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Promotional DC replenishment : "riding the wave of explosive demand"

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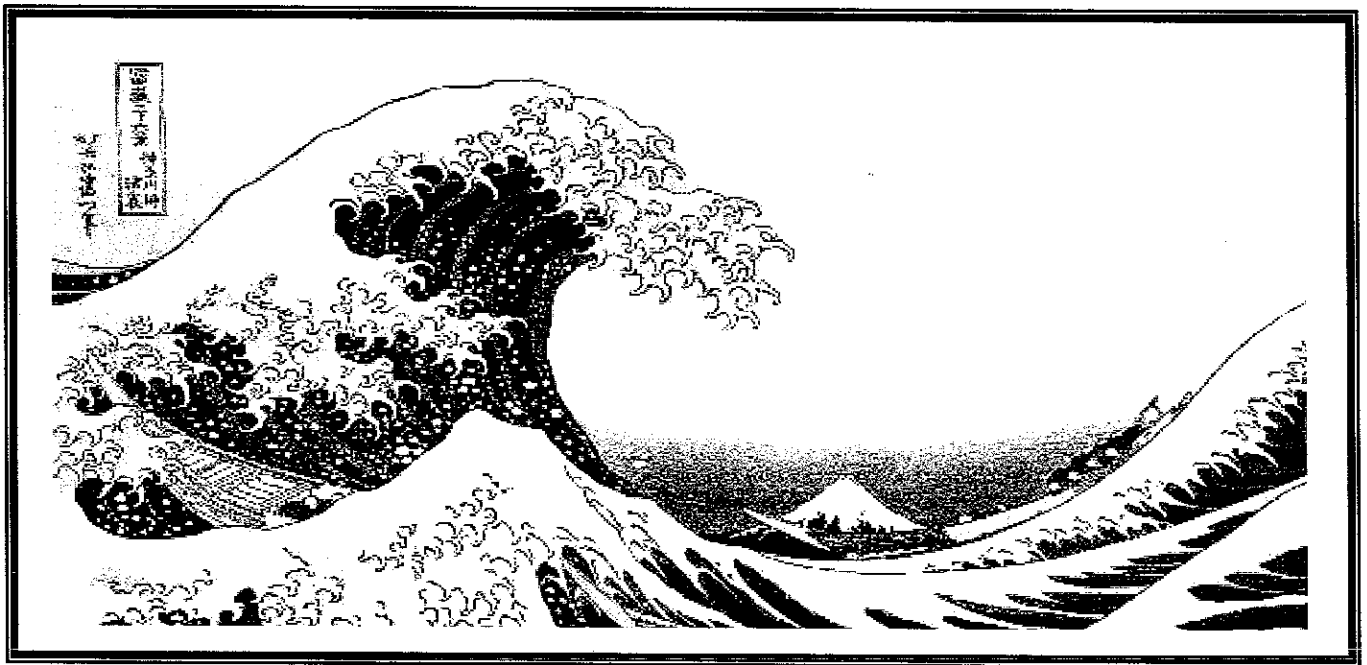
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Promotional DC Replenishment



“Riding the wave of explosive demand”

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Promotional DC Replenishment

“Riding the wave of explosive demand”

Main Report

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Abstract

This graduation report describes the results of the Promotional DC Replenishment Project. The project was initiated by Procter & Gamble Belgium / Holland and has been carried out in close collaboration with Albert Heijn. The project addresses the issues regarding the inventory control by P&G, of the Distribution Centers of Albert Heijn during promotions. Because of explosive and volatile demand, promotions pose great challenges for the logistic systems and processes, to prevent promotional stockouts and minimize stock levels after the promotion. Potential solutions for these issues are evaluated and finally the design of a promotional inventory control system and a collaborative forecasting process are described. This report is written for P&G, Albert Heijn and the participating staff of the Eindhoven University of Technology. The report is confidential but a summary is available for public inspection.

Executive summary

This executive summary is meant to provide a brief overview of the main results and conclusions of the Promotional DC Replenishment Project. The summary roughly follows the structure of this report.

Background of the project

The Promotional DC Replenishment Project was initiated by Procter & Gamble Belgium / Holland in close collaboration with Albert Heijn. Procter & Gamble is a large multinational in the Fast Moving Consumer Goods (FMCG) industry, with operations in 70 countries. P&G's main product categories are Laundry & Cleaning, Paper, and Health & Beauty Care. Albert Heijn is the largest supermarket chain in The Netherlands. It is part of "Koninklijke Ahold n.v.", which operates more than 7000 stores in North and South America, Europe and Asia. Albert Heijn b.v. runs approximately 690 stores.

Two reasons make efficient and effective logistical execution of promotions a top priority for both Albert Heijn and P&G:

- Price promotions are an important marketing tool for many of P&G's product categories. Most of the P&G products are market leaders in their segment and are positioned in the higher price ranges. Temporary Price Reductions (TPR) for these products, lead to a significant increase of store sales. Promotions account for 45% of P&G's total sales volume with Albert Heijn. Promotions are therefore not rare events and can be regarded as an important part of everyday business.
- Both P&G and AH strongly support the Efficient Consumer Response (ECR) vision. One of the main focus areas of the ECR vision is an efficient and effective promotional process.

Because of the explosive and volatile demand, promotions pose great challenges for the logistic systems and processes to effectively manage the goods flow. During promotions, consumer sales can be as much as 20 times higher than regular sales and the store orders to the AH DC's follow a similar pattern. P&G is responsible for the inventory control at the AH DC's through Vendor Managed Inventory. Past experience, indicated that P&G did not deliver the outstanding DC replenishment performance during promotions that both P&G and AH desire, resulting in:

1. Stockouts in the AH stores. Part of these result from stockouts at the AH DC's.
2. Inventories after promotions at the AH DC's exceed agreed targets.

This directly led to the following assignment of the Promotional DC Replenishment Project:

- Identify the root causes for the high post-promotional stock level, and the OOS during promotions at the AH DC's.
- Develop solutions that will reduce the post-promotional stock levels in the Albert Heijn DC's to set targets and that reduces out of stocks at the Albert Heijn DC's during promotions.
- Implement these solutions as a pilot, to check feasibility and to see if they meet the objectives.

The project's success measures are promotional service levels at the AH DC's and post-promotional stock levels at the AH DC's. The achieved performance during the analyzed reference promotions is presented in Table 1, along with the success criteria that have been set for this project. Clearly, the performance on both success measures needs improvement.

Criteria:	Reference promotions	Target:
Post promotional stock	32 days coverage	12 days coverage
Promotional service level	98,0%	99,5 %

Table 1: Project success criteria and achieved performance during reference promotion weeks

Business benefits estimation

An estimation is made of the potential benefits that can be achieved through this project for both P&G and AH. The business benefits consist of savings through post-promotional stock reduction and increased sales due to higher service levels.

Business benefit	Value in Hfl.
Yearly estimated savings through stock reduction for AH	216.465
Additional yearly promotional sales P&G alone through service level increase	375.000

Table 2: Estimated business benefits

Root cause analysis

To determine potential improvement areas, a thorough root cause analysis was carried out. This resulted in the following three groups of factors that currently negatively affect the project's success measures. For each of the three groups, the potential improvements were evaluated on their contribution towards the project's success measures and on their feasibility to be implemented as a part of the Promotional DC Replenishment Project.

1. Inventory control system:
 - Poor pre- and in-promotional forecasting
 - Lack of structured ordering methodology
 - VMI information system is not suitable for promotions
2. Product availability higher up the supply chain:
 - Unavailability of items at the P&G DC's
3. High order quantities due to ordering constraints:
 - Half truckload minimum constraint
 - One order moment per day constraint

Selected solutions

The following table presents an overview of all the potential improvements that have been considered, with the expected impact on service levels and post-promotional stock levels, as well as perceived feasibility as part of this project. The possible ratings run from "—" representing a very poor score, to "++" which represents a very good score. In the final column the decision on whether or not to include the potential change in the project's solution plan is made.

Potential change	Service level	Post-prom. stock	Feasibility	Include
1. Redesign and improve the pre-promotional forecasting process	++	+	+	Yes
2. Design of accurate in-promotional daily store order forecasting system	++	++	++	Yes
3. Increase daily store order forecast accuracy by reducing the replenishment lead time	++	++	-	No
4. Design a suitable ordering system for promotions	++	++	++	Yes
5. Relieve order size constraints that are part of the SLOG agreements	±	+	-	No
6. Multiple deliveries per day	±	±	-	No

Table 3: Overview potential improvements with their impact and feasibility

The final solution plan is graphically illustrated by Figure 1 and consists of two separate parts.

- The design of a suitable promotional inventory control system.
This includes the design of a daily store order forecasting system and the design of a suitable promotional ordering system.

- The redesign of the pre-promotional forecasting process. This improvement will positively affect both the performance of the promotional inventory control system and service level at the P&G DC. The redesign will focus on improving the forecast accuracy of the pre-promotional forecast through collaboration between AH and P&G. This approach is called “Collaborative Forecasting”.

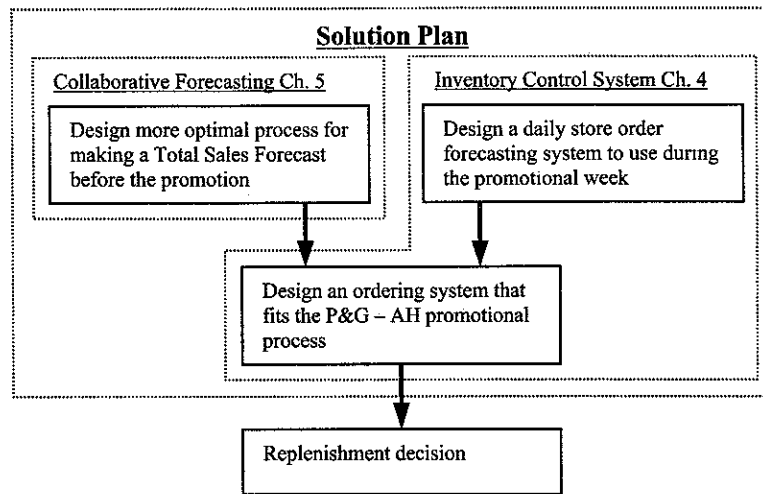


Figure 1: Solution plan

The design of a suitable promotional inventory control system

An inventory control system needs to facilitate the making of decisions concerning when and in what quantity replenishments to the AH DC’s should be made: A generic inventory control system consists of three subsystems:

1. Forecasting system:
The forecasting system generates the demand forecasts that form the input for the ordering system. How far ahead this system needs to forecast depends on the choice of ordering system.
2. Ordering system:
This system controls when and how much should be ordered or replenished. The parameters used in this system depend on the forecast accuracy of the forecasting system.
3. Information system:
This system is a prerequisite for the forecasting and ordering system. Usually this will be a software application and a database that keeps track of all the inventory levels and mutations. It should aid the user in making the right ordering or replenishment decisions. It is the backbone of an efficient inventory control system.

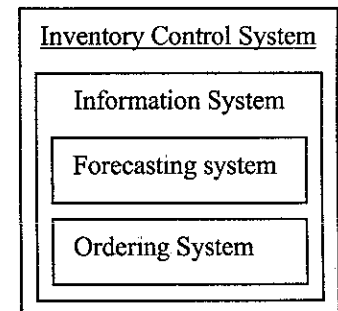


Figure 2: Generic inventory control system

Ordering system

The (R,S) system, with daily replenishments, is chosen as an ordering methodology. This system depends on periodic review, which fits P&G’s ordering process, and allows for variable replenishment quantities. In addition, the order-up-to level S can be adjusted, every review period of, which is a necessary property, since store order volume varies considerably over the promotional weekdays.

Forecasting system

In this section three different forecasting methods have been designed and evaluated, each based on different types of information:

1. Follow-up Order Forecast (FOF: pre-promotional forecast).
2. Store-orders in the previous days of the promotion.
3. Store-sales in the previous days of the promotion (POS-data).

The final goal was to design and implement a structured daily store order forecasting system, to use as part of the promotional inventory control system, that maximizes forecast accuracy. The three designed forecasting methods have been compared based on the forecast accuracy they realized in simulated historical forecasts. This results in the following selected forecasting methods for each promotional replenishment.

Friday (t=1)	Monday	Tuesday	Wednesday	Thursday	Friday (t=7)
FOF	FOF	Store Orders	Store Orders	Store Orders	Store Orders

Table 4. Selected daily store order forecasting method for each promotional replenishment decision

The first two promotional replenishments will be based on the pre-promotional forecast, the Follow-up Order Forecast. The remaining replenishments are based on the forecast based on store orders over the previous days in the promotion. The forecasts will cover store orders over the next $R+L$ period (a little more than one day) for each individual DC.

Information system

The information system was not redesigned the way the ordering and forecasting systems were. Within 2 years, the current VMI information system, CRP, will be replaced by a new system. This system is currently under development by P&G. The requirements that have to be met by a new system to manage promotional DC replenishments with AH effectively and efficiently are identified. They have been shared with the group that is currently developing the new system.

Simulation of the promotional inventory control system

The designed promotional inventory control system was simulated to test the validity of the designed system and to determine whether the system was capable of achieving the set success criteria. For the simulation, actual store orders from previous promotions were used as input. The following graph shows several simulated promotional service levels with the realized (simulated) post-promotional stock levels.

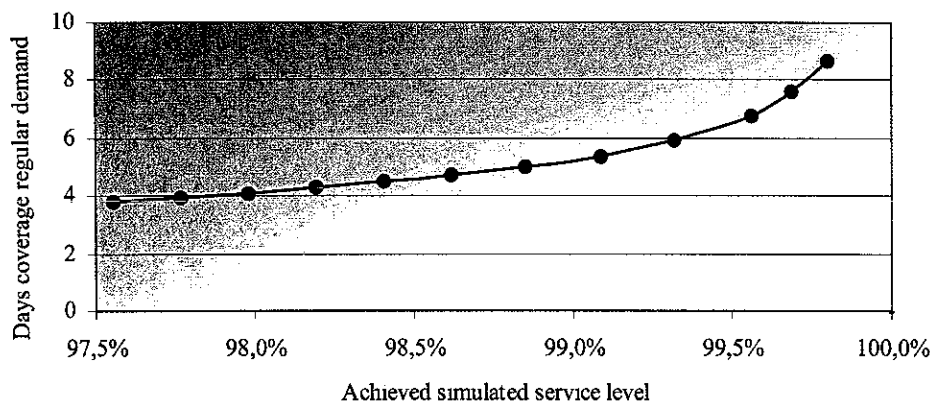


Figure 3. Simulated post-promotional stock, for different service levels

The system achieves a post-promotional stock level of 6,5 days at the target service level of 99,5%. Clearly, the designed promotional inventory control system is capable to achieve the set success criterion of 12 days coverage of regular demand.

Collaborative forecasting

The second part of the solution plan was to design a new pre-promotional forecasting process. 35% of all pre-promotional forecasts are estimated to be so much higher than actual sales, that the early promotional replenishments based on this forecast are already equal or higher than the total promotional store orders. In

addition to this, forecasts that are a lot lower than actual have a negative effect on availability of the items in the DC's of P&G and are an important contributor to the low promotional service levels at the AH DC's. Improving the accuracy of the pre-promotional forecast would have a very positive impact on both success measures of this project.

Producing an accurate forecast of the promotional sales is difficult because of the large number of factors that influence the final promotional sales. Opportunities exist mainly in the way information is shared between AH and P&G. The process that was developed to improve on this is called Collaborative Forecasting. The newly designed forecasting process rests on a few key aspects that need to be implemented:

1. Establishing joint forecasts that are shared by AH and P&G.
2. Distinguish between a Total store Sales Forecast and a shipment forecast (comparable to FOF).
3. Using a single figure forecast accessible by both P&G and AH.
4. Use rolling forecasts, that can improve as information comes available.
5. Use of historical data from Syncra to produce forecasts that are more accurate.

The forecasting process to implement these key aspects will be supported by a collaboration tool called Syncra Ct. Syncra is a web-based piece of data-base software that enables both companies to access single figure forecasting information, from any computer with web-access. A schematic overview of the process behind this is given below.

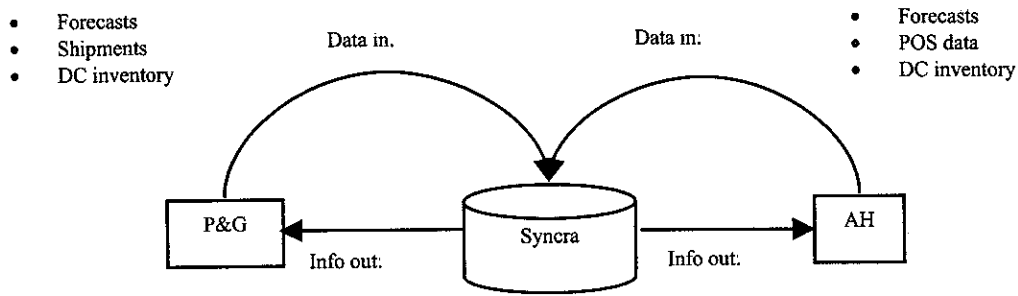


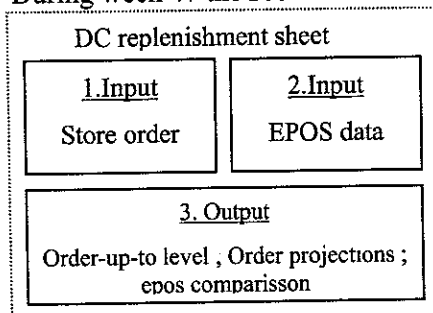
Figure 4. Schematic overview Syncra Ct

The Syncra tool is piloted in early 2001. Initially, logistical forecasting will be included and when experiences are positive, it will be used for the entire forecasting process.

Pilot week

The designed promotional inventory control system was implemented through the Promotional DC Replenishment Sheet. This Excel sheet contains all the functionality that is required for the functioning of the system. Figure 5 shows the lay out for the sheet. The top part is used for input of the previous days' promotional store orders. The input of POS-data is optional. The bottom part delivers the output in the form of daily order-up-to-levels and store order projections.

During week 47 the Promotional DC Replenishment Sheet was piloted with two Dash SKU's that were on promotion. The sheet performed satisfactory. It did become clear that for successful implementation of the promotional inventory control system in the long run, it should be fully integrated in the VMI software that is also used for the non-promotional items.



Conclusions and recommendations

This summary is brought a close with a presentation of the most important conclusions and recommendations that result from this research project.

Figure 5: Lay-out DC replenishment sheet

Conclusions

The root cause analysis resulted in the following conclusion:

Conclusion 1: The two most important causes of both high post-promotional stock levels and low promotional service levels at the AH DC's, are the lacking of an effective promotional inventory control system and low pre-promotional forecast accuracy.

The first of the two selected solutions was the design of a promotional inventory control system. As stated, an inventory control system is a combination of an ordering system, forecasting system and information system. Concerning the ordering system, the following conclusion was drawn:

Conclusion 2: The promotional ordering methodology should be based on the (R,S) system, where the inventory is replenished each day up to the order-up-to level S . S should be adjusted daily, based on the daily promotional store order forecast.

The forecasting system can be based on different types of information. Analysis of the different methods led to the following conclusion:

Conclusion 3: Daily promotional store order forecasting based on the previous days' store orders achieves the best forecast accuracy.

The designed promotional inventory control system is tested in a simulation where actual store orders from previous promotions are used as input. The results from the simulation support the following conclusion.

Conclusion 4: The designed inventory control system, with the calculated parameters and forecasting system is capable of achieving the required service levels and stock levels.

The second of the two selected solutions was the redesign of the pre-promotional forecasting process. Pivotal in the design choices of the new process are the collaboration between AH and P&G and the means of sharing information. This process is referred to as Collaborative Forecasting. Five key aspects have been identified, that need to be implemented as part of this process to improve forecast accuracy.

To improve the pre-promotional forecast accuracy, the Collaborative Forecasting process should implement the following five key aspects:

- Conclusion 5:**
1. A joint forecasts, shared by AH and P&G.
 2. Distinguish between a sales and shipment forecast
 3. Single figure forecast, accessible by both P&G and AH.
 4. Rolling forecasts that can be improved as information comes available.
 5. Use of historical data.

From the results in the pilot week can be concluded that the DC Replenishment Sheet performed satisfactory. The most important conclusion from a practical perspective that was drawn during the pilot is the following:

Conclusion 6: To successfully implement the promotional inventory control system in the long run, it needs to be fully integrated in the VMI software and all required information needs to be exchanged automatically.

Short-term recommendations:

Promotions have a stronger negative effect on post-promotional stock levels for slow moving items than for fast moving items. This leads to the following recommendation.

Recommendation 1: Slow moving items should be distributed from the National Distribution Center (LDC) instead of from the Regional Distribution Centers (RDC).

CRP does not handle leftovers at the DC of the initial store orders the way it should. This can be by-passed by having the DC's exchange the actual initial store orders to P&G. E.g. on the same fax that is also used for the exchange of the Follow-up Order Forecast.

Recommendation 2: The actual initial store orders per DC should be exchanged, in addition to the EDI orders.

The Follow-up Order Forecast is currently divided over the DC's based on their percentage of the total initial store orders. This is not very effective and should be replaced by historical promotional store order shares of the DC's.

Recommendation 3: The Follow-up Order Forecast accuracy at DC level should be improved by dividing the total FOF over the DC's based on historical store orders.

Long term recommendations:

The initial order is currently placed manually by the stores. Many stores have ceased to place this initial order at all, while many others order too little. This has impact on the in-store execution of promotions, which is one of the main uncertain factors in the promotional process at the moment and complicates the making of an accurate store order forecasts.

Recommendation 4: Stores should be assisted with automated initial order proposals, based on the Total Sales Forecast, just like they are assisted with automated order proposals for the regular orders.

Based on the analysis of the current store order forecast accuracy that can be achieved by using store sales, a final recommendation is made towards promotional store ordering:

Recommendation 5: Promotional store ordering should become assisted or automated.

When the manual link between store sales and store orders is removed, order forecasting can become store sales driven. DC replenishment can then be steered to meet consumer demand instead of store demand.

Acknowledgements

Promotional processes between retailer and manufacturer are often complex. In the case of Albert Heijn and Procter & Gamble this is probably even more true because of the combination of P&G's centralized production strategy and AH's exceptionally short lead times from DC to stores. Only through the help and support of many people, I was able to deal with the great amount of influencing factors and to create structure in complicated processes.

I wish to express my gratitude to the following people and departments for making this project both academically and professionally a very rewarding and educational experience:

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Santpoort, April 2001

Marcel van der Wurff

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Acronyms & Abbreviations

AE	Account Executive P&G
ASI	Production planning tool
BDF	Promotional database used by the Planning dept. and CBD
CAM	Category manager AH
CPFR	Collaborative Planning Forecasting and Replenishment
CRP	Software tool used for inventory control by P&G at the AH DC's (VMI)
CSR	Customer Service Representative
CTLM	Customer Team Logistics Manager
CTSM	Customer Team Systems Manager
C.U.	Consumer Unit, the items that are for sale in the store
ECR	Efficient Consumer Response
EDI	Electronic Data Interchange
EPOS	Electronic Point Of Sale (data) = POS; store sales data
Fempro	Feminine Protection product category, e.g. Always, Alldays
FOF	Follow-up Order Forecast
F&HC	Fabric & HomeCare
GBS	Global Business Services
GBU	Global Business Unit
H&BC	Health & Beauty Care
LDC	Nationwide ("Landelijk") Distribution Center
LM	Logistics Manager AH
MDO	Market Development Organization
O.U.	Ordering Unit, the minimum store order size e.g. boxes with a number of C.U.
POS	Point Of Sale (data) = EPOS; store sales data
RDC	Regional Distribution Center
SKU	Stock Keeping Unit
TSF	Total Sales Forecast
VMI	Vendor Managed Inventory
(R,S)	Inventory system, relying on periodic (daily) Review, increasing the inventory to level S

List of Appendices

This is a list of all the appendices accompanying this report. They are included in a separate volume accompanying this report.

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