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Improved Forecast Accuracy Does Pay Back!

Justifying forecast improvement investments based on facts and figures

A research report from EyeOn in association with the Tilburg University

EyeOn bv
Business Planning
& Control Solutions

Croylaan 14
P.O.Box 85
NL - 5735 ZH Aarle-Rixtel

+31 492 388850
+31 492 388835

mail@eyeon.nl
www.eyeon.nl

Improved Forecast Accuracy Does Pay Back!

Loek Lemmens, EyeOn

Emile van Geel, EyeOn

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1 Introduction

1.1 Management summary

Is your company's demand planning roughly right or precisely wrong?

Demand forecasts play an important role in many supply chain decisions. Inventory management decisions, production planning and scheduling decisions are made on the basis of these demand plans. For effective decision making reliable forecasts are required of the demand in future periods. Therefore, there is a need to make these forecasts as reliable as possible. But what is the bottom line effect for the company if this reliability increases?

A demand forecast will never be perfect. However the influence of a more reliable demand planning is not negligible. It has various consequences, including the following:

1 *The sales volume increases, because of the higher customer service level and reduced out-of-stock*
2 *Reduction of the operational costs, such as less obsolete inventory, less capital costs for retaining inventory and a lower demand for safety inventory.*
3 *The Weighted Average Cost of Capital percentage decreases. The company will have a lower risk profile for shareholders leading to a lower Weighted Average Cost of Capital percentage.*

EyeOn and the Tilburg University developed a generic simulation model that measures the financial consequences of an improved demand planning reliability in a graspable way. 'Generic' refers to the fact that different companies, with different supply chain models, can implement this model.

The results of the simulation runs clearly indicate if there is a sound business case for the scenarios defined, including priority setting of the different improvement projects. In this way a clear link between the logistic practice and the more financially oriented top management is made. The model has been implemented at LG. Philips Displays Europe and Ferro Electronic Material Systems. Armin Latz (Logistics Manager LG.Philips Displays Europe): "The results show that an increased demand planning reliability has a positive effect on the total value chain: it leads to higher sales and margin through less out-of stock, a higher margin through less obsolete stocks and in less working capital through fewer inventories."

1.2 Problem definition

A few years ago, a study at Hewlett-Packard revealed that 40 percent of the inventories in their system were cycle and pipeline stocks, of which 80 percent were due to variability. Of this variability component, 96 percent was due to demand uncertainty. These large inventories can cause enormous costs.
This proves the need for a good demand forecasting.

Demand planning is about making an accurate demand plan. Overestimating customer demand will result in unsold inventory while underestimating customer demand will lead to inventory stock outs, loss of potential sales and can result in a loss of customers.
A demand forecast will never be perfect. It is certain that a forecast error is always present. If this error becomes smaller, the forecast is more accurate, resulting in a more reliable demand planning. There are a number of methods to increase the forecast accuracy. A few possible methods are shown in the list below.

- *Account planning*
- *Statistical forecasting techniques*
- *Planning of promotions and events*
- *Market analysis*
- *Anticipating the product life cycle*

In several companies the supply chain department is responsible for the demand plan. However, structural improvement of the demand plan often lies outside the direct circle of influence of the supply chain department, although this plan is one of the key factors for a stable flow of goods within the supply chain. The key factor is to convince top management in its own language of the benefits of improved demand plan reliability and get proactive support in initiating such a project.

Nowadays, ROI is one of the most commonly used business metrics for enterprise investment decisions and is expected to be around for several years as the dominant determinant in decision-making. Approximately 75% of the companies require some kind of ROI analysis to support their decisions. The essence of ROI is very simple: do you get back more than you put in?
ROI is often used as a tool to understand the cost and benefits of a project. It does not just come up with a number, but it also gives a structured understanding of the cooperative benefits. In such a way, a project must prove its value alongside other capital investments in a corporation before it is initiated.

In order to be able to demonstrate the financial results of a demand planning improvement project in a graspable way EyeOn, together with the Tilburg University, has developed a computer simulation model for the analysis of the bottom-line financial consequences of different levels of demand planning reliability. The simulations can be performed for different business scenarios. In this way a solid business case can be presented to the management team, including a priority setting among different improvement projects.

1.3 Organization of the report

The first part of this report, covering Chapter 2, consists of the detailed problem description and the description of all the aspects playing a role in the model that will be developed. The problem is identified and the consequences of a more reliable demand planning with the corresponding assumptions to measure these consequences are described qualitatively.

Chapter 3 describes the simulation results of the validation process. The model has been validated at LG.Philips Displays Europe, which is a large supplier of tubes for use in television sets and computer monitors. Firstly, data of the current situation has been used and is validated with LG.Philips Displays Europe. As a next step, results were simulated with improved demand planning reliabilities.

Because the model is generic, it can be used for diverse businesses with completely different supply chains. Chapter 4 describes the results at Ferro Electronic Material Systems. Ferro EMS develops, manufactures and markets high-purity powders, pastes, and tapes for many electronic applications. Some interesting scenarios have been simulated and one of them has been worked out in a business case. The paper ends with the conclusions in Chapter 5.

The white paper is the joint result of a research study performed by EyeOn and the Tilburg University, the validation of the simulation model by LG.Philips Displays Europe as final step during the research study and the implementation of the model at Ferro EMS. Many thanks go to Prof. dr. ir. Jalal Ashayeri (Econometrics and Operational Research, Tilburg University), Marieke de Graaf (Student research study, Tilburg University, 2003), Armin Latz (Logistics Manager LG.Philips Displays Europe Europe, 2003), Alan Rogers (Financial Controller LG.Philips Displays Europe Europe, 2003), Henrico van den Boomen, (Global supply chain manager Ferro EMS), Robert Lamain (Controller Ferro EMS), Alice van Baal (Project member Ferro) and Thijs Cremers (Tilburg University) for the support during the Ferro implementation and support in writing the white paper.

Improved reliability is one of the subjects discussed in the knowledge network CPM-BP. See page 20 for more information on this knowledge network.

Loek Lemmens, partner EyeOn
Emile van Geel, Senior consultant EyeOn

2 The simulation model

The model has been set up to simulate a supply chain from supplier to customer, and to give an insight in the financial aspects of this supply chain. The supply chain is the network of entities that are involved, through upstream and downstream linkages, in the different processes and activities that produce value (products, services) in the hands of all customers. Entities include suppliers, carriers, manufacturing sites, distribution centres, retailers, customers and recycling agents.

The supply chain, the statistical input parameters and the simulation parameters are input requirements for the model implemented in Ms/excel. By running the model for different business scenarios, the scenarios can be analyzed and the simulation parameters adjusted. The simulation model has been developed in the software package Powersim ©. The final results are worked out in graphs and tables in Ms/excel and form the basis for management decisions. In diagram form this looks as follows:

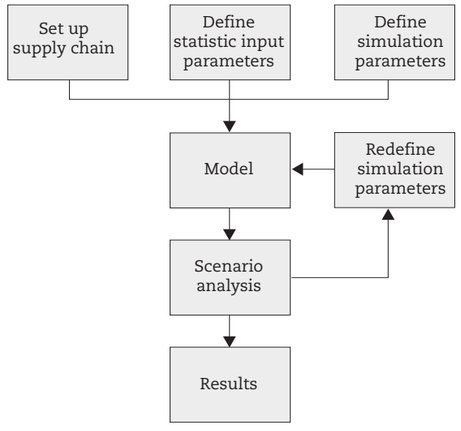

figure 2.1: General structure of the simulation model. The supply chain, the statistical input parameters and the simulation parameters are input variables to the model. By running the model for different business scenarios, the scenarios can be analyzed and the simulation parameters adjusted, so that the eventual results will form the basis of management decisions.

Set-up supply chain 2.1

The model can be used for diverse businesses with completely different supply chains. Normally this supply chain is to be set-up once in the model, including lead times, order intervals, safety stocks and other logistical parameters. The model also offers the possibility for simulation with the supply chain by, for example, adding, moving or closing a factory or a sales organization.

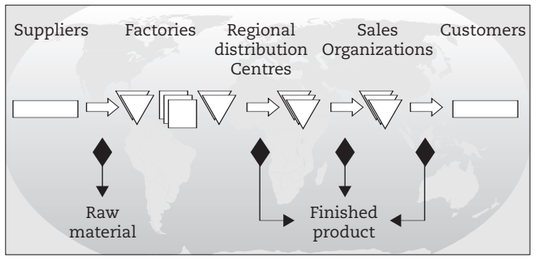

figure 2.2: General set-up of the supply chain. In the simulation model this supply chain can be tailored to the specifics of a company. The factories, regional distribution centres and sales organizations, including lead times and other logistic parameters are to be defined within the simulation model.

A supply chain network is often categorized as a push or pull system. In a push-based supply chain the supplier gets an order from the factory and pushes the raw material into the system towards the customer. He uses this order to make his demand forecast. For the factory and the Regional Distribution Centre (RDC) the same way of working applies. They get orders from the RDC and Sales Organi–zations (SO) respectively and based on these orders they forecast their demand.

In a pull-based supply chain every element in the supply chain is customer demand driven. The customer demand forecast activates the ordering of the raw materials, production and sending of finished products to the RDC, SO and customer. In hybrid supply chain systems, parts of the supply chain are push-based and others pull-based. The place where those two stages meet is called the push-pull-boundary. In the model this boundary is located at the raw material inventory. Hence the supplier pushes raw material into the system. From that point a pull method is used. The factory bases its production planning on the actual demand forecast and not on the RDC orders received. The SO and RDC orders also depend on the actual demand forecast. Figure 2.3 reflects this supply chain. Every part in the supply chain has access to the same information with respect to the forecast and actual demand. In this way, the Bullwhip effect[1] is avoided.

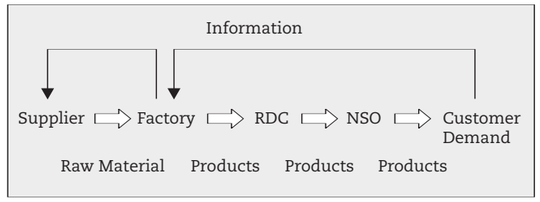

figure 2.3: Supply chain in the model

The model assumes that demand is lost whenever a product is out of stock.
Based on the demand plan expected and the demand planning reliability expected the realized sales are calculated, taking into account the stock on hand. This information is used for internal orders of finished products and for external orders of raw materials.

2.2 Define statistical input parameters

In the model a number of parameters will be defined that are basically independent of the different business scenarios. For example: product characteristics, the demand plan and costs aspects playing a role in the model.

2.2.1 Product characteristics

When a company has a huge number of products in its range it tends to focus on the most important products. The process of dividing products according to their importance is called the ABC analysis. A-products are the most important products, usually meaning a high annual dollar or Euro usage. Other aspects on which this division is made include marketing reasons, the sales price or margin aspects. Roughly twenty percent of the total number of products represents eighty percent of the sales volume in dollars or Euros. Therefore, this classification is called the 80/20-rule, or Pareto-analysis. In the model it is referred to as hero/non-hero or important/less important subdivision.
Because a company usually focuses on the hero-products the demand planning reliability of the hero-products will be higher than the non-hero products. The model therefore offers the opportunity to distinguish parameters based on the Pareto rule.

Demand plan 2.2.2

The customer demand considered in the model is unconstraint and independent of supplier capacity constraints. This is the demand of the customer without knowing manufacturing, transport and inventory capacities or difficulties. It is called unconstraint demand. The demand planning is prepared per product, per SO, per month.

Cost aspects 2.2.3

A number of fixed and variable cost elements and a number of financial parameters, such as the expected payment periods of incoming and outgoing invoices and the average cost of capital (WACC %) are included in the model.
Capital costs can be fixed or variable. The cost of capital investment in the inventory is part of the inventory holding costs and is variable. The costs of capital investments in buildings, machines and other equipment are fixed capital costs. The costs of capital invested in accounts payables and the negative costs of accounts receivables are variable costs. When calculating the capital costs of inventory, accounts payables and receivables,

[1] Bullwhip effect = The fact that demand variation is higher when moving up a supply chain.

buildings, machines and other equipment, the WACC is used. It is expressed as a percentage. The capital can be borrowed from a bank or obtained from shareholders. These financiers require a certain interest or return on investment every period. The calculated weighted average of this will be used as WACC percentage in the model.

2.3 Define simulation parameters

The key parameter used for simulation in the different scenarios is the demand planning reliability. This parameter represents an expected average reliability over all the products and months per SO. The reliability in the model means the deviation in percents of the customer demand actually satisfied with respect to the customer demand planning on a product-by-product basis. Not all the products have exactly the same forecast reliability, but taking into account the product mix, the average reliability in this mix is taken as the expected average product forecast reliability.

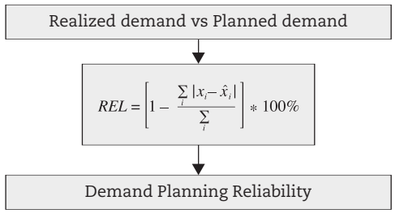

figure 2.4: The definition of sales planning reliability as used in the model is 1 minus the sum of the absolute deviations of realized sales and planned sales divided by the sum of planned sales. This calculation is made at SKU level, since we also want to be able to see the consequences for stock levels in the model.

Starting with the demand planning reliability as it is in the current situation, different scenarios can be simulated, e.g.:
- *A general increase of the demand planning reliability for the total organization by x % point*
- *An increase of the demand planning reliability for the worst sales organization*
- *An increase of the demand planning reliability for only the fast moving products by % point*

The Model 2.4

The objective of every business decision is to raise the market value of the company. If the company is capable of creating value for its owners, the company is successful. A company creates value if the Market Value Added (MVA) is positive. The company creates value because the market value of its capital exceeds the amount of capital invested in it. If the MVA is negative, the company is destroying value. A company's MVA is positive if the market expects the company to generate positive Economic Value Added (EVA) in the future. EVA is equal to the after tax operating profit generated by the company minus the cost of the capital employed to finance this. In Figure 2.5 it becomes clear how this EVA is measured.

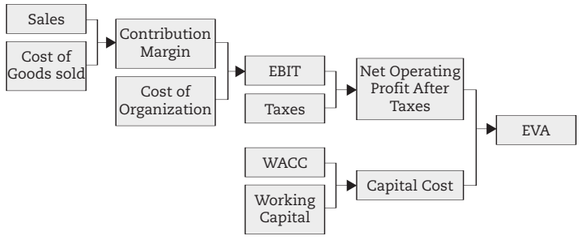

figure 2.5: In the model the bottom line financial consequences are processed in the Economic Value Added financial structure. This structure is recognizable to top-management and combines elements of the profit and loss account and the balance sheet.

2.5 Results

The results of the various demand planning reliability scenarios are presented in the EVA structure. This structure is very recognisable to top management. In this way we can make a clear link between logistic practice and the more financially oriented top management. When financial consequences of a specific scenario are higher than the expected project costs of realizing the scenario, there is a sound business case for starting up the project. What has to be taken into account is that the project costs are a one-off expenditure, whereas the financial consequences will re-iterate on an annual basis. As illustrated in figure 2.6, useful results will only be achieved after going through a number of scenario analyses, including the redefinition of the simulation parameters.

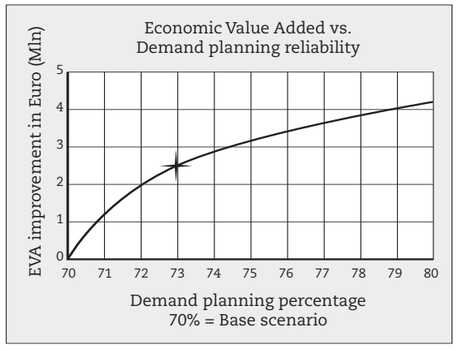

figure 2.6: Example of the standard results of the simulation model. This graph shows the Economic Value Added improvement in millions of Euros in relation to the improvement of the sales planning reliability. The star in this example shows that with an improvement of sales planning reliability from 70% to 73% the EVA will improve by EUR 2.5 million annually

As shown in figure 2.6 the EVA is expected to be a positive function of the demand planning reliability. This increase in the EVA is attributed to three important factors.
- *Service level:*
  It is assumed that customer demand is lost if it cannot be satisfied from stock. An increase in the demand planning reliability results in an increase of the delivery service to the customer. Fewer stock-outs will occur, resulting in less loss of sales.
- *Operational costs:*
  There will be less in inventory. As a result, the amount of capital in inventory decreases and therefore also the costs of capital. Another reason for the reduction of the operational costs can be a decrease of the obsolete inventory. Whenever inventory is too high, companies can give a certain discount for non-current products.
- *Weighted Average Cost of Capital*
  If the company is able to improve their financial forecasts as a consequence of the improved demand planning reliability of the demand forecasts, the company has a lower risk profile for e.g. shareholders, leading to a lower WACC.

It is important to notice that the results are derived from a simulation model. It cannot be used as a mathematical exact calculation of the increase of the EVA.

Benefits not captured by the model 2.6

Although the model clearly indicates the bottom-line financial consequences of different scenarios, it does not take into account all the benefits of an improvement of the demand planning reliability.
The model is a simplification of the real-life supply chain, and is strongly based on important definite assumptions that are input of the model. The model does not capture benefits that cannot be derived mathematically from improved demand plan reliability. However, most of these benefits are tangible and can be estimated outside the model, based on objective calculations. Examples of these benefits are:
- *Changed inventory policy*
- *Reduction of personnel cost*
- *Reduction in capital cost*
- *Higher customer satisfaction*
- *Improved supplier relation because of improved demand reliability*

The model uses the same inventory policy for different reliabilities. In practice, higher reliabilities may lead to a stock and WIP reduction. In the simulation model the safety stock is based on a number of days of expected customer demand. The inventory will decrease based on the increased reliability. The defined safety stock policy is defined per scenario and will not change based on the reliability. Of course the safety stock policy can be changed into another simulation scenario. In the model the lower inventory results in two financial advantages: less capital in stock and less storage space required to store these inventories.

An improvement in the demand planning reliability will lead to a more stable flow in the supply chain. As a result of this, it will take less time for the supply chain personnel to anticipate changes in demand. There will be less fire fighting in the planning. Another consequence of a more stable flow in the supply chain is an overtime reduction in production.

An improved financial forecast leads to a lower risk profile for e.g. the shareholders. This will lead to a lower WACC, resulting in lower capital costs. As mentioned before, the model does not simulate the decrease of the WACC, but the WACC is input of the model.

Fewer stock-outs do not only lead to higher sales and margin on a short term, but also to a higher customer satisfaction. If a customer is confronted with more than expected stock-out situations, he will lose confidence and shift sales to competitors. On the other hand, higher than expected delivery reliability will improve customer satisfaction and may lead to higher future sales and margin. In practice, it is very subjective to estimate the effect of higher customer satisfaction on the future sales and margin.

If higher demand reliability is translated into higher supply plan reliability it will lead to a better supplier relationship. This will result in a stable goods flow and less exception management on the supplier side. This is a solid basis for negotiating improved purchase prices.

3 Implementation at LG.Philips Displays Europe

LG.Philips Displays Europe is a joint venture of Philips Electronics of the Netherlands and LG. Electronics of Korea and employs approximately 30,000 people all over the world. Its headquarters is located in Hong Kong. With a turnover of more than 4 billion dollars, it is the worldwide supplier of tubes for use in television sets and computer monitors. LG. Philips Displays supplies its tubes to global set- and monitoring making companies, including Philips TV, Loewe and Bang & Olufsen.

Planning reliability (Base Scenario)	
Aachen	88%
Barcelona	88%
Dreux	72%
Durham	73%
Hranice	29%
Newport	26%
Average reliability	**62,6%**

table 3.1: Data description 2002

This investigation is focused on the Colour Picture Tubes (CPT's) produced and sold in Europe. The products that are imported in Europe are not taken into this investigation. The monthly data for the various products has been studied for one year and is used to calculate the forecast reliability. This reliability is the average reliability in the product mix and is based on a three-month forecast. The data used is related to the year 2002.

This table shows that LG.Philips Displays Europe faces very low demand planning reliabilities for the manufacturing plants in Hranice and Newport. As we mentioned before, these low reliabilities might result in high costs. To measure the profitability of some reliability improvement projects EyeOn has implemented the current situation in the model and simulated some interesting scenarios in cooperation with LG.Philips Displays Europe.

Base scenario 3.1

With the reliabilities displayed in table 3.1, the expected situation for 2003 is simulated. From the simulation it followed that the current situation is not profitable, due to the relatively small margin on the products. This margin does not cover the total fixed and variable cost and will lead to a negative EBITA. Therefore, the EVA also becomes negative.

Simulating the expected results for 2003 based on the current demand planning reliabilities will provide the results for the base scenario. The results for 2003 are also simulated based on improved reliabilities. These results are compared with the base scenario.

Increase of reliabilities by 5 % 3.2

In this scenario, the demand planning reliabilities for all manufacturing plants increase by 5 % per simulation. However, because there is always some uncertainty in the customer demand, it is not realistic that this reliability exceeds 90 %. Therefore, this is taken as an upper limit. The results are shown in Figure 3.2.

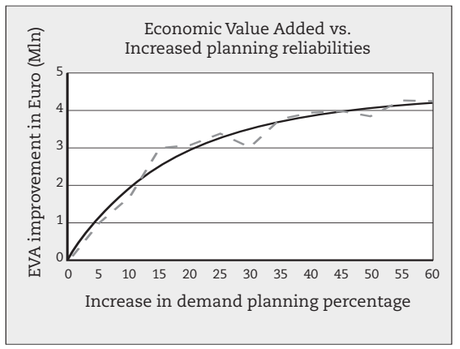

figure 3.2: Change in the EVA for an increasing sales planning reliability

As expected Figure 3.2 shows that an increase in the demand planning reliability influences the EVA positively.
An increase of the reliability by 5% in each plant already results in an increase of the EVA by 1.1 million euros. And in case the company is able to increase its reliabilities by 60% (up to a maximum of 90%), the EVA even increases by 4.6 million euros with respect to the current situation.

One of the main factors is the increase of the service that is provided to the customers. In Figure 3.3 the relationship between lost sales and the increase of the reliabilities is shown. As a result of the increased reliabilities there will be fewer stock-outs, resulting in less loss of sales.

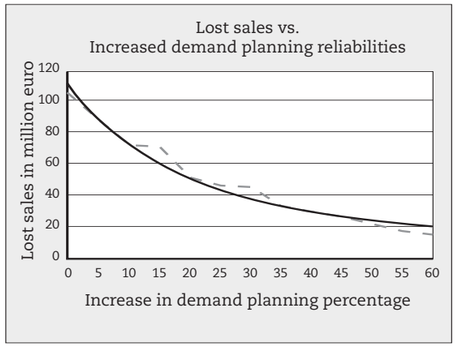

figure 3.3: Change in the lost sales for an increasing sales planning reliability

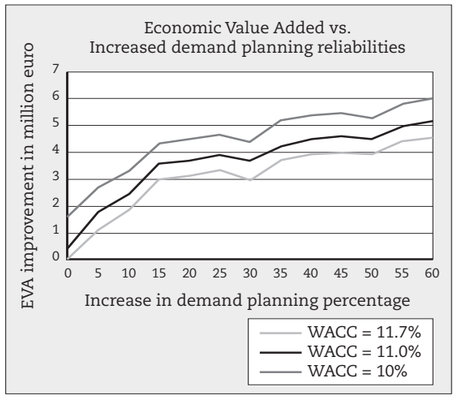

figure 3.4: Change in the EVA for an increasing sales planning reliability with different values of the WACC %.

The model does not automatically correct for a decrease of the weighted average cost of capital (WACC). This percentage is input of the model. However, if the company is able to improve its financial forecasts as a consequence of the improved demand planning reliability of the demand forecast, the company has a lower risk profile for e.g. shareholders, leading to a lower WACC. Figure 3.4 shows that a decrease of the WACC percentage to 11.0% results in an increase of the EVA by 0.6 million euros. In the extreme case that this percentage is 10% the EVA even increases by 1.5 million euroswith regard to the current WACC.

Other scenarios 3.3

In the model it is also possible to run some other interesting simulations. EyeOn has investigated five different scenarios that were suggested by LG.Philips Displays Europe. In table 3.5 there is an overview of the scenarios that were investigated.

	Reliability (%) of different scenarios					
Manufacturing plant	**Base**	**1**	**2**	**3**	**4**	**5**
Aachen	88	88	88	88	88	90
Barcelona	88	88	88	88	88	90
Dreux	72	88	72	72	88	90
Durham	73	73	73	73	73	78
Hranice	29	29	72	29	72	77
Newport	26	26	26	73	73	78

table 3.5: Overview of the reliabilities of the different scenarios

For these scenarios the change in the EVA with respect to the EVA in the current situation has been simulated. Table 3.6 shows the profitability of the different scenarios.

Scenario	**Change in EVA** (x EUR 1,000)
1. Reliability Dreux equal to Barcelona	540
2. Reliability Hranixe equal to Dreux	2241
3. Reliability Newport equal to Durham	1058
4. Combination of these three simulations	3335
5. Combination + 5%	3885

table 3.6: Change in the EVA for different scenarios

3.4 Conclusions LG.Philips Displays Europe

If LG. Philips Displays Europe is able to improve the demand planning reliability for all the manufacturing plants, the Economic Value Added will increase.
If the reliabilities increase by 60% (with a maximum limit of 90%), the EVA will even increase by 4.6 million euros.

Furthermore, five interesting scenarios, suggested by LG.Philips Displays Europe have been simulated. The first scenario is an increase in the demand planning reliability of Dreux to the level of Barcelona. This results in a positive change in the EVA by 0.5 million euros. If the reliability of Hranice is taken equal to that of Dreux, the EVA increases by 2.2 million euros. When the reliability of Newport gets equal to the level of Durham, the EVA increases by 1.1 million Euros. The consequences of a combination of these three scenarios is a positive change in the EVA by 3.3 million euros and if the demand planning reliability then again improves by 5% for every manufacturing plant, the EVA will even increase by 3.9 million euros compared with the current situation.

The model was validated and approved by the logistic and financial management of LG.Philips Displays Europe. Armin Latz, Global Supply Chain Manager, on the results:

"The simulations carried out with the model clearly present the financial results of the various business scenarios. Together with the expected project costs a well-structured business case can be built for a number of demand planning projects. Since not all demand planning projects can be initiated simultaneously, the model provides a clear view of priority setting of the different business cases. The results show that an increased demand planning reliability has a positive effect on the total value chain: it leads to higher sales and margin through less out-of stock, a higher margin through fewer obsolete stocks and in less working capital through fewer inventories."

4 Implementation at Ferro EMS

Ferro is a leading global producer of technology-based performance materials for manufacturers and has global operations selling products in more than 100 countries and employs approximately 7,000 people. Ferro materials enhance the performance of products in a variety of end markets, including electronics, telecommunications, pharmaceuticals, building and renovation, appliances, automotive, household furnishings, and industrial products.

Ferro Electronic Material Systems develops, manufactures and markets high-purity powders, pastes, and tapes for many electronic applications. Although one of Ferro's goals is to reduce the working capital to a minimum, it appears that the business suffers from very unreliable demand forecasts. To convince management of the financial consequences of an improvement of this reliability, the current supply chain will be implemented in the ROI-model. When all relevant data is collected the model will run the base scenario. Once the model has simulated the base scenario and its costs, there is a possibility to run several scenarios to prioritise the improvement projects, based on the expected return of investment. When the financial consequences of a specific scenario are expected to be higher than the anticipated project costs of realizing this scenario, there is a sound business case for starting up the project.

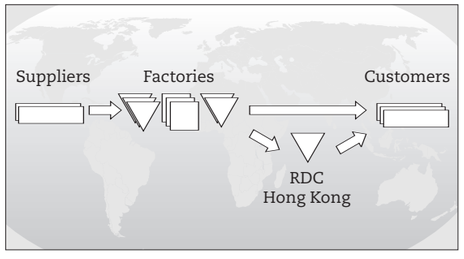

figure 4.1: Set-up of the supply chain of Ferro's Electronic Material Systems. The numbers of factories, regional distribution centres and customers, including lead times and other logistic parameters are to be defined within the simulation model.

In the Ferro supply chain most of the products are sold directly to the 26 customer groups, but there is also the option to store some of the products in the regional distribution centre in Hong Kong before reaching the customer. The simulation model enables the possibility to implement different routes from factory to customer for each product. All characteristics of the supply chain, the statistical input parameters and the simulation parameters are input requirements for the model, which has been implemented in Ms/excel.

Base scenario 4.1

The study focuses on 46 products, covering approximately 50% of the turnover of Ferro EMS. After studying the monthly data (2004) of these products the forecast reliability for each customer group has been calculated. This reliability is the average reliability in the product mix and is based on an absolute difference at SKU-level.
In Table 4.2 there is a short overview of the customer groups and their planning reliabilities, ranging from 20 % – 79 %.

Planning reliability (Base Scenario)	
Lowest performer	20%
Highest performer	79%
16 Customer Groups	20 - 40%
7 Customer Groups	40 - 60%
3 Customer Groups	60 - 80%
Average reliability	**38,2%**

table 4.2: Data description 2004

The table points out that Ferro faces very low demand planning reliabilities in the majority of the customer groups, which might result in high inventory and stock-out costs.
To measure the profitability of reliability improvement projects EyeOn has implemented the situation 2004 as 'base scenario' in the model and simulated several scenarios. The base scenario is used as reference for the other scenarios.

4.2 Increase of reliabilities by 10%

As illustrated in Figure 4.3, useful results will only be achieved after running a number of scenarios, including the redefinition of simulation parameters. The graph shows the Economic Value Added improvement in dollars in relation to the improvement of the demand planning reliability.

As expected Figure 4.3 shows that an increase in the demand planning reliability influences the EVA positively. If Ferro is able to increase its reliability by 60% (up to a maximum of 90% per customer), the EVA will increase by 4.8 million dollars compared to the base scenario.

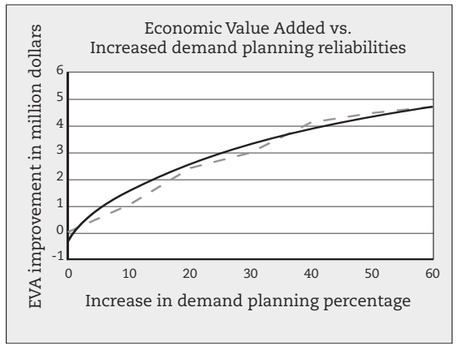

figure 4.3: Change in the EVA for an increasing sales planning reliability

Other scenarios 4.3

The tool is a support to determine the priorities for the various improvement projects. Given the demand planning settings, different scenarios can easily be simulated. For instance, the scenario below describes the results when Ferro EMS is able to increase its demand reliability of one of its customers up to 80%.

Ferro also investigated the financial consequences when improving the demand planning reliabilities for the top-5 of its customers. This top-5 is based on the estimation of the future revenues.

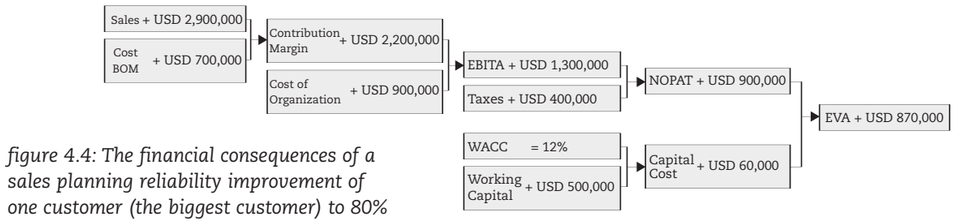

figure 4.4: The financial consequences of a sales planning reliability improvement of one customer (the biggest customer) to 80%

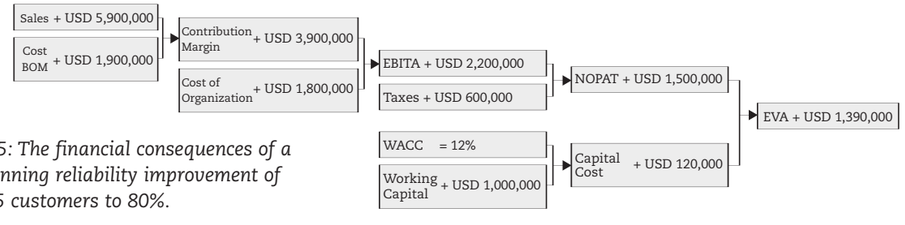

figure 4.5: The financial consequences of a sales planning reliability improvement of the Top-5 customers to 80%.

As expected, the EVA increases more, because the biggest customer is one of its Top-5 customers. Table 4.6 provides an overview of the investigated scenarios. The results show that Ferro will gain approximately 1.4 million dollars, in case the planning reliabilities of the Top-5 customers increase to 80%.

Scenario	Change in EVA (x USD 1,000)
1. Increase all reliabilities by 10% points	1082
2. Increase all reliabilities by 40% points	4114
3. Reliability Yageo equal to 80%	869
4. Reliability Top-5 equal to 80%	1394

table 4.6: Change in the EVA for different scenarios

4.4 Business case

The simulation model provides an estimation of the benefits of an increased demand planning reliability. As we mentioned before, there are benefits not captured in the model. The output of the model provides an underestimation of the real EVA improvement. To estimate the real EVA improvement, Ferro has quantified these benefits for scenario 4, where the reliabilities of the top-5 customers increase to 80%.
The benefits that are not captured by the model have been split up into five categories: reduced capital related to inventory, reduction of personnel cost, reduced capital cost, higher customer satisfaction and an improved supplier relation via improved demand reliability.
Savings in reduced inventory are invested in consignment stock at customer site, so an improved demand planning reliability will not lead to a reduction of capital in inventory. Therefore no bottom line improvement is expected.
An improvement in the demand planning reliability will lead to a more stable flow in the supply chain. As a result of this, it takes less time for the supply chain personnel to anticipate changes in demand. There will be less fire fighting in the planning. Another consequence of a more stable flow in the supply chain is an overtime reduction in production.
The reduced fire fighting in the planning is estimated at 2 FTE's * 100,000 euros and the overtime reduction as 1,500,000 dollars.
An improved financial forecast leads to a lower risk profile for e.g. the shareholders. This will lead to a lower WACC, resulting in lower capital costs. This capital cost reduction is estimated to be 1% of the relative share of the top-5 to the total turnover. The capital cost reduction is estimated at 900,000 dollars.
As stated in paragraph 2.6 it is very subjective to estimate the effect of higher customer satisfaction on the future sales and margin. Therefore no amount is taken into account in the business case presented
Better purchase prices as a consequence of improved demand reliability are estimated to be equal to 2% of the purchased value for the top-5 customers: 590,000 dollars.
The project costs have been split up into three categories: system support, consultancy support and travelling expenses.
Table 4.7 provides an overview of the estimated improvements and project costs.

Improvement captured by model	**USD 1,390,000**

Improvement not captured by model	**USD 3,190,000**
Reduced capital related to inventory policy	-
Reduction of personnel cost	USD 1,700,000
Reduced capital cost	USD 900,000
Higher customer satisfaction	-
Improved supplier relation	USD 590,000

TOTAL IMPROVEMENT (yearly):	**USD 4,580,000**

Project costs	**USD 450,000**
System support	USD 120,000
Consultancy support	USD 230,000
Travelling expenses	USD 100,000

table 4.7: An overview of estimated improvements and costs of the scenario where the reliabilities of the Top-5 customers increase to 80%.

As denoted in the table, the total estimated improvement is approximately 4,600,000 dollars, whereas the project costs are estimated to be merely 450,000 dollars. Furthermore, it should be noted that the project costs will be a one-off expenditure, whereas the financial consequences will re-iterate on an annual basis.

4.5 Conclusions Ferro

An increase in the demand planning reliability influences the EVA positively. In case Ferro is able to increase its reliabilities by 60% (up to a maximum of 90%), the EVA will even increase by 4,800,000 dollars with respect to the current situation.

In cooperation with Ferro, two interesting scenarios have been simulated. In the scenario where the demand planning reliability of the biggest customer improves to 80%, the EVA will increase by 870,000 dollars. An improvement of the reliabilities of the top-5 customers to 80% results in a positive change in the EVA by 1,390,000 dollars. This is an underestimation of the real change in the economic value added. For clear reasons some relevant benefits are not captured in the model and need to be added manually. Ferro EMS added these benefits and has estimated them at 3,190,000 dollars, so the total estimated project benefits equal 4,580,000 dollars. These benefits outdo the estimated project costs of 450,000 dollars. Furthermore, it should be noted that the project costs will be a one-off expenditure whereas the financial consequences will reiterate on an annual basis.

Henrico van den Boomen, Global Supply Chain Manager Ferro EMS:

"Ferro is a global component supplier that is almost at the beginning of the electronics supply chain. We are very aware we have to 'help our customers win'. If we are late in supplying our customers they will face a delay in supplying to their customers or will be shopping elsewhere. The results of this model clearly underline that investing in forecast reliability improvement will pay off. Based on the described Business Case Ferro is currently evaluating to invest in a two-way strategy: Consignment inventories at our major customers, using the VMI concept, and at the same time investing in more visibility upstream in our supply chain to reach our customer's customers".

5 Conclusions

In these times of economic downturn every Euro invested will have to be accounted for beforehand (which obviously is a good business attitude in better times too). This also holds for demand planning improvement projects. It would be wrong though to postpone investments that repay themselves quickly. Worse even is to not invest in them at all out of extreme carefulness. Higher operational turnover and margin and lower operational costs are, after all, financial results that the company will see in the operational result every year, on a continuous basis. On the other hand a complex project with minimal financial results is to be of a certain strategic magnitude in order to be initiated. In such a case it might be wise to focus management attention on something else.

With the simulation model developed by EyeOn and the Tilburg University the financial consequences of an improved demand planning reliability can be calculated in a graspable way. The simulation runs clearly indicate the bottom-line consequences of the different scenarios. In this way we can make a clear link between logistic practice and the more financially oriented top management. When financial consequences of a specific scenario are higher than the expected project costs of realizing the scenario, there is a sound business case for initiating the project. In this way a solid business case can be presented to the management team, including a priority setting among the various improvement projects.

Armin Latz (LG.Philips Displays Europe) and Henrico van den Boomen (Ferro EMS): *"The results of this model clearly underline that investing in forecast reliability improvement will pay off."*

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Internet sites:

Powersim	*http://www.powersim.no*
Beergame	*http://beergame.mit.edu/guide.htm*
CPM-BP Knowledge Network	*http://www.eyeon.nl*

Contact

For additional information regarding this research, please contact EyeOn BV.

Drs. Loek Lemmens, *Partner*
++ 31 629072388, loek.lemmens@eyeon.nl

Ir. Emile van Geel, *Senior business consultant*
++ 31 651888796, emile.vangeel@eyeon.nl

About EyeOn

EyeOn is an innovative consulting firm specialized in delivering planning and control solutions to complex organizations. These solutions include the design and implementation of business processes, as well as ICT systems supporting these processes.

About Corporate Performance Management – Business Planning Knowledge Network

The knowledge network 'CPM-BP' offers finance professionals a learning network on contemporary trends and best practices in corporate performance management and business planning. CPM-BP enables the members to share experiences and learn from each other via research and benchmark studies whereas members' needs are closely reflected. EyeOn and CPM Partners have initiated the network as per November 2004. There is a possibility to meet each other in person semi-annually during Round Table sessions. CPM-BP is targeted at large sized companies realizing at least 1 billion Euro sales revenues. The participating companies include: ASML, Campina, FEI, Ferro, Heineken, Hero, Nashuatec, Océ, OPG Groep, Royal Philips Electronics, Royal Cosun, Royal Wessanen, Shell and TNT.

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About High-Tech & Electronics Industry – Business Planning Knowledge network

Planning and forecasting are at the very heart of the business processes of most industrial companies involving a variety of functional areas such as marketing and sales, finance and SCM. And whereas ensuring good planning and forecasting is far from trivial in most business environments, few industries are more challenging than the high-tech electronics industry with its cyclical demand patterns, short product life cycles and complex production processes. This makes the high-tech electronics value chain a challenging environment for both researchers and practitioners in planning.
With this in mind, EyeOn has initiated the High-Tech & Electronics Industry - Business Planning network for managers working in SCM, Logistics and Sales and Operations in the high-tech electronics industry. Through semi-annual Round Table sessions, members are provided with the opportunity to share learning and best practices regarding forecasting and planning processes, organizational set-up and systems.
The participating companies include: Apple, Arrow, ASM International, ASML, Assembléon, Canon Europe, Dell, Ferro, Flextronics, Freescale, KPN Mobile, LG.Philips Displays, MediaMotion, Navteq, Omron, Philips Consumer Electronics, Philips Semiconductors, Solectron, ST Micro electronics, Thomson and Vodafone.

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