

MASTER

Physical distribution of Océ white office paper in Europe : the relation between customer service, physical distribution costs and logistic distribution structures

van Wallenburg, B.

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Physical distribution of Océ White Office Paper in Europe

The relation between customer service, physical distribution costs and logistic distribution structures

SUMMARY

**NIET
UITLEENBAAR**

Océ -Technologies B.V. Venlo
Technische Universiteit Eindhoven

Bas van Wallenburg
June 2002



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June 2002

Technische Universiteit Eindhoven
Department of Technology Management
Industrial Engineering and Management Science
Department of Operations Planning and Control

Author

Bas van Wallenburg

Supervisors Technische Universiteit Eindhoven

1st: Dr. Ir. L. Fortuin Department of Operations Planning and Control

2nd: Dr. M. Slikker Department of Finance, Accounting and Marketing

Supervisor Océ-Technologies B.V.

Ir. J.M.J. Courtens

**NIET
UITLEENBAAR**

Preface

This is the summary of the report about the graduation research project that I have carried out at Océ-Technologies B.V. in Venlo as part of the course Industrial Engineering and Management Science at the Technische Universiteit Eindhoven.

Bas van Wallenburg
Eindhoven, June 2002

Abstract

This summary presents the results of a research carried out at Océ-Technologies B.V. The research is concerned with the physical distribution of Océ White Office Paper (WOP) in Europe. After an analysis of the physical distribution of White Office Paper in six European countries in the first part of the research, the focus of the second part is on the physical distribution of Océ WOP for Océ Germany. For Germany, five alternative logistic distribution structures have been evaluated by comparing the physical distribution costs.

Summary

Introduction

The project is carried out at Océ-Technologies B V , a division of Océ N V Océ N V. is a copying and printing specialist that supplies a broad range of products and services to meet professional needs for the management of document flows. Océ is doing business in more than 80 countries all over the world and has its own sales companies in more than 30 countries. World-wide, Océ employs over 22 000 people

The project is carried out at and by order of Group Logistics, a staff department of Océ-Technologies B V , in co-operation with the Business Group Imaging Supplies. The project deals with the physical distribution of Océ White Office Paper (WOP) in Europe

The product range of White Office Paper consists of white coloured A4 and A3 paper. WOP is a trade product and is neither manufactured nor packed by Océ itself. It is completely purchased at different paper mills where the paper is produced and packed in Océ packing, which is produced at the paper mills as well. The paper mills supply the WOP products to Océ warehouses, out of which the WOP is delivered to the customers, or the paper mills deliver the WOP directly to the customers, which is called a dropshipment. On high level, the Océ White Office Paper sales chain is as shown in figure A.

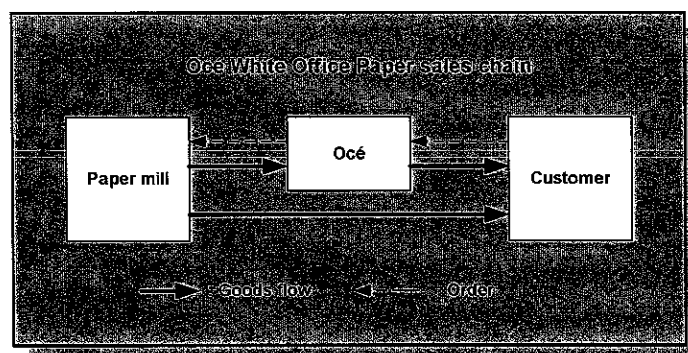


Figure A. Océ White Office Paper sales chain

All transportation of WOP and all warehouses where WOP is stored are outsourced to logistic service providers.

Assignment

After a first analysis of the situation, the following research question was defined.

“What is the relation between customer service and physical distribution costs for the physical distribution of White Office Paper in Europe?”

After the determination of the scope for the project, the following assignment has been defined.

“Determine and quantify the relation between customer service, physical distribution costs and different basic logistic distribution structures for the physical distribution of White Office Paper in Europe.”

The focus of the first part of the project is on The Netherlands, Belgium, Germany, France, Italy and the UK.

Project approach

The project approach can be summarised in five steps:

1. Describing and analysing the current situation for WOP in the six countries concerning market, product and logistic distribution structures
2. Defining customer service, physical distribution costs and basic logistic distribution structures.
3. Focus on Germany: Describing and analysing the Physical distribution of WOP in Germany
4. Focus on pallet deliveries in Germany: defining alternative logistic distribution structures for pallet deliveries
5. Evaluation of alternative logistic distribution structures for pallet deliveries in Germany

Due to the limited time for the project, it has been decided to shift the focus of the project from the six countries to Germany after analysing the current situation in the six countries. Germany was chosen because developments were going on concerning the physical distribution of WOP in Germany which required further research.

The results of the different steps are discussed below

Basic logistic distribution structures

For the physical distribution of WOP in the six countries, seven basic logistic distribution structures can be distinguished. They are shown in figure B. The actual logistic distribution structures for WOP deliveries in the six countries are a combination of these basic structures.

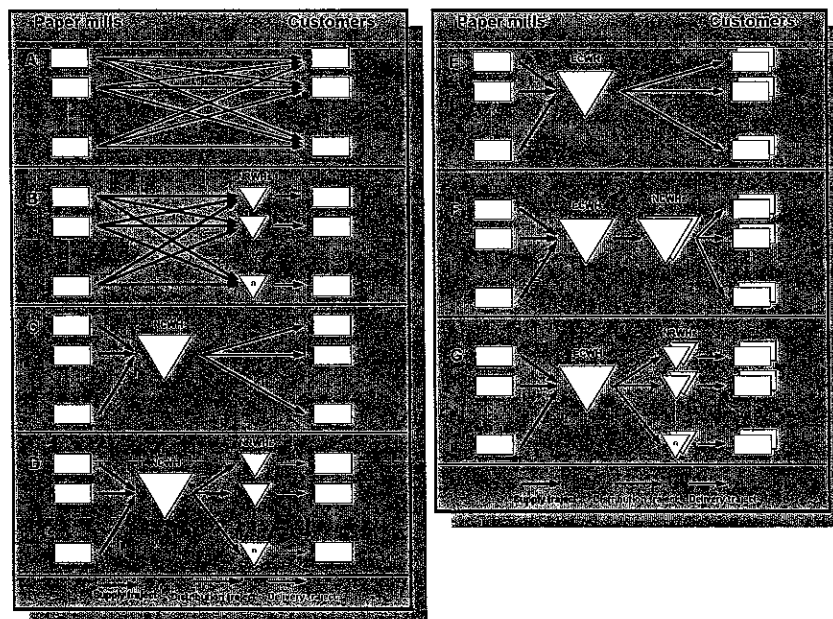


Figure B: Basic logistic distribution structures

In general, the seven basic logistic distribution structures differ by the number of warehouse links and the number of warehouses per warehouse link:

Number of warehouse links between the paper mills and the customers

The number of warehouse links is 0 in basic structure A, 1 in basic structures B, C and E and 2 in basic structures D, F and G

The number of warehouses per warehouse link

The warehouse links can be subdivided in central- and regional warehouse links. A central warehouse link consists of 1 warehouse while a regional warehouse link consists of more than 1 warehouse. The warehouse in a central warehouse link is called Central Warehouses (CWH) and a warehouse in a regional warehouse is called a Regional Warehouse (RWH)

Looking at the seven basic logistic distribution structures, a distinction can be made between basic National and basic European logistic distribution structures.

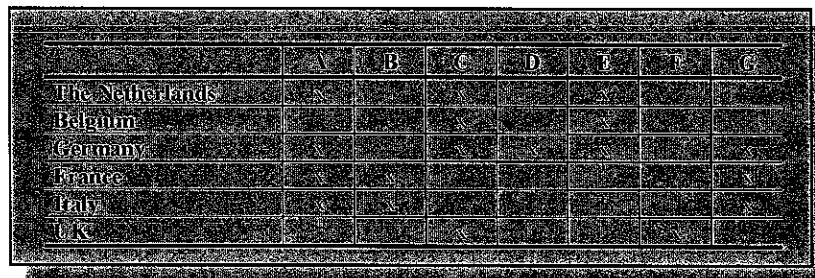
National logistic distribution structures

Basic structures A to D are national logistic distribution structures. Those structures are for the physical distribution of WOP in one country. The WOP products that are stored in the National Central Warehouses (NCW) and in the National Regional Warehouses (NRWHs) are for deliveries in one national market.

European logistic distribution structures

Basic structures E to G are European logistic distribution structures. The basis for those basic structures is the European Central Warehouse (ECWH). In the Océ WOP situation, two ECWHs can be distinguished, namely the Schenker Warehouse in Venlo and the IFO warehouse in Amersfoort. The WOP that is stored in a ECWH is for customer orders and replenishment orders for several national markets.

The logistic distribution structures for the WOP deliveries in the six countries are a combination of the basic logistic distribution structures. Figure C shows per country of which basic structures the logistic distribution structures for those countries are a combination.



	A	B	C	D	E	F	G
The Netherlands	X						
Belgium							
Germany							
France							
Italy	X						
UK			X				

Figure C: Basic structures for the six countries

Customer Service

Customer service is regarded here as the relation between marketing and logistics. Four customer service elements can be distinguished for WOP.

- *Product assortment:* the variety of WOP articles Océ offers to its customers
- *Delivery service:* the service that is offered when products are physically delivered at the customer. As delivery service elements can be defined: delivery behind the first door; use of barrow, de-palletising, and delivery at the copying/ printing machine,
- *Delivery unit:* the unit in which Océ WOP is delivered to the customers. a box and a pallet.
- *Delivery time:* the time between the moment that a customer places an order at Océ and the moment that the ordered products are delivered at the customer

These elements form the customer service concept used in this project.

Physical distribution costs

The third element of the assignment is the physical distribution costs. The physical distribution costs that are taken into account in the project are:

- *transportation costs*
- *warehousing costs*, i.e. handling and storage costs.
- *inventory costs*, i.e. interest costs and costs of unsalable stock
- *other costs*: administration costs, under which customer order and replenishment order handling costs and part of the total company overhead costs.

As was mentioned before, after analysing the current situation in the six countries and after defining the basic structures, customer service and physical distribution costs, the focus of the project has been on the physical distribution of WOP in Germany.

Océ Germany current situation

Of the total volume of WOP sold in Germany in 2001, 15 % were direct deliveries from the paper mills to the customers, i.e. dropshipments, 5 % were box deliveries out of the Schenker Warehouse, 70 % were pallet deliveries out of the IFO Warehouse, and 10 % were pallet deliveries out of four regional warehouses in Germany. Those four good flows are delivered to the customer via five basic logistic distribution structures: dropshipments via basic structure A, box deliveries via basic structure E, and pallet deliveries via basic structures C, D, E and G.

Dropshipments are carried out for free by the paper mills, so the only physical distribution costs for Océ Germany for dropshipments are the administration costs. The minimum delivery batch size is a Full Truck Load, containing 44 pallets. The delivery time for a dropshipment is dependent on the order lead time of the paper mills, which is 4 weeks on average.

The physical distribution costs that are different for box and pallet deliveries are the administrative handling costs, the physical handling out costs and the transportation costs for the delivery trajectory. The handling out and transportation costs allocated to a box are € ** for a box delivery (A4 paper) and € ** for a pallet delivery in Germany. The average purchase value of a box is € **. So the handling out and transportation costs as percentage of the average value of a box of A4 WOP is $(\text{€ **} / \text{€ **}) = 28\%$ for a box delivery and $(\text{€ **} / \text{€ **}) = 12\%$ for a pallet delivery.

The administrative handling costs are the same for a box and a pallet delivery, so the administrative handling costs allocated to a box are higher for a box delivery than for a pallet delivery.

Developments pallet deliveries Océ Germany

After analysing the current situation in Germany, the focus of the project has been on pallet deliveries. Here a development is going on in Germany: more and more customers in Germany of the fast moving Océ WOP article numbers demand delivery within 24 hours. This development was the reason to define alternative logistic distribution structures for Germany.

Alternative logistic distribution structures Germany

For the pallet deliveries of fast moving article numbers, four alternative logistic distribution structures have been defined which enable a delivery time of 24 hours for deliveries to customers all over Germany. The four alternative logistic distribution structures are based on two issues, namely:

1. Deliveries out of one NCWH versus deliveries out of 7 NRWHs
2. Stock replenished by paper mills versus stock replenished out of IFO.

The four alternative structures are:

Structure B: Basic structure B with 7 National Regional Warehouses in Germany

Structure C: Basic structure C with a National Central Warehouse in Germany

Structure F: Basic structure F with ECWH IFO and 1 National Central warehouse in Germany

Structure G: Basic structure G with ECWH IFO and 7 National Regional Warehouses in Germany

Figure D shows a matrix with issue 1 on the vertical axis and issue 2 on the horizontal axis. In the matrix, the four alternative structures are filled in

	Stock replenished by paper mills	Stock replenished through IFO
10 IFO	Structure C	Structure F
7 NRW's	Structure B	Structure G

Figure D Matrix logistic distribution structure issues

A fifth alternative structure is the current structure for deliveries of pallets out of IFO Germany. Starting point is basic structure C. The alternative, called *structure C IFO*, enables a delivery time of 48 hours to customers in the west and middle of Germany and 72 hours for customers in the east of Germany.

The five alternative structures are shown in figure E

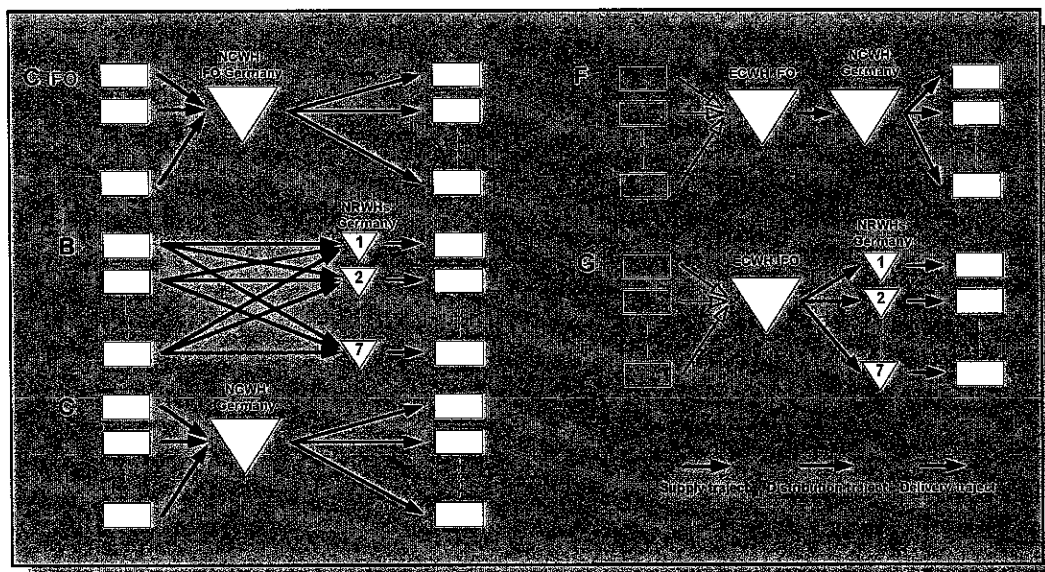


Figure E. alternative logistic distribution structures Germany

They have been evaluated by calculating the yearly physical distribution costs. The physical distribution costs that have been calculated are costs for transportation, storage, handling and interest.

For the calculation of the storage and interest costs, the average safety stock and cycle stock per warehouse have been calculated. The calculation of the stock levels is based on the (s,Q) stock replenishment control system that is currently used by Océ Germany.

The safety stock level that is currently kept in the NCWH IFO is used as basis to derive the safety stock levels in the warehouses of the alternative structures

For the calculation of the safety stock per warehouse in the N NRWHs situation (SS(2)), the following formula has been derived. $SS(2) = SS(1) * \sqrt{1/N}$, in which SS(1) is the current SS level in one Central WH.

If stock is replenished out of ECWH IFO instead of by the paper mills, the replenishment lead time (L) will change from 4 weeks (L₁) to 0,5 week (L₂). In order to calculate the impact of this change of replenishment lead time on the safety stock level, the following formula has been derived:

$$SS(L_2) = SS(L_1) * \sqrt{L_2/L_1}$$

For the calculation of the cycle stock, the Camp formula for calculating the Economic Order Quantity (EOQ) has been used.

Results calculation

Figure F shows the results of the calculation

	C IFO	B	C	F	G
TOTAL COSTS without trolley use	***	***	***	***	***
TOTAL COSTS with trolley use	***	***	***	***	***

Figure F. calculated yearly costs per structure

The following conclusions have been drawn from these figures.

- If a delivery time of 24 hours is wanted for the fast moving article numbers for customers all over Germany, the calculated physical distribution costs will rise at least at least with € ***. (Costs structure B – Costs Structure C IFO) That means an increase in costs of 95 %
- If for all deliveries a trolley is used, which is extra delivery service, the calculated yearly physical distribution costs will rise with € *** for all five structures, or 55 % for C IFO, 28 % for B, 28 % for C, 20 % for F and 23 % for G
- Of the four structures which enable a delivery time of 24 hours can be achieved, the calculated costs for structure B are the lowest. However, the difference in the calculated costs for structure B and C is small. The costs for structure C are € *** higher than the costs for structure B, which is 0,8 %

Besides the calculated costs, other costs were considered for structure B and C. This has led to the following conclusions.

- Administration costs are lower for structure C than for structure B
- The costs for fixing up the new warehouses for Océ use will be lower for structure C than for B. This, because for structure B seven warehouses will have to be fixed up for Océ use, while for structure C only one warehouse has to be fixed up

Given the small difference in the calculated costs and the above mentioned conclusions, structure C with one Central Warehouse and stock replenishment by the paper mills follows as the best choice for Océ Germany if 24 hours deliveries are wanted.

Conclusions for the physical distribution WOP in Europe

The calculations for Océ Germany have led to a conclusion about stock replenishment out of ECWH IFO versus stock replenishment by the paper mills.

- If stock in a National WH in Germany is replenished out of ECWH IFO instead of by the paper mills, a stock reduction of more than 100 days is needed in the National WH to compensate the extra costs made for stock replenishment out of the ECWH IFO instead of by the paper mills

Based on the conclusion mentioned above, a general conclusion was drawn:

- In general, the costs for stock replenishment out of an ECWH are high compared to stock replenishment by the paper mills, because the paper mills supply replenishment orders free of charge.

For three countries, the following conclusion was drawn concerning stock replenishment.

- For France, the UK and Italy, the main percentage, namely more than 90 %, of stock in the National Warehouses in 2001 was replenished by the paper mills

Recommendations

The conclusions of the research have lead to four recommendations.

1. Dropshipments

- Analyse large users of WOP in Germany that are currently not delivered with dropshipments. Offer them the possibilities for dropshipments, for a lower price per pallet. Analyse if large customers are willing to restructure their purchasing policy (early ordering, large delivery batch size) for lower price per pallet. Do the same for The Netherlands, France and Italy where dropshipments also occur
- For the UK and Belgium, analyse the possibilities for dropshipments, which at present do not occur
- Analyse the possibilities for smaller delivery batch sizes for dropshipments at the different paper mills

2. Box deliveries

- Reflect on the current customer service policy concerning the minimum delivery unit, because of the high cost for a box delivery compared to a pallet delivery. Three ways of reflection are suggested.
 - Reduce the number of box deliveries by analysing if customers that currently order boxes, are willing to order pallets of WOP in the future
 - Charge extra delivery costs to customers for box deliveries
 - Stop selling boxes of WOP.

3. The best alternative logistic distribution structure Germany

- If a delivery time of 24 hours is wanted for the pallet deliveries of fast moving WOP article numbers are wanted for WOP in Germany, structure C should be chosen. Structure C is the structure with a National Central Warehouse in Germany and stock replenishment by the paper mills.

4. Stock replenishment out of ECWH versus stock replenishment by paper mills

- For France, Italy and the UK, the replenishment of stock in the National Warehouses by the paper mills should be continued for the main percentage of stock.