leverancier). Als ervoor gekozen werd een samenwerking aan te gaan, werd dus de partner zodoende ook al door R&D gekozen. Inkoopbetrokkenheid in deze beslissingen zou eerder tot een goede leverancierskeuze geleid hebben. } II

Voor de elektronica is tijdens development door R&D meerdere malen een keuze gemaakt voor een technologie en een bijbehorende leverancier (welke sterk samenhangen). In het project bleek echter iedere keer dat de fit met de gekozen leverancier onvoldoende was om te kunnen engineeren.

Een van de voorbeelden is de keuze voor Epson (asics), dat tijdens development wel de technologische eisen aankon maar 3 jaar later (tijdens engineering) onvoldoende op Océ bleek in te kunnen spelen (slechte "fit"). Epson paste de technologie namelijk toe voor LCD displays, waarvoor de productbetrouwbaarheid veel lager mag zijn dan voor Océ en welke tevens in vele grotere aantallen afgenomen worden. Hierdoor was Epson niet bereid om op aanvraag van Océ veranderingen in het product door te voeren (inflexibel, weinig belang aan Océ als klant).

Voor het overbrengen van gegevens van het apparaat (vast) naar de drum (draaiend) was in eerste instantie gekozen voor optische communicatie. Hier is vervolgens een leverancier voor gezocht. Doordat de keuze voor de technologie niet in samenhang met de leverancierskeuze was gemaakt, bleek de leverancier niet te voldoen aan de technische verwachtingen.

Vervolgens zijn technologie en leverancier samen gekozen, maar zonder inkoop: sleepring technologie met Stemmann als leverancier. Deze leverde normaal gesproken vooral aan tram fabrikanten. Technologisch gezien voldeed de leverancier, maar tijdens productie (en zelfs na verkoop) kwamen problemen a.g.v. de "fit" tussen Océ en Stemmann boven: producten die al in de markt stonden, werkten niet meer.

Uiteindelijk is tijdens reguliere productie een nieuwe leverancier gekozen in samenspraak met inkoop, R&D en M&L: Litton. Deze voldeed uiteindelijk wel volledig aan alle Océ eisen.

R&D heeft de epoxy (kritisch materiaal) vanaf het begin van development t/m engineering zelf gemaakt, op basis van 7 grondstoffen. Dit heeft zo'n 10 jaar gelopen met in totaal 2 à 3 R&D-ers. Pas in de loop van engineering heeft een inkoper het idee ingebracht om ook te kijken naar de mogelijkheden om de epoxy op een hoger niveau uit te besteden. Uiteindelijk zijn de (drie) epoxy's samen met de leverancier ontwikkeld. R&D heeft deze leverancier overigens zelf gezocht. Als inkoop zich eerder bemoeid had met de keuze voor zelf, versus samen met leverancier ontwikkelen had veel tijd en geld bespaard kunnen blijven. De eigen ontwikkeling had dan immers beperkt kunnen blijven tot het opdoen van kennis om de leverancier aan te kunnen sturen.

Voor de sputterprocessen heeft het gezamenlijk hierover beslissen tot goede resultaten geleid. R&D, inkoop Investments en M&L hebben een groep gevormd om gezamenlijk te komen tot een keuze voor een technologieleverancier en een productieleverancier. Deze partijen hebben dus bewust een onderscheid gemaakt tussen deze twee typen leveranciers.

M en N merken op dat het buiten R&D moeilijk is om in te schatten of een leverancier in technologisch opzicht bij Océ past. Het al dan niet betrekken van leveranciers in de development fase zou dan ook een keuze van R&D moeten zijn (op technologische gronden). L is het hiermee eens, maar vult aan dat inkoop hierbij aanvullend is (bedrijfsstructuur en marktpositie leverancier). } I

R&D moet de voordelen van het betrekken van leveranciers vooral zelf in de gaten hebben, eventueel ondersteund door inkoop (aangezien R&D soms teveel geneigd is intern te ontwikkelen. R&D moet inkoop wel vroeg confronteren met de leverancier die R&D op het oog heeft. Voor bestaande leveranciers zou inkoop echter de voordelen van een samenwerking aan moeten geven (aangezien inkoop deze leveranciers het beste kent). Inkoop is binnen Océ te klein om "het venster op de hele wereld te kunnen zijn". } III

Het Stemmann voorbeeld geeft duidelijk aan dat inkoop hier ondersteuning had kunnen bieden door aan te geven dat de leverancierskeuze sterk afhankelijk zou zijn van de technologie keuze.

Momenteel is inkoop te laat betrokken om daadwerkelijk mee te beslissen voor de combinatie van technologie en leverancier (Epson, optische communicatie, Stemmann). Vaak worden tijdens development namelijk "exotische" dingen ontwikkeld (ontwerp arrays paste niet bij buitenwereld). Of, zoals L aangeeft: "Zo gauw als na het technologische selectieproces een relatie opgezet wordt (vroeg in ontwikkeling), moet inkoop betrokken zijn." } II

De gewenste timing verschilt nogal eens, maar er worden argumenten genoemd om dit te doen:

- vanaf de start van development, aangezien de keuze voor een technologie sterk samenhangt met de leverancierskeuze (Epson, Stemmann)
- nadat R&D globaal te technologische richting bepaald heeft voor een onderdeel (vrijwel direct vanaf de start)
- bij de oude fase 1-2 overgang (tijdens development), aangezien ervóór nog teveel (technologische) onduidelijkheid heerst

de algemene mening is dat het initiatief om inkoop te betrekken bij R&D moeten blijven liggen aangezien hier de lead (en verantwoordelijkheid) voor het project als geheel ligt.

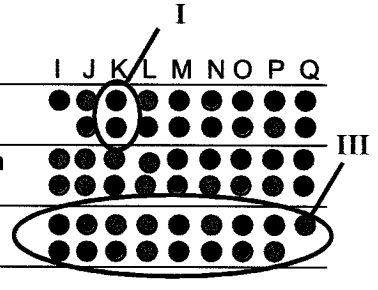
Vanaf de overgang naar engineering bracht inkoop haar perspectief wel goed in. Vooral de contacten met DV zullen dan ook verbeterd moeten worden.

2.

a inkoop moet mede <u>develop</u> or buy <u>beslissingen</u> maken

b inkoop moet inzicht geven in de kosten van de "buy" optie (kosten schatting van samenstellingen)

c inkoop moet kandidaten identificeren voor de "buy" optie



In eerste instantie bepaalt R&D de kerntechnologieën van Océ zijn, aangezien hier de project verantwoordelijkheid en het totaaloverzicht ligt. Vervolgens moet er op een wat lager niveau (productniveau, onderdeelniveau) wel discussie tussen R&D en inkoop zijn over uitbesteed – ontwikkel beslissingen. } I

Vanuit R&D was er al de wens om op een hoog niveau uit te besteden. Het resultaat van de develop or buy beslissingen was dan ook goed, maar het proces niet: inkoop was hierbij niet betrokken. Dit zou een proces van R&D en inkoop samen moeten zijn.
Zie ook het voorbeeld van de epoxy.

Het equipment voor het polijsten van de profielen is grotendeels zelf gebouwd. Het kernonderdeel (polijstkop) is van Supfina betrokken. De rest van het equipment is zelf opgebouwd uit meerdere onderdelen (oa. een 2e hands draaibank). Later is voor productie een standaard machine van Supfina gekozen. Achteraf had men veel beter direct met een standaard machine van Supfina kunnen werken, aangezien dan minder eigen capaciteit nodig was geweest, en men sneller had kunnen ontwikkelen.
Inkoop had R&D moeten pushen om te kijken naar de mogelijkheid om het gehele equipment meteen buiten te leggen ("buy" optie).

Aangezien R&D tot aan de overdracht naar M&L de verantwoordelijkheid voor de kostprijs heeft, dringt R&D aan op decompositie van de kosten bij een leverancier. Inkoop bleek hierin niet altijd een actieve rol in te spelen. Dit is echter wel mede een taak van inkoop aangezien hier de kennis aanwezig is om dit te doen. Zo zou inkoop ook aan de bel moeten trekken op het moment dat binnen R&D onrealistische targets opgesteld worden (op basis van zelfgebouwde prototypes). } i

M en Q merken op dat inkoop onvoldoende inzicht heeft gegeven in de kostenstructuur. Vanuit inkoop wordt echter aangegeven dat R&D hier niet om heeft gevraagd
Hieraan zal dan ook expliciet aandacht geschonken moeten worden: dit is immers een gezamenlijke inspanning en targets blijken niet altijd haalbaar (zie voorbeeld).

Het target voor het array was €170. Initieel waren de kosten echter €300. De hoge kosten komen voort uit de slechte fit met de leverancier (machtspositie). Na één jaar feitelijke levering zijn de kosten teruggebracht tot €200. In eerste instantie was men tevreden dat er überhaupt een leverancier gevonden was die aan de eisen kon voldoen.

Gezamenlijke rol: R&D is verantwoordelijk en inkoop ondersteunt in het verkrijgen van kosten decomposities.

Het team als geheel moet kandidaten identificeren (inkoop, MQ/QA, logistiek, R&D). Vanuit inkoop wordt aangegeven dat hiervoor wel meer duidelijkheid moet zijn over het technologiepad dat R&D voor de komende jaren wil bewandelen. Binnen de bestaande leveranciers zal inkoop de mogelijkheden na moeten gaan. Of, zoals N het formuleert: "vooral voor beginnende R&D-ers is het van belang dat inkoop de markt kent, aangezien zij zelf nog geen inzicht in de markten hebben. Binnen inkoop zou kennis over de markten opgebouwd moeten worden." } III

Nu gaat R&D vooral zelf op zoek naar leveranciers die zij relevant achten. Voor procesdrum heeft dit ertoe geleid dat het team meerdere malen met ongeschikte leveranciers voor de elektronica heeft ontwikkeld. Dit leidt tot veel extra werk (nieuwe prototype tests) en vertraging. Ook voor de epoxy is ¾ jaar samengewerkt met een te grote leverancier (die daardoor onvoldoende in wilde spelen op de wensen van Océ. Deze was door R&D zelf gevonden. } II

R&D heeft met meerdere leveranciers samengewerkt in development: Epson, Thesys (later Melexis), Philips CFT, Alcatel, Celestica.

R&D heeft 7 jaar lang samengewerkt met Alcatel (EMS) in de ontwikkeling van de arrays. Deze leverancier was gekozen op basis van strategische overwegingen: Alcatel was een grote afnemer van Océ apparatuur. Alcatel gebruikte een een basismateriaal dat werd betrokken van Isola voor deze arrays. Dit basismateriaal was klantspecifiek (voor het Océ array). Isola is een groot bedrijf, dat niet in wilde spelen op de specifieke wensen van Océ (Océ viel namelijk niet in de core-business van Isola). Een actieve inkoper zou hierin ingegrepen moeten hebben: deze relatie zou geen goede oplossing bieden (aangezien Océ nog volop in ontwikkeling zat, en de leverancier hierin niet mee wilde: Alcatel wel, maar Isola niet).

In mei 1997 heeft R&D het roer omgegooid, omdat tijdens engineering bleek dat de leverancier (en bijbehorende technologie) niet engineerbaar was. Vervolgens heeft R&D voor Thesys en Celestica gekozen (asics, resp. EMS). Zo is men in 1997 vanuit engineering weer teruggeworpen naar development. Celestica gebruikte overigens geen special als basismateriaal (ander concept).

Ook met deze nieuwe leveranciers was inkoop niet erg tevreden (Celestica is vele malen groter dan Océ, machtsverhouding). Echter, inkoop kon geen alternatieven aandragen die zowel aan de

R&D (mede ontwikkelen) als aan de inkoopeisen (gezonde relatie/ fit, kostenstructuur) voldeden. Daarom is ervoor gekozen om bij de toenmalige leveranciers te blijven.
De niet-gehaalde targetkosten uit de vorige vraag geven aan wat het resultaat hiervan is.

Ook voor het verspanend bewerken van de profielen is onvoldoende breed naar de markt gekeken:

In development en engineering had R&D al veel kleine stappen met de initieel gekozen leverancier (Hembrug) gezet. Omdat overstappen naar een andere leverancier risico's met zich mee zou brengen, bleef men bij deze leverancier. Dit was een klein bedrijf (±10 man), waardoor er weinig zekerheid en service was. Deze leverancier was wel erg flexibel. Hoewel dit uiteindelijk wel goed gekomen is, hebben R&D. noch inkoop het spectrum aan mogelijke leveranciers de hun voordelen in kaart gebracht.

3. inkoop moet een belangrijke rol spelen in het spotten van nieuwe product- en technologische ideeën van leveranciers (markten), en deze vervolgens intern (R&D) communiceren

I J K L M N O P Q
●●●●●●●●●
●●●●●●●●●

Er worden twee gevallen genoemd waarvoor inkoop dit moet doen: } I
- nieuwe ideeën van bestaande leveranciers en leveranciers uit dezelfde markten (state of the art leveranciers zoeken voor veel toegepaste technologieën; zie: technologiematrix GSP)
- commerciële doorbraken (waardoor bepaalde onderdelen goedkoper beschikbaar komen)

Wat technologische nieuwe ideeën betreft wordt unaniem aangegeven dat dit een R&D aangelegenheid is. Nieuwe ideeën moeten echter wel gezamenlijk geëvalueerd worden, zodat zowel de technologische kant als de fit klopt. } I, II

Als deze functie beter opgepikt was in het project, hadden de problemen met de arrays (Alcatel) en de epoxy voorkomen kunnen worden. R&D heeft bij de arrays namelijk niet verder gezocht naar alternatieven in leveranciersmarkten, en voor de epoxy heeft men überhaupt niet naar de mogelijkheden om uit te besteden gekeken.

4. inkoop moet zorg dragen voor de selectie van leveranciers van test-equipment (t.b.v. experimenten GR-DV)

I J K L M N O P Q
●●●●●●●●●
●●●●●●●●●

Aangezien functionaliteit hierbij voorop staat, moet R&D de vrijheid hebben specifiek equipment dat ze nodig hebben te kiezen. R&D moet wel gebruik maken van de ervaringen die inkoop met leveranciers heeft (relationeel en commercieel, niet functioneel). Aangezien dit equipment ook voor productie toegepast zou kunnen gaan worden, moet inkoop wel enige inbreng hebben. Voor specifiek equipment werken R&D en EE nauw samen. } I

5. inkoop moet communicatie faciliteren tussen het ontwikkel team en leveranciers

I J K L M N O P Q
●●●●●●●●●
●●●●●●●●●

Het is vooral belangrijk dat inkoop de communicatie faciliteert aangezien Océ als één bedrijf naar buiten moet treden, en niet als 50 afzonderlijke projecten. Na de initiële contacten is echter vooral direct contact tussen R&D en de leverancier nodig. Zou inkoop hier tussenin zitten, dan zou dit vertragend werken. Wel moet inkoop hierbij op de hoogte gehouden worden van de vorderingen. } ii

Voor de procesdrum was er vaak direct contact tussen R&D en leveranciers (zonder enige inbreng van inkoop). Het gevolg hiervan was bijvoorbeeld dat de leveranciers voor de arrays door R&D zelf gekozen werden, en hiermee samenwerking opgestart werd (met de bekende gevolgen).

L geeft aan dat inkoop hierbij zou moeten zorgen dat de juiste mensen aan weerszijde van de tafel zitten, en dat de problematiek helder gesteld wordt (bv. wanneer dat een project overgaat naar productie en zo inkomsten voor een leverancier oplevert).

6.

	I	J	K	L	M	N	O	P	Q
inkoop moet zorg dragen voor informatievoorziening over leveranciers (oa. preferred suppliers) van samenstellingen	●●	●●	●●	●●	●●	●●	●●	●●	●●

Hoewel aangegeven wordt dat er wel preferred supplier lijsten zijn, is dit voor R&D weinig zichtbaar. Zo zijn ervaringen met leveranciers verspreid over de gehele organisatie (zowel R&D als inkoop). Het zou goed zijn als er vanuit inkoop informatie over bestaande leveranciers beschikbaar gesteld zou worden (bv. soort intranet site) met ervaringen ermee uit voorgaande en parallelle projecten.
Ook zijn er geen afgesproken criteria waarop leveranciers beoordeeld worden (om preferred supplier te worden). } III

Een afweging die hierbij blijft is het belang van een relatie in productie tegenover een relatie voor een nieuw project. Zo kan je een leverancier tijdens ontwikkeling niet zonder meer aan de kant zetten als er voor een vorig product nog een relatie met deze leverancier loopt.

7.

		I	J	K	L	M	N	O	P	Q
a	inkoop moet leveranciers uitdagen om alternatieve technieken/ materialen/ onderdelen in te brengen die tot betere functionaliteit leiden (dus niet alleen lagere kosten).	●●	●●	●●	●●	●●	●●	●●	●●	●●
b	inkoop moet concepten mede evalueren: afwegen van toegevoegde waarde van materialen, onderdelen, processen in vergelijking met de kosten ervan	●●	●●	●●	●●	●●	●●	●●	●●	●●

R&D stuurt op het functionele gebied. Inkoop kan wel bestaande leveranciers uitdagen om voor verbeteringen te zorgen. In het verleden heeft inkoop leveranciers echter wel vaker gepusht om bepaalde ontwikkelingen door te zetten. Het risico hiervan is, dat een leverancier buiten zijn eigen kerngebied komt (zie vb.) } iii

R&D heeft leveranciers voor de elektronica technologieën opgedrongen. Celestica (de huidige leverancier) heeft bijvoorbeeld duidelijk zelf keuzes hierin gemaakt. De IC's van Epson die R&D wilde dat Celestica zou gebruiken, zijn door Celestica van de hand gewezen.

Aangezien het afwegen van concepten van technologische (functioneel) aard is, is dit vooral een zaak van R&D. Als de concept- en leverancierskeuze sterk samenhangen, heeft inkoop wel een belangrijke stem. Zo kunnen gevallen als het concept (technologiekeuze) voor de arrays en het Stemmann voorbeeld vorkomen worden. } II

overgang development – engineering

II

8.

		I	J	K	L	M	N	O	P	Q
a	inkoop moet meebeslissen over de mate en de timing van betrokkenheid van leveranciers voor onderdelen en samenstellingen	●●	●●	●●	●●	●●	●●	●●	●●	●●
b	inkoop bepaalt in hoge mate de niet-technologische eisen aan leveranciers (eisen opstellen voor selectie: betrouwbaarheid, prestatiemeting, target kosten)	●	●●	●●	●●	●●	●●	●●	●●	●●
c	inkoop moet alternatieve mogelijkheden voor leveranciers-relaties aangeven (ESI, residential engineering)	●●	●●	●●	●●	●●	●●	●●	●●	●●

Vanaf dit punt zijn meer engineers betrokken in het project. Zij zijn gewend samen te werken met inkoop en leveranciers. Vanuit inkoop is dit ook helderder vastgelegd: hier wordt standaard een inkoopportfolio indeling opgesteld door inkoop.
Voor de epoxy had inkoop hierin een rol moeten spelen: dan zou eerder de keuze gemaakt zijn om een leverancier te betrekken in de ontwikkeling hiervan. } II

Inkoop moet niet-technologische eisen samen met andere M&L- (logistiek, kwaliteit) en R&D disciplines (technologie, target kosten) opstellen. Vanuit inkoop gaat het hierbij om eisen op het commerciële gebied en voor lange-termijn stabiliteit. Deze partijen zouden beter hun keuzecriteria en weegfactoren met elkaar af moeten stemmen. } II

Voor de elektronica is al aangetoond dat meerdere malen een leverancier op louter technologische gronden geselecteerd is. Problemen met de engineerbaarheid door een leverancier zouden voorkomen zijn als inkoop mede de selectiecriteria opgesteld had.

Uiteindelijk is voor de asics een leverancier geselecteerd die normaal gesproken voor airbags toelevert. Deze past qua product- en leveringsbetrouwbaarheid goed bij de eisen van Océ. Inkoop heeft hierbij dan ook goed naar de niet-technologische eisen gekeken.

Het is zelfs voorgekomen dat überhaupt geen duidelijke criteria voor leverancierskeuze opgesteld zijn (alleen o.b.v. onderbuikgevoelens). Zo is bijvoorbeeld met Hauzer (nu HTCE) voor vacuüm equipment op subjectieve (persoonlijke) gronden samenwerking aangegaan terwijl er inhoudelijk problemen waren.

Voor het voorbeeld van Hembrug (zie ook 2) heeft inkoop ook onvoldoende inbreng gehad op het vlak van niet-technologisch eisen. Deze kleine leverancier (10 medewerkers) biedt namelijk weinig lange termijn zekerheid.

Er wordt duidelijk aangegeven dat inkoop meer aandacht zou moeten besteden aan de vormgeving van de leveranciersrelatie. Dit wordt over het *algemeen* echter vooral gezien als een mooi extraatje. Hier ziet men momenteel nog weinig van terug in projecten, als alleen het opzetten van ESI tijdens engineering. } ii

9. inkoop moet een centrale rol innemen in het ontwikkelteam

I J K L M N O P Q

Inkoop is voor een deel ondersteunend aan R&D. Wel moeten er geregeld ook op gelijk niveau beslissingen genomen worden (bijvoorbeeld evaluatie van leveranciers voor de elektronica). Inkoop zou meer kritische vragen moeten stellen om R&D te dwingen na te denken over de gekozen route met leveranciers.

Binnen het ad-hoc opgerichte DEO (Drum Elektronica Overleg) zijn wel gezamenlijk afwegingen gemaakt voor de partnerkeuze. Omdat er begrip voor elkaars standpunten was, is uiteindelijk gekozen bij de leverancier van dat moment te blijven (Celestica) aangezien er geen alternatieven waren die vanuit beide standpunten voldeden. Celestica was geselecteerd vanuit technologische overwegingen, en vertoonde daardoor geen goede fit met Océ, waardoor de kostprijs hoog bleef.

Tijdens R&D fase liep het DEO goed aangezien R&D het initiatief nam om de leden tweewekelijks bij elkaar te roepen. Vervolgens zou inkoop dit initiatief bij M3 over moeten nemen, maar dit is niet gebeurd. Reden: het DEO had geen vaste plaats in de projectorganisatie (ad-hoc, niet structureel).

J formuleert dit als volgt: "inkoop speelt een centrale rol op het gebied van relaties (met leveranciers, maar ook met andere delen van Océ), *maar* niet op technisch-inhoudelijk gebied."

II

10. inkoop moet bij M2 levering van kritische componenten zeker stellen

I J K L M N O P Q

M2 is erg vroeg om levering volledig zeker te stellen, maar risico's moeten wel al ingeschat worden. N formuleert dit als volgt: "de problemen die nog optreden moeten oplosbaar zijn binnen de grenzen van inkoop".
Momenteel is dit voor categorie 1 items (strategisch) ook vastgelegd (ODS400-C). } II

Voor de elektronica is men te vroeg overgegaan naar engineering (met Alcatel), terwijl de risico's onvoldoende afgebouwd waren. Hierdoor is men <u>na drie jaar engineeren</u> teruggeworpen naar de start van engineering (en zelfs nog een deel development).

Engineering fase

11.

		I	J	K	L	M	N	O	P	Q
a	Inkoop moet mede <u>make</u> or buy <u>beslissingen</u> maken	●	●	●	●	●	●		●	●
b	inkoop moet kandidaten voor de "buy" optie identificeren	●	●	●		●	●		●	●
c	inkoop moet in de gaten houden of make or buy beslissing aangepast moet worden bij ontwerpwijzigingen	●	●	●	●	●	●	●	●	●

Voor Consumables is de make or buy beslissing niet erg interessant aangezien alle belangrijke keuzes zijn al bij de develop or buy beslissing gemaakt zijn (kritische componenten). } II

Kandidaten identificeren moet in samenwerking tussen R&D en inkoop gebeuren. Het is gebleken dat leveranciers die door R&D op louter technologische gronden gekozen worden, bij engineering niet voldoen aan niet-technologische eisen. Indien hier nog nieuwe leveranciers naar voren komen (bijvoorbeeld als gevolg van marktontwikkelingen), moeten R&D en inkoop deze gezamenlijk evalueren. Dat dit voor de procesdrum niet goed gebeurd is, blijkt uit het feit dat nu nog nieuwe leveranciers naar voren komen (die bijvoorbeeld productie in China hebben).

Echter, als inkoop uitgebreid (Europees of wereldwijd) de beste leveranciers zou moeten zoeken, zou er meer capaciteit nodig zijn. Hiervoor kan de voorgestelde constructie waarbij inkoop bestaande leveranciers (markten) bekijkt, en R&D eventuele nieuwe, een oplossing bieden. } III

Evaluatie van de kandidaten zal vervolgens vanuit meerdere perspectieven (technologisch, commercieel, lange termijn) moeten gebeuren. } II

Voor de procesdrum was het niveau van uitbesteden vóór engineering al vastgelegd. Ook is inkoop onvoldoende vertegenwoordigd en ontbeert de technologische kennis om ontwerp wijzigingen te kunnen evalueren, en speelt R&D een belangrijkere rol hierin (ook vanuit R&D is immers contact met de leverancier).
Als voor "make" gekozen is, is er vaak ook al geïnvesteerd, waardoor de beslissing moeilijk nog teruggedraaid worden. Vandaar dat deze activiteit vaak niet relevant is.

12.

		I	J	K	L	M	N	O	P	Q
a	inkoop moet zorg dragen voor leveranciersselectie voor subsystemen, materialen en onderdelen	●	●	●	●	●	●	●	●	●
b	inkoop moet zorg dragen voor leveranciersselectie voor proto productiemiddelen			●	●	●	●	●	●	●
c	inkoop moet zorg dragen voor leveranciersselectie voor productiemiddelen		●	●	●	●	●	●	●	●

Leveranciers selectie is altijd een gezamenlijke keuze van inkoop, logistiek, QA, en R&D. Alle partijen die met de leverancier te maken krijgen moeten achter de keuze staan. Voor productiemiddelen heeft EE (M&L equipment engineering) hierin een belangrijke stem. } II

13.

	I	J	K	L	M	N	O	P	Q
inkoop moet de overgang bij een leverancier naar serie productie coördineren	●	●	●	●	●	●	●	●	●

Een goede leverancier zorgt hier zelf voor. Inkoop moet dit proces wel volgen en ingrijpen wanneer nodig. } iv

Een voorbeeld waar dit zeer goed gaat, is Celestica (arrays). Hiermee is goed afgesproken wat Océ belangrijk vindt, en wat niet (wat wel meten, wat niet). Hierbij lag de nadruk erop om de leverancier aan het denken te zetten: uitdagen. Ook is de overgang van de proto lijn naar de productielijn bij deze leverancier gevolgd, en zijn de resulterende producten getest door Océ. In het eerdere concept met Alcatel had inkoop aan moeten geven dat de leverancier niet geschikt was voor serieproductie.

M merkt op dat bij Consumables opschaling door een leverancier impact heeft op de functionaliteit. R&D moet dan ook deze overgang coördineren en doet dit ook, evt. samen met QA.

14.

	I	J	K	L	M	N	O	P	Q
inkoop moet zorg dragen voor informatievoorziening over standaard onderdelen en hun leveranciers	●	●	●			●	●	●	●
	●	●	●			●	●	●	●

Dit blijkt weinig relevant voor Consumables, aangezien er nauwelijks tot geen standaard onderdelen zijn. Voor de NiCr laag (zie 19) had inkoop dit wel actief moeten doen. De vraag is echter of inkoop hiervoor de technologische kennis en fte heeft.

15.

	I	J	K	L	M	N	O	P	Q
inkoop moet ontwerpwijzigingen evalueren om in te kunnen schatten wat de impact is op kosten en verkrijgbaarheid	●	●	●	●	●	●	●	●	●
	●	●	●	●	●		●		●

Na M2 is het PDMS actief, waarin inkoop goedkeuring moet geven voor ontwerpwijzingen. Is men het niet eens met een wijziging, dan is er direct terugkoppeling met de ontwerper. Voor de meeste problemen moet de leverancier dit echter inschatten. Inkoop is hierbij intermediair.
Voor de procesdrum elektronica is dit goed gegaan door overleg in het DEO.

16.

	I	J	K	L	M	N	O	P	Q
inkoop moet de levering van prototypes plannen en sturen	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●

Plannen van levering van prototypes gebeurt door de ontwerper (R&D) of door de projectleider, aangezien hier de projectplanning in deze fase opgesteld en bewaakt wordt. Wel moet inkoop zorgen dat de juiste mensen (van R&D en leveranciers) met elkaar aan tafel zitten, en sturend handelen richting toeleveranciers indien nodig (relatiebeheer).

Het bijsturen van de leverancier door inkoop vindt nog teveel reactief plaats. Om op de hoogte te zijn van de afspraken tussen R&D en leveranciers en van de wensen van R&D, moet inkoop wel op de een of andere manier structureel betrokken zijn (CVO, DEO). Het gebrek hieraan lijkt de beperkte pro-activiteit van inkoop hierin te verklaren.

17.

	I	J	K	L	M	N	O	P	Q
inkoop moet levering van kritische materialen en onderdelen zeker stellen (tijdens engineering)	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●

Zeker stellen houdt vooral verband met de initiële leverancierskeuze, zoals blijkt uit het Stemman voorbeeld (vraag 1). } II

18.

		I	J	K	L	M	N	O	P	Q
a	inkoop moet een belangrijke stem hebben in "value analysis" van materialen en onderdelen: afwegen van toegevoegde waarde in vergelijking met de kosten	●	●	●	●	●	●	●	●	●
		●	●	●	●	●	●	●	●	●
b	inkoop moet hierbij invloed op specificaties en toleranties uitoefenen (voldoen aan functionele specificaties en leveranciers-mogelijkheden)	●	●	●	●	●	●	●	●	●
		●	●	●	●	●	●	●	●	●
c	inkoop moet standaardisatie en simplificatie van onderdelen voorstellen	●	●	●	●	●	●	●	●	●
		●	●	●	●	●	●	●		●
d	inkoop moet substitutie van materialen en onderdelen voorstellen (bv. met betere verkrijgbaarheid en zelfde functie). Ook part exclusions (hard)	●	●	●	●	●	●	●	●	●
		●	●	●	●	●	●	●		●

Vanuit R&D wordt aangegeven dat R&D beslissingen neemt over value analysis aangezien de functionaliteit van Consumables kritisch is.
Wel wordt vanuit inkoop (en R&D-er P) aangegeven dat inkoop hieraan bij kan dragen. Zo zou inkoop R&D moeten pushen om functioneel te specificeren, en R&D van open kostprijs calculaties moeten voorzien. } II

Voor het slijpen van de groeven in de drum is men tijdens development uitgegaan van een monokristallijne diamant. Functioneel was dit goed, maar de kosten waren zeer hoog. Uiteindelijk heeft men deze tijdens engineering vervangen door een polykristallijne diamant. Deze mogelijkheid had inkoop (of ook engineering) meteen in development aam moeten geven.

Over het algemeen wordt aangegeven dat alleen R&D de implicaties van wijzigingen in specificaties kan overzien. Vanuit inkoop is hier wel enige invloed op (uitdagen, aangeven wanneer verruiming tot duidelijke verkrijgbaarheid- of commerciële voordelen kan leiden). Dit is in de praktijk ook gedaan voor de epoxy's.

Suggesties voor standaardisatie worden gezien als "nogal vrijblijvend", en "inkoop zou hiermee wel op de stoel van R&D gaan zitten". Inkoop kan dit proces wel stimuleren, bijvoorbeeld bij zaken die vanuit de leverancier duidelijk voor de hand liggen. Engineering heeft zelf ook gestreefd naar standaardisatie voor de arrays. Hierin is geen rol van inkoop geweest.
Echter, R&D redeneert vaak dat standaard materialen en onderdelen "net niet goed genoeg zijn voor Océ producten". Dit komt ook overeen met de stelling dat Océ eigen(wijze)/ specifieke technologieën ontwikkelt.

} II

Voor de NiCr laag op de drum had men tijdens development gekozen voor een 30/70 toepassing, terwijl standaard 70/30 verkrijgbaar was. 30/70 was dan ook als klantspecifiek materiaal duurder. Development had onder druk van inkoop eerder naar buiten moeten kijken wat de (standaard) mogelijkheden van leveranciers waren. Dit probleem kwam pas naar boven tijdens engineering (toen grotere partijen van het materiaal besteld werden). Uiteindelijk is een geheel ander materiaal gekozen.

Inkoop heeft niet voldoende kennis van markten (noch de capaciteit om dit op te bouwen) om substitutie voor te stellen. Voor de elektronica heeft inkoop wel substitutie voorgesteld (zie voorbeeld 2c), maar dit bleken geen alternatieven voor R&D. Voor het voorbeeld van de poly/ monokristallijne diamant en de NiCr laag, had inkoop dit wel kunnen doen.

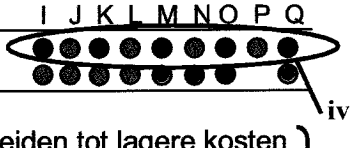
Part exclusions worden nauwelijks opgelegd. Inkoop heeft niet de macht om dit door te zetten. Wel kan inkoop aannemelijk maken dat het niet verstandig is om met een onderdeel/ leverancier verder te gaan (bijvoorbeeld vanwege een onzeker toekomst).

} II

Voor de connectors (elektronica) gaf inkoop aan dat de toenmalige leverancier ermee stopte. Component Support (R&D afdeling) heeft vervolgens naar alternatieven gezocht. Zij kennen de buitenwereld namelijk wel op specifieke technologische gebieden, in tegenstelling tot inkoop.

19.

inkoop moet leveranciers ondersteunen in het halen van targets en hen aanmoedigen procesverbeteringen en kostenreducties door te voeren



iv

Functionele verbeteringen vallen op het vlak van R&D. Verbeteringen die leiden tot lagere kosten worden wel door inkoop aangemoedigd, al lijkt dit vooral op aandringen van R&D te gebeuren.
Voor Celestica (array) doet inkoop dit momenteel ook.
Om dit mogelijk te maken, zal inkoop wel over een decompositie van de kosten bij een leverancier moeten hebben. Anders zal deze nooit beter dan het target presteren.

} iv

Overige
Inkoop moet haar rol in productontwikkeling duidelijker communiceren. Iedereen (binnen R&D) heeft namelijk een eigen beeld van de verwachtingen m.b.t. inkoop. Zo is bijvoorbeeld niet duidelijk wie marktkennis moet hebben: R&D of inkoop.
Als er eenmaal in de praktijk een heldere samenwerking en verdeling van de verantwoordelijkheden is, kan aan de hand van resultaten hiervan nog bijgesteld worden wat inkoopbijdragen moeten zijn (leren uit projecten).

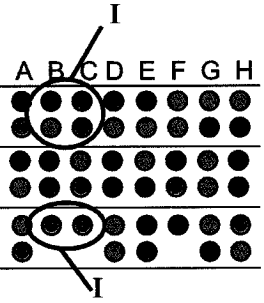
Door geregeld overleg tussen R&D en inkoop te hebben (DEO), krijg je begrip voor elkaars standpunten, en kan je de beste manier kiezen om met problemen om te gaan.
Samenwerken op afstand werkt niet: inkoop zal (part-time) fysiek bij het projectteam moeten zitten.
Bij productie staat in het algemeen namelijk de afdeling vaak centraal (niet de projecten), terwijl binnen R&D projecten juist centraal staan. Deze tegengestelde belangen botsen nogal eens.
In de praktijk leidt dit er soms toe dat problemen op elkaar (productie vs R&D) worden afgeschoven, in plaats van dat gezamenlijk project verantwoordelijkheid genomen wordt. Op het moment dat je bij elkaar zit, stap je eerder naar elkaar toe, en probeer je problemen samen op te lossen.

Appendix 5.4 Case study results Printhead

A **inkoop**
B C **DV (development)**
D E F G H **engineering (ME en EP)** N.B. engineers zijn ook al tijdens development betrokken

Tijdens development fase

1.



a inkoop moet meebeslissen over de mate en de timing van betrokkenheid van leveranciers in de development fase

b inkoop moet voordelen (bv. toegang tot technologieën) die het betrekken van leveranciers in de development fase heeft, intern communiceren

c inkoop moet deze zaken inbrengen, vroeg in de development fase

De ontwerper (R&D) is leidend, inkoop volgend – dit is goed, echter er moet wel meer inbreng vanuit inkoop zijn. Vooral de scores vanuit DV geven aan dat hierin geen bijdrage van inkoop gewenst is. Dit wordt onderbouwd met slechte ervaringen: inkoop werkt vertragend als je snel een idee wilt vormen ism partners omdat inkoop eisen aan partners stelt die nog niet relevant zijn (lange-termijn en kostengericht). Ook: je wil geen valse beloftes richting leverancier doen. } I

"inkoop kan geen onderscheid maken tussen partner relaties in GR/DV en leveranciersrelaties in engineering/ productie"
Voor de actuator is tijdens development een partner gezocht die in een meetmethode kon voorzien (niet gericht op een lange termijn relatie). R&D heeft toen de leverancier ervan onder druk gezet om binnen twee maanden te leveren (ontwikkelingen gaan in het begin nl. zeer snel). De aanvraag hiervoor bleef vervolgens echter een maand bij inkoop liggen.

De partner tijdens development wordt door DV nog niet gezien als een uiteindelijke leverancier. Het voorbeeld van PI Ceramics geeft echter aan dat er tijdens development wel beslissingen genomen worden die bepalend zijn voor de uiteindelijke leveranciers selectie. } II

Voor de actuator is in de development fase met PI Ceramics samengewerkt (op technologische gronden geselecteerd). Vervolgens bleek een hoger niveau van uitbesteden gewenst (niet alleen het leveren van een piezo, maar hier tevens de groeven in zagen). Hier bleek PI Ceramics moeilijk aan te kunnen voldoen. Om deze reden is het team op zoek gegaan naar nieuwe leveranciers.

Vanuit engineering wordt wel aangegeven dat inkoop hierin een adviserende stem moet hebben, omdat tijdens development beslissingen gemaakt worden op basis van prototypes: "is het prototype goed, dan is de leverancier ook geschikt". } II
H tekent hierbij wel aan dat inkoop niet over voldoende kennis van potentiële leveranciers beschikt om hierin mee te beslissen. [genereren kandidaten: zie 2c. Hier blijkt dat dit vanuit elke functie kan komen; het gaat om het evalueren van kandidaten]. } III

Men is het er over eens dat inkoop waarde kan toevoegen aan een project door de voordelen van het betrekken van leveranciers aan te geven. De verantwoordelijkheid in deze fase blijft echter wel bij R&D liggen. Een probleem hierbij is dat de contacten tussen inkoop en R&D hiervoor in deze fase slecht zijn. F geeft aan dat dit voor investeringen wellicht eerder zou moeten gebeuren (begin van development) dan voor onderdelen en materialen (rond M1.1).

Op het moment dat partners voor Cobalt gezocht werden, was inkoop nog niet betrokken. R&D heeft dan ook de eerste contacten gelegd (bijvoorbeeld met de grafietleverancier voor de kanalenplaat). Als inkoop zich hier wel mee bezig zou houden, dan zou efficiënter gewerkt kunnen worden aangezien inkoop de expertise bezit voor het vinden en evalueren van leveranciers. Bewijs hiervoor is echter moeilijk te geven, omdat eventueel misgelopen kansen onbekend zijn.

Over de timing van inkoopbijdragen zijn de meningen verdeeld. Dit is ook al aangegeven aan de hand van de voorbeelden van PI Ceramics tegenover de meetmethode voor de actuator. In elk geval moet de afweging gemaakt worden of het ontwerp al voldoende uitgekristalliseerd is. De capaciteit van inkoop is namelijk niet dusdanig dat aan veel verschillende (technologische) concepten meegewerkt kan worden. C suggereert dat inkoop wel R&D aan zou kunnen sporen om nieuwe ontwikkelingen ook voor te leggen aan preferred leveranciers. C (DV-er) geeft echter ook aan dat technologische argumenten tijdens development centraal staan. } I
Het verschil in timing lijkt ook samen te hangen met het verschil in de onderdelen. Zo zou men voor de elektronica makkelijker kunnen switchen als het ontwerp uitgewerkt is met de huidige partner. Voor de actuator blijkt dit veel moeilijker te zijn omdat de leverancier mede de functionaliteit bepaalt.

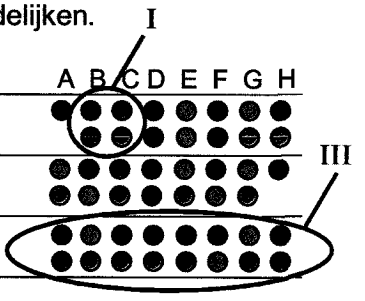
d.m.v. het 2M2 overleg is hierin wel al enige vooruitgang geboekt: inkoop is nu ruim voor de start van engineering betrokken in een overleg met de (R&D) functieverantwoordelijken.

2.

a inkoop moet mede develop or buy beslissingen maken

b inkoop moet inzicht geven in de kosten van de "buy" optie (kosten schatting van samenstellingen)

c inkoop moet kandidaten identificeren voor de "buy" optie



De meeste R&D respondenten geven aan dat develop or buy beslissingen aan R&D zijn (ook wel: "een poldermodel is hiervoor niet gewenst") omdat R&D de technologische implicaties kan overzien. Wel wordt hierbij aangegeven dat het goed zou zijn om inkoop hierbij te consulteren (B, C, E) omdat dan meer commitment voor de uiteindelijke keuze opgebouwd kan worden. } I

Tijdens development bleef inkoop alleen via ATB's op de hoogte van relaties tussen R&D en leveranciers. Dat inkoop momenteel meer invloed heeft op develop or buy beslissingen blijkt uit het volgende: Voor de actuator is in eerste instantie (tijdens development) besloten deze zelf te ontwikkelen, maar deze wordt nu voor een groot deel extern ontwikkeld om zo gebruik te maken van de kennis van leveranciers. Deze beslissing is gemaakt onder invloed van M&L/ inkoop.

Hoewel alle respondenten het erover eens zijn dat inkoop de kosten van de buy optie aan moet geven, gebeurt dit maar weinig. Voor kerncomponenten (die voor een belangrijk deel de totale kosten bepalen) is 3 à 4 jaar geleden binnen R&D al discussie over de kosten gevoerd (zonder inkoop). Hier had inkoop wel in betrokken moeten zijn. } i

Voor de actuator is dit heel duidelijk het geval: momenteel wordt gezocht naar een leverancier die de volledige actuator kan maken. Omdat niet eerder bekend was wat het buiten leggen van de actuator voor kosten met zich mee zou brengen:
- is een deel van het voorwerk onnodig geweest (niet voldoende gefocust op kennis die Océ zelf op moet bouwen vóór de overdracht aan een leverancier);
- moet voor elke partner die nu in beeld is gekomen (PI Ceramics, Morgan, Noliac) het ontwikkeltraject doorlopen worden (veel testen welke partner het beste voldoet). Deze leveranciers zijn in beeld gekomen naar aanleiding van marktontwikkelingen.

Voor de basisplaat is de kostprijsopbouw onvoldoende gedetailleerd geanalyseerd (afschrijving, materialen, mensen, etc). Op dit moment (overgang naar engineering) gebeurt dit wel (op initiatief van R&D; inkoop is hier later bij betrokken). Dit had eerder en gedetailleerder gezamenlijk gedaan moeten worden.

E merkt hierbij op dat niet zozeer inkoop zelf inzicht moet geven in de kosten, als wel zorgen dat de leverancier inzicht geeft in de kosten. } i

Hoewel inkoop kandidaten in moet brengen, is dit niet de enige functie die dit moet doen. Inkoop moet zich vooral op bestaande leveranciers richten (uit vorige en parallelle projecten), en R&D op nieuwe (op technologische gronden). Inkoop kan namelijk ervaringen met leveranciers bundelen om zo te leren over projecten heen. III
Vervolgens moeten geïdentificeerde kandidaten met elkaar afgestemd worden (R&D: technologie; inkoop: betrouwbaarheid, opschaalbaarheid; andere relevante functies: kwaliteit, logistiek). II

A geeft aan dat inkoop hieraan wel meer capaciteit zou moeten kunnen besteden. Momenteel is er namelijk onvoldoende zicht op relevante markten. Tevens is het onduidelijk wat het R&D technologiepad voor de komende jaren is. III

Voor de elektronica is inkoop niet actief op zoek gegaan naar de best mogelijke leveranciers (bijvoorbeeld op Europees niveau). Dit is puur gedaan op basis van bestaande leveranciers (uit de procesdrum) en leveranciers die door R&D aangedragen zijn.

Voor de elektronica van het head is men gestart met dezelfde leveranciers als voor de procesdrum (Melexis voor de asics en Celestica als EMS). Binnen inkoop Consumables was weinig ervaring met andere leveranciers hiervoor.

Aangezien voor de asics van de procesdrum nu een nieuwe leverancier in beeld gekomen is (AMS), wordt nu ook binnen de elektronica van het head gekeken naar de mogelijkheden (en voordelen) om ook hiervoor naar deze leverancier toe te stappen. Dit levert sysnergie op (waardoor de leverancier zich flexibeler richtring Océ op zal stellen).

Van leverancier(s) switchen zal voor dit individuele project een kostbare zaak zijn vanwege gedane investeringen met leveranciers. Voor de elektronica is het echter wel makkelijker om het ontwerp over te zetten naar een nieuwe leverancier dan bijvoorbeeld voor de actuator of de basisplaat.

E merkt op dat de procurement engineers een beter beeld van de omgeving hadden, en dan ook veelal kandidaten voor R&D aandroegen. III

3. inkoop moet een belangrijke rol spelen in het spotten van nieuwe product- en technologische ideeën van leveranciers (markten), en deze vervolgens intern (R&D) communiceren

A B C D E F G H

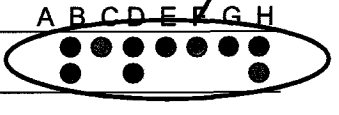
Het zoeken van nieuwe mogelijkheden is een taak van R&D. dit kan dan ook "niet van inkoop gevraagd worden", aangezien het een diep inzicht in de technologie vereist, en technologie buiten het gebied van inkoop valt. Ook werkt R&D tijdens development meestal met onderzoeksinstituten samen, niet met feitelijke leveranciers. Voor ideeën van bestaande leveranciers zou inkoop wel een rol spelen. I

E geeft echter wél aan dat inkoop dit zou moeten doen: inkoop als "venster op de omgeving".
A geeft aan dat herselectie voor de actuator (zie 2b) eerder voorzien had kunnen worden als inkoop actiever nieuwe ideeën zou spotten (hierbij gaat het duidelijk wel om veranderingen in de marktstructuur: overnames, niet om technologische ontwikkelingen).
C merkt op dat inkoop wel aan zou moeten geven wat de mogelijkheden zijn om ideeën onder te brengen bij leveranciers.

4. inkoop moet zorg dragen voor de selectie van leveranciers van test-equipment (t.b.v. experimenten GR-DV)

I

A B C D E F G H



De algemene mening is dat test equipment vooral snel beschikbaar moet zijn. Inkoop betrokkenheid kan hierin beperkend/ vertragend werken. Qua kosten valt hier weinig te verdienen, qua snelheid wel. Inkoop kan wel enig advies geven (echter, geen langdurig marktonderzoek). Wel zou R&D intern beter af moeten stemmen om dubbele investeringen te voorkomen. I

5.

	A	B	C	D	E	F	G	H
inkoop moet communicatie faciliteren tussen het ontwikkel team en leveranciers	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●

Inkoop is de stabiele factor naar leveranciers toe (belangen van projecten kunnen tegenstrijdig zijn). Ook wil de ontwikkelaar (R&D) wil snel vooruit op het gebied van technologie, waarom het goed is als inkoop het proces managed (fasering, afstemmen, kosten). } ii

Voor de nozzleplaat werkten zowel GRT als DV samen met Stork Veco. Hiernaast was er ook een initieel contact geweest met Elmicron. De GR-groep had op een gegeven moment snel proto's nodig. Hiervoor hebben zij Elmicron benaderd, waardoor daar de indruk ontstond dat ze meededen voor de uiteindelijke levering. Toen achteraf bleek dat dit slechts een proto-levering was zonder follow-up was dit een zware teleurstelling. Dit zou via inkoop duidelijker zijn afgestemd.

E en H geven als reden voor de lage score dat inkoop wel het initiële contact moet leggen, maar dat (technologische) communicatie daarna direct tussen het team en de leverancier plaats moet vinden (efficiënter). C geeft aan dat deze rol belangrijker wordt, later in de development fase. Het volgende voorbeeld geeft aan dat ook direct richting Stork Veco niet goed gecommuniceerd is. } ii

Voor de nozzleplaat heeft R&D aangegeven dat de zaken met de leverancier (Stork Veco) niet goed liepen. Dit ging niet om technologische zaken, maar om de organisatie van de leverancier. Zo werden bestellingen slecht afgehandeld, bewaakte de leverancier zijn kwaliteit slecht, en rapporteerde deze hierover niet goed. Als inkoop eerder betrokken was in deze relatie, had dit eerder opgemerkt en verholpen kunnen worden.
Communicatie met Stork Veco verliep rechtstreeks met R&D. Hierdoor heeft inkoop te laat de problemen met deze leverancier opgemerkt

6.

	A	B	C	D	E	F	G	H
inkoop moet zorg dragen voor informatievoorziening over leveranciers (oa. preferred suppliers) van samenstellingen	●	●	●	●	●	●	●	●
	●		●	●	●	●		●

Hoewel iedereen het erover eens is dat inkoop preferred leveranciers aan moet dragen, moet het proces verbeterd worden. Zo zou beter gezamenlijk vastgelegd moeten worden wat voor het specifieke project de belangrijkste eisen aan een leverancier zijn (goed model / criteria nodig).

Kritiek die E en H uiten betreft het beperkte zicht dat inkoop heeft op leveranciersmarkten. De oorzaak die hierbij gegeven wordt, is de nieuwheid van technologieën (voor Océ) die voor Consumables gebruikt worden. Kennis die er wel is, ligt verspreid over meerdere inkopers. } III

Vanuit inkoopperspectief is het belangrijk om bij het aandragen van preferred leveranciers ook rekening te houden met belangen uit productie. Zo kunnen leveranciers in een project niet zonder meer opzij geschoven worden, als Océ van deze leverancier afhankelijk is in productie.

7.

		A	B	C	D	E	F	G	H
a	inkoop moet leveranciers uitdagen om alternatieve technieken/ materialen/ onderdelen in te brengen die tot betere functionaliteit leiden (dus niet alleen lagere kosten).	●	●	●	●	●	●	●	●
		●	●	●	●	●	●	●	●
b	inkoop moet concepten mede evalueren: afwegen van toegevoegde waarde van materialen, onderdelen, processen in vergelijking met de kosten ervan	●	●	●	●	●	●	●	●
		●	●	●	●		●	●	●

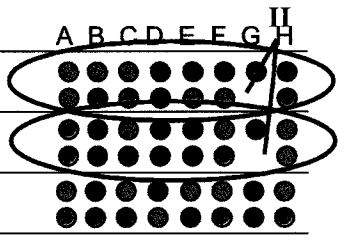
Inkoop kan veel toegevoegde waarde hebben in suggesties voor verbeteringen, bijvoorbeeld door R&D te pushen meer functioneel te specificeren. Voor de actuator is dit ook door R&D en inkoop samen goed opgepakt (voor Noliac en Morgan).
DV-er C geeft aan dat verbeteringen in de functionaliteit het gebied van R&D zijn, en inkoop zich hiermee dan ook niet moet bezig houden. De overige respondenten geven echter aan dat inkoop hier wel suggesties voor aan kan dragen. } iii

Inkoop zou leveranciers eerder (tijdens development) uit moeten dagen om alternatieven of verbeteringen in te brengen. Dit hangt samen met de late inkoop betrokkenheid. In vergelijking met enkele jaren geleden is inkoop nu wel veel meer bereid tijdens development bij te dragen.

Aangezien voor het afwegen van concepten de technologie centraal staat, wordt dit over het algemeen (vanuit R&D) gezien als een duidelijke R&D verantwoordelijkheid.
Wel wordt genoemd dat inkoop geconsulteerd moet worden over mogelijkheden voor het vinden van geschikte leveranciers in bepaalde concepten en de gebruikelijke marges in leveranciersmarkten (die samenhangen met de conceptkeuze). De uiteindelijke conceptkeuze vindt echter in de TC plaats. } II

overgang development – engineering

8.



a inkoop moet meebeslissen over de mate en de timing van betrokkenheid van leveranciers voor onderdelen en samenstellingen

b inkoop bepaalt in hoge mate de niet-technologische eisen aan leveranciers (eisen opstellen voor selectie: betrouwbaarheid, prestatiemeting, target kosten)

c inkoop moet alternatieve mogelijkheden voor leveranciers-relaties aangeven (ESI, residential engineering)

Timing en betrokkenheid worden door inkoop mede bepaald door de definitie van het inkoopportfolio.

Inkoop speelt bij het stellen van eisen aan leveranciers mede een beslissende rol: } II
- R&D: technologische aspecten en target kosten
- MQ/QA: kwaliteitsborging
- Inkoop: kosten (decompositie) en een solide basis voor samenwerking (oa. voortbestaan) Inkoop gaat immers uiteindelijk de relatie aan voor lange termijn. Hierbij zouden ervaringen uit vorige projecten en productie meegenomen moeten worden

Target kosten worden opgelegd door R&D. A geeft aan dat inkoop hier een grotere rol in zou moeten spelen omdat targets vaak niet realistisch zijn (en bijvoorbeeld gebaseerd zijn op zelfgebouwde prototypes).

Zo is het target voor de piezo gebaseerd op "wishful thinking". Daarbij zijn tijdens het project de specificaties nauwkeuriger geworden, waardoor target (€11,50) niet haalbaar blijkt. De gerealiseerde kostprijs loopt momenteel op tot €19.

F geeft als suggestie dat inkoop zich beter zou moeten richten op het opleggen van bonussen en sancties aan leveranciers die beter dan/ onder het afgesproken niveau presteren.

De respondenten zijn het erover eens dat inkoop samen met R&D een hele belangrijke rol moet spelen in het bepalen van alternatieve mogelijkheden om leveranciers te betrekken. ESI wordt momenteel ook daadwerkelijk door inkoop gestimuleerd en opgezet. Alleen B geeft aan dat de ontwerper de leveranciersbetrokkenheid bepaalt, en inkoop dit alleen afstemt met de leverancier. } ii

Voor het printhead hebben inkoop en R&D gezamenlijk de omgangsvorm opgezet met Sysmelec. Deze partner heeft al een prototype productielijn neergezet op locatie bij Océ, en zal ook de uiteindelijke productielijn verzorgen.

9. inkoop moet een centrale rol innemen in het ontwikkelteam

A B C D E F G H

Hoewel de meningen verschillen, wordt wel aangegeven dat inkoop een belangrijke rol speelt. Voornamelijk een centrale rol vindt men te sterk. "Als je echter tot leverancierskeuzes wil komen zal inkoop betrokken moeten zijn (gezamenlijk afwegingen maken)". Zo merkt F op dat "specialisten sneller en efficiënter om kunnen gaan met zaken op hun vakgebied: inkoop moet door inkopers ingebracht worden, niet door R&D'ers".

Momenteel is inkoop goed betrokken via 2M2 en ad-hoc contacten. 2M2 is echter ook op een informele manier opgestart, dus er is geen vaste structuur om op terug te vallen als belangrijke zaken aan de orde zijn. D en F geven aan dat inkoop eerder (tijdens development) betrokken zou moeten zijn dan voor het printhead het geval is geweest. Inkoop is hier namelijk teveel "dienend" voor R&D geweest, en onvoldoende kritisch. II

10. inkoop moet bij M2 levering van kritische componenten zeker stellen

A B C D E F G H

Hoewel D aangeeft dat M2 te vroeg is om kritische onderdelen (categorie 1 en 3) zeker te stellen, is iedereen het erover eens dat hier wel duidelijk moet zijn dat er geen grote problemen met de leverancierskeuze meer op mogen treden hierna. II
Momenteel blijkt dit ook goed te verlopen, behalve voor het volgende voorbeeld:

Er is onvoldoende aandacht vanuit inkoop voor de "flex" (de connectie van de elektronica met de actuator, een cat. 3 item). De meeste potentiële leveranciers draaien vele grotere aantallen dan Océ vraagt (standaardonderdelen). De flex van Océ is echter nauw gespecificeerd (hoge resolutie) waardoor deze moeilijker te maken is. Er is wel een leverancier gevonden die kan leveren onder de nauwe specificaties en lage volumes van Océ, maar deze is erg duur. Inkoop zou hierbij meer betrokken moeten zijn om problemen met verkrijgbaarheid en te hoge kosten in een later stadium te voorkomen.

Engineering fase

11.

A B C D E F G H

a Inkoop moet mede make or buy beslissingen maken

b inkoop moet kandidaten voor de "buy" optie identificeren

c inkoop moet in de gaten houden of make or buy beslissing aangepast moet worden bij ontwerpwijzigingen

Voor de kritische onderdelen die veelal voor Consumables gebruikt worden, is deze beslissing niet meer aan de orde (is al gemaakt met de develop or buy beslissing). II

In feite worden de kandidaten al tijdens development gekozen. Elke functie kan kandidaten aandragen. Het gaat erom deze kandidaten vanuit de verschillende perspectieven te beoordelen. Momenteel blijkt namelijk dat leveranciers die door R&D op louter technologische gronden gekozen werden, later niet voldoen aan eisen voor opschaling. III
H geeft als enige aan dat juist inkoop actiever kandidaten zou moeten zoeken.

Voor kritische onderdelen kan de make or buy beslissing niet meer aangepast worden, aangezien kerntechnologie hierop gebaseerd is. Ook zijn vaak al investeringen gedaan. Vandaar dat deze activiteit meestal vaak niet relevant is. Wel zouden inkoop en R&D gezamenlijk moeten evalueren of er grote wijzigingen in het product of de leveranciersmarkt optreden waardoor bijvoorbeeld het niveau van uitbesteden zou moeten veranderen.

12.		A	B	C	D	E	F	G	H
a	inkoop moet zorg dragen voor leveranciersselectie voor subsystemen, materialen en onderdelen	●	●	●	●	●	●		●
b	inkoop moet zorg dragen voor leveranciersselectie voor proto productiemiddelen		●	●	●	●	●		●
c	inkoop moet zorg dragen voor leveranciersselectie voor productiemiddelen		●	●	●	●	●		●

Alle respondenten (ook E) geven aan dat leveranciersselectie een gezamenlijke inspanning is van inkoop, R&D, en andere M&L disciplines (MQ/QA, logistiek) in het 2M2. Het is namelijk van belang om zowel de technologische aspecten, als de lange-termijn relatie op orde te krijgen.
F geeft zelfs aan dat inkoop hierin leidend is, aangezien inkoop leveranciersrelaties beschouwt in het kader van relaties tussen leveranciers met Océ als geheel (niet gericht op één project).

Tijdens engineering is hierin ook voldoende inbreng van inkoop, maar voor leveranciers waarmee in development al samengewerkt is, valt vaak weinig meer te kiezen (zoals PI Ceramics).

Voor (proto en normaal) equipment speelt EE (equipment engineering) een vrij grote rol. Zij coördineren vaak ook inkoop hiervoor. Verder komt dit overeen met de leverancierskeuze voor onderdelen en materialen. Voor productie equipment heeft M&L (als gebruiker) een sterke rol.

} II

13.		A	B	C	D	E	F	G	H
	inkoop moet de overgang bij een leverancier naar serie productie coördineren	●	●		●	●			●

Aangezien vooral inkoop op dit moment een nauwe relatie met de leverancier onderhoudt, ligt deze taak gedeeltelijk bij inkoop. Echter, voor functionaliteit-kritische processen (hetgeen vaak voor Consumables/ chemie het geval is) neemt engineering (EE, EP, ME) deze coördinatie voor haar rekening. Ook de afnemers (logistiek, productie) hebben hierin een stem.
Voor Cobalt valt hierover nog weinig te zeggen (punt nog niet bereikt). Wel wordt er al discussie gevoerd over de competenties van leveranciers om op te schalen. Hiermee wordt ook rekening gehouden in de keuze voor de leveranciers van de actuator.

} iv

14.		A	B	C	D	E	F	G	H
	inkoop moet zorg dragen voor informatievoorziening over standaard onderdelen en hun leveranciers		●	●	●	●	●		●

Dit is weinig relevant voor Consumables, aangezien er nauwelijks standaard onderdelen zijn.

B geeft aan dat dit echter niet goed gaat voor chemicaliën van een leveranciers die niet in SAP staan (tijdens development). Omdat inkoop het leveranciersbestand beperkt wil houden, is men niet bereid een nieuwe leverancier "aan te melden". Binnen de development fase van ontwikkeling gaat het nl. om het doen van experimenten, en niet om het vastleggen van een uiteindelijke leverancier. Er zou hiervoor meer vertrouwen vanuit inkoop moeten zijn.

} I

15.		A	B	C	D	E	F	G	H
	inkoop moet ontwerpwijzigingen evalueren om in te kunnen schatten wat de impact is op kosten en verkrijgbaarheid	●	●	●	●	●	●		●

De ontwerper moet de impact van ontwerpwijzigingen zelf in kunnen schatten. De respondenten geven aan dat inkoop dit niet actief moet doen, maar wel haar visie zou moeten geven over de gebieden waarbinnen de leverancier voldoet.
Alleen F geeft aan dat inkoop hier specifiek verantwoordelijk zou moeten zijn.

Na M2 is het PDMS actief, waarin inkoop goedkeuring moet geven voor ontwerpwijzingen. Is men het niet eens met een wijziging, dan is er direct terugkoppeling met de "constructeur" (degene die intern verantwoordelijk is voor het betreffende onderdeel).

16.

	A	B	C	D	E	F	G	H
inkoop moet de levering van prototypes plannen en sturen	●●	●	●	●●	●●	●		●

Het plannen van prototype levering is een taak van engineering, aangezien hier de projectvoortgang in het oog gehouden wordt. Leveranciers (bij)sturen in de levering ervan is wel een inkooptaak. R&D moet inkoop dan ook op de hoogte stellen van afspraken die hierover lopen.

Dit gebeurt momenteel ook redelijk. Alleen zou inkoop actiever moeten bijsturen richting de leverancier (niet op het moment dat de levering al te laat is, hetgeen nu voorkomt).

17.

	A	B	C	D	E	F	G	H
inkoop moet levering van kritische materialen en onderdelen zeker stellen (tijdens engineering)	●●	●	●	●	●●	●		●

Voor het zekerstellen van kritische onderdelen is een systematischer benadering nodig. Criteria zullen afgesproken moeten worden (bijvoorbeeld percentage van de totale omzet van een leverancier dat Océ mag beslaan). Inkoop kan dit echter maar zeer beperkt afzekeren: bijvoorbeeld brand bij een leverancier of het wegvallen van de medewerker die als enige op de hoogte is van belangrijke zaken (bij de leverancier), kan door inkoop niet opgevangen worden } II

Voor de actuator wordt dit momenteel goed voorbereid, of zoals E het formuleert: "Als het goed is, heeft inkoop hier al voor gezorgd door de juiste leveranciers in beeld te brengen". }

18.

		A	B	C	D	E	F	G	H
a	inkoop moet een belangrijke stem hebben in "value analysis" van materialen en onderdelen: afwegen van toegevoegde waarde in vergelijking met de kosten	●●	●	●	●●	●●	●		●
b	inkoop moet hierbij invloed op specificaties en toleranties uitoefenen (voldoen aan functionele specificaties en leveranciers-mogelijkheden)	●●	●	●	●●	●●	●		●
c	inkoop moet standaardisatie en simplificatie van onderdelen voorstellen	●●	●	●	●●	●●	●		●
d	inkoop moet substitutie van materialen en onderdelen voorstellen (bv. met betere verkrijgbaarheid en zelfde functie). Ook part exclusions (hard)	●	●	●	●●	●●	●		●

Alle respondenten behalve D geven aan dat inkoop hierbij ondersteunend is (omdat R&D de inhoudelijke kennis en het overzicht heeft). Zo kan inkoop R&D pushen om functioneel te specificeren en open kostprijscalculaties met een leverancier opstellen } II

Nozzleplaat: Océ geeft al aan welke vorm en diepte de gaten in de nozzleplaat moeten hebben om een bepaald soort druppelvorming te bereiken. Het zou hier beter zijn om aan een leverancier aan te geven, welke vorm druppel gewenst is (functioneel)

In de kostprijsbenadering is een scheiding gemaakt tussen materiaalwaarde en investeringen. Zo is bij prototypes van de actuator (CFT) bepaald waar de belangrijkste kostenbijdrage lag ("aan de goede knop draaien"). Hoewel het materiaal van grote invloed leek, bleek de belangrijkste component te bestaan uit manuren.

Over het beïnvloeden van specificaties zijn de meningen sterk verdeeld. Aan de ene kant kan inkoop het aanpassen van specificaties en toleranties niet overzien vanwege de interactie met andere onderdelen. Aan de andere kant wordt aangegeven dat inkoop discussie met R&D over specificaties en toleranties moet aanzwengelen. Inkoop kan ook ervoor zorgen dat R&D discussies hierover voert met de leverancier. Uiteindelijk blijft dit echter een technologische afweging (de functionaliteit van een nieuwe technologie staat immers centraal). } II

Engineering streeft ernaar al om het ontwerp zo eenvoudig mogelijk te maken. Iedereen kan vanuit zijn eigen perspectief hier ideeën voor aandragen (dus ook inkoop). De beslissing blijft echter bij R&D liggen. Echter, veel stoffen zijn "net niet goed genoeg voor Océ product", waardoor stoffen bijvoorbeeld zelf nog een keer gezeefd worden"

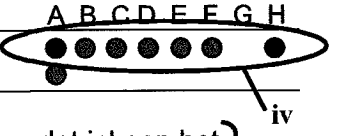
Substitutie wordt niet als taak voor inkoop gezien. Bezwaren zijn het beperkte inzicht dat inkoop in leveranciersmarkten heeft, en het beperkte inzicht in de functionaliteit. } II

Bijvoorbeeld voor de OPC stelde inkoop een ander oplosmiddel voor, wat Fl.100.000 per jaar op zou leveren. Het bleek echter, dat hiervoor Fl.500.000 aan testen nodig was. Bovendien waren de opbrengsten niet zeker.

Hoewel A aangeeft dat inkoop niet de macht heeft om part exclusions door te zetten, geven B en E (beide R&D respondenten) aan dat dit wel kan. D geeft aan dat ook exclusions een te grote impact op de functionaliteit zouden kunnen hebben. } II

19.

inkoop moet leveranciers ondersteunen in het halen van targets en hen aanmoedigen procesverbeteringen en kostenreducties door te voeren



Alle respondenten geven aan dat inkoop hier een rol in speelt. D merkt wel op dat inkoop het proces van leveranciers niet kan optimaliseren zonder aan de functionaliteit te raken. Verbeteringen bij leveranciers moeten dan ook door inkoop en R&D samen aangemoedigd worden. F geeft aan dat leveranciers hiervoor wel gecompenseerd dienen te worden. } iv

Overige

(B) Omdat inkoop ook bijdragen heeft die specifiek op het project gericht zijn (ondersteunen in vroege fasen, snel bestellen zonder focus op lange termijn of kosten), moet inkoop ook op projectdoelen afgerekend worden (gedeeltelijk).
Van belang is dan ook voor dit project: wie stel je verantwoordelijk voor activiteiten (centralisatie van beslissingen, geen poldermodel).

Aangezien veel beslissingen samen door R&D en inkoop genomen moeten worden (en men hiermee goed op weg is), is het goed dat het 2M2 overleg gestart is (waar inkoop een belangrijke rol speelt, en JHC voorzitter is). Dit overleg loopt echter pas een half jaar (begin 2003). Het zou goed zijn om in nieuwe projecten dit overleg eerder te starten.
Het initiatief voor het oprichten van 2M2 ligt bij de projectorganisatie (R&D). Het primaire doel is het "nemen" van M2: coördineren wat gedaan moet worden, wat niet, hoe, etc.
De oprichting van 2M2 zou (voor volgende projecten) ca. 1 jaar voor M2 moeten plaatsvinden. Nu zoekt men nog sterk naar de invulling ervan; dit moet straks beter kunnen.
Door de fysieke afstand tussen R&D en inkoop, weet je niet goed van elkaar waar je mee bezig bent (en waarom). Omdat je met het team als geheel succes wil behalen, moet je ook als organisatie-eenheid bezig zijn: op locatie betrokken zijn. Dit is een probleem van grote organisaties als Océ. omdat rapportages hierdoor belangrijker worden, moet beter omschreven worden hoe deze gebruikt worden.

(D) Een probleem in de samenwerking tussen inkoop en R&D is het feit dat de organisatie van inkoop in ontwikkelprojecten niet duidelijk is. Aan de ene kant zit MBRO in het 2M2 overleg (specifiek voor printhead), en tegelijkertijd zit LPO in Cobalt als projectinkoper. Het is niet duidelijk of LPO op projectniveau ook MBRO vertegenwoordigt. Tevens is onduidelijk welke inkoop zaken op welk punt spelen (MBRO/2M2/printhead tegenover LPO/AVO/Cobalt).

(E) In het algemeen geldt dat inkoop eerder betrokken moet zijn om bij te dragen aan de ontwikkeling van kerncomponenten, want het duurt jaren om in samenwerking met de juiste leveranciers (partners) functionaliteit te ontwikkelen en het ontwerp ervan te optimaliseren. Momenteel blijven kansen liggen omdat inkoop niet betrokken is in het zoeken en (pre)selecteren van leveranciers en het ondersteunen van het team in de development fase.

(E) De Procurement Engineers boden een structuur in vroege fasen, maar hun organisatie-ophanging was niet optimaal (met name de link met inkoop). Zij zorgden voor het venster op de buitenwereld, en stemden leveranciers relaties tussen projecten en in verschillende fasen van

projecten af. Met het wegvallen van de Procurement Engineers is veel werk blijven liggen, wat nauwelijks meer is opgepikt.
Aangezien projecten "geen geheugen hebben" is er grote behoefte aan het afstemmen van relaties over projecten heen en gedurende de looptijd van een project. In een project verandert de bezetting (en de visie dus ook) regelmatig. Ook is het voorgekomen dat leveranciers verbaasd reageren als iemand vanuit een project contact legt, niet wetende dat een ander project ook contacten met dezelfde leverancier heeft. Dit komt onprofessioneel over, en men leert op die manier niet van ervaringen met leveranciers uit andere projecten. Er is geen systeem waarin vastgelegd wordt wat de ervaringen met leveranciers zijn (en kan men dus niet leren van problemen en successen uit het verleden).