Proyecto de fin de carrera

Garnier Lionel

Design and implementation of a solution for Vendor Managed Inventory

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Summary

Vendor Managed Inventory (VMI) is a tool selected by Schneider Electric to optimize its Supply Chain. The basic principle of VMI it that the manufacturer is responsible for managing the stock of its customers, that are mainly distributors.

VMI is complex since it links two different organizations with two different IT systems. Having the keys of the customers' stock is a great responsibility, particularly today when the pressure on the costs is permanent. As a consequence, the manufacturer needs to reach high levels of performance if he wants to improve its relation with the customer. Any failure can mean a loss of business.

From 2005 to 2007 Schneider Electric did a pilot experience with one of its big Dutch customer. Looking at the logistic KPIs this experience was a real success. Both companies were very happy about the results. But the resources invested by Schneider Electric in this project were quite important. This closed the door to any implementation of VMI on a larger scale.

The target of my project was to improve the efficiency of our internal VMI processes in order to reduce the investment of time needed to implement and maintain new customers.

An analysis of the time spent on various tasks showed that there were a lot of manual steps and operations. Furthermore the solution implemented for the first customer was complex and with limited capacities. By developing a new tool Schneider Electric could industrialize VMI.

Once it has been identified that a new tool was needed, I had to define an architecture that allows:

- To handle a lot of data
- To implement easily new customers
- To reduce significantly the time needed to run up VMI

The solution is based on a set of Access databases communicating with each others. Three main databases are the core of this project. Customer's data is stored in a specific database (one database per customer), another database is used for the interface and a third one is making the calculations and communications between the others.

As a result all the operations are simplified for the user. He can carry out most of his tasks only with one click when it could take him one complete day in the past.

Once this solution was developed, the first VMI customer migrated to it without any issue (Fully transparent for the customer). It has then been implemented successfully with a new customer in a record time!

Unfortunately, due to the global crisis, Schneider Electric temporary decided summer 2008 to slow down the implementation of VMI since even if it is costing less today, it is still representing a cost.

Glossary

Abbreviation	Description
DB	Database
ETSEIB	Escola Tècnica Superior d'Enginyeria Industrial de Barcelona
FTE	Full Time Employee (represents 8 hours of work in the Netherlands)
RDC	Regional Distribution Center
ROI	Return On Investment
SPO	Stock Parameter Optimizer
SE	Schneider Electric
VMI	Vendor Managed Inventory

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1. Introduction

Vendor Managed Inventory (VMI) is a way to optimize the supply chain where the supplier is responsible for managing the stock of his customer. This is for example one of the successful business models used by Wal-Mart, the world's largest public corporation by revenue[1].
Since 2005 Schneider Electric is investigating the possibilities of implementing VMI with some of its big customers. This tool would be a way for Schneider Electric to increase its supply chain performance, but also to strengthen its relations with its customers.

From summer 2005 to summer 2007 Schneider Electric did a successful pilot project with one of their Dutch customer. Various KPIs showed some positive effects on the supply chain performance. Service level to the end customer increased by 6 points while reducing inventory levels at distributor side. The relation with the targeted customer also strongly improved.
But the resources invested by Schneider Electric on this pilot project were high. With this set up Schneider Electric could not imagine implementing VMI on a larger scale, even with the positive results that it showed.

When I was hired summer 2007, my mission was to improve the tools and processes in order to make VMI more efficient. So in a first step I had to analyze the current set up in order to see where the potential points of improvement were. Out of this analysis I saw that indeed a lot of steps in the operating processes were manual and could be partly automated. Furthermore, as my predecessor went into something totally new for the company, the solution that was built was very complex and with limited capacities. With hindsight it was possible to simplify it and make it more powerful.

[1] **Source:** 2008 Fortune Global 500 - http://money.cnn.com/magazines/fortune/global500/2008/index.html

2. Presentation of the project and the company

2.1. Schneider Electric: Make the most of your energy

2.1.1. History of Schneider Electric

From 1836 to today, Schneider Electric has transformed itself into the global specialist in energy management. Starting from its roots in the iron and steel industry, heavy machinery, and ship building, it moved into electricity and automation management.[2]

19th century

- **1836:** The Schneider brothers took over the Creusot foundries. Two years later, they created Schneider & Cie...
- **1891:** Having become an armaments specialist, Schneider innovated by launching itself into the emerging electricity market.

First half of the 20th century

- **1919:** Installation of Schneider in Germany and Eastern Europe via the European Industrial and Financial Union (EIFU).
- In the years that followed, Schneider associated with Westinghouse, a major international electrical group. The Group enlarged its activity to manufacturing electrical motors, electrical equipment for power stations and electric locomotives.
- **Post war:** Schneider gradually abandoned armaments and turned to construction, iron and steel works and electricity. The company was completely reorganized in order to diversify and open up to new markets.

[2] **Source**: "Schneider, l'Histoire en force" (available only in French)
Tristan de la Broise et Félix Torres - De Monza Editions.

Late 20th century

- **1981-1997:** Schneider Group continued to focus on the electrical industry by separating from its non-strategic activities. This policy was given concrete form through strategic acquisitions by Schneider Group: Telemecanique in 1988, Square D in 1991 and Merlin Gerin in 1992.
- **1999:** Development of Installation, Systems and Control with the acquisition of Lexel, Europe's number two in electrical distribution. In May 1999 the Group was renamed Schneider Electric, to more clearly emphasizing its expertise in the electrical field. The Group engaged in a strategy of accelerated growth and competitiveness...
- **2000-2009:** Period of organic growth, positioning itself in new market segments: UPS (uninterruptible power supply), movement control, building automation and security through acquisitions of APC, Clipsal, TAC, Pelco, Xantrex, and more.

2.1.2. Business of Schneider Electric[3]

Schneider Electric is **the global specialist in energy management**. The mission of the company is to "help our customers to **achieve more while using less** of our common planet".

The goal of Schneider Electric is to make the energy:

Safe

- Protecting people and assets...

Reliable

- Ultra secured power for critical applications

Efficient

- Energy efficiency solutions
- Open and integrated systems for optimized Capex and Opex

Productive

- Automation everywhere

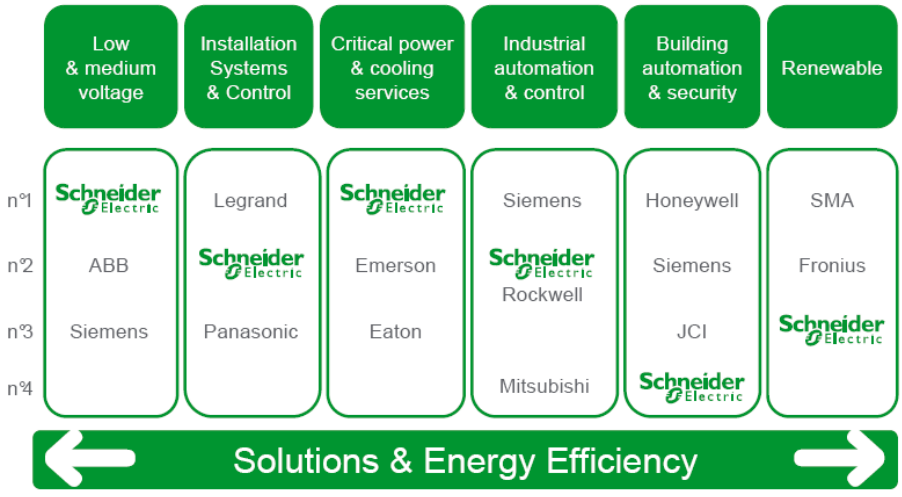
[3] **Source**: http://www.schneider-electric.com

> Connectivity everywhere
> Services at every phase of the lifecycle

Schneider Electric businesses address 72% of the world's energy consumption.

Schneider Electric businesses

Schneider Electric is present in different markets. The core activity of Schneider Electric was initially Power and Control. But thanks to multiple acquisitions over the past years, Schneider Electric increased its portfolio in energy management.



Position of Schneider Electric in the different markets

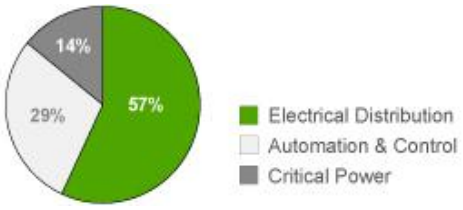
2.1.3. Schneider Electric: A global company

2.1.3.1 Schneider Electric in some key figures

€ 18,3 billion in sales in 2008

114 000 employees in more than 100 countries

32% of revenue in emerging countries



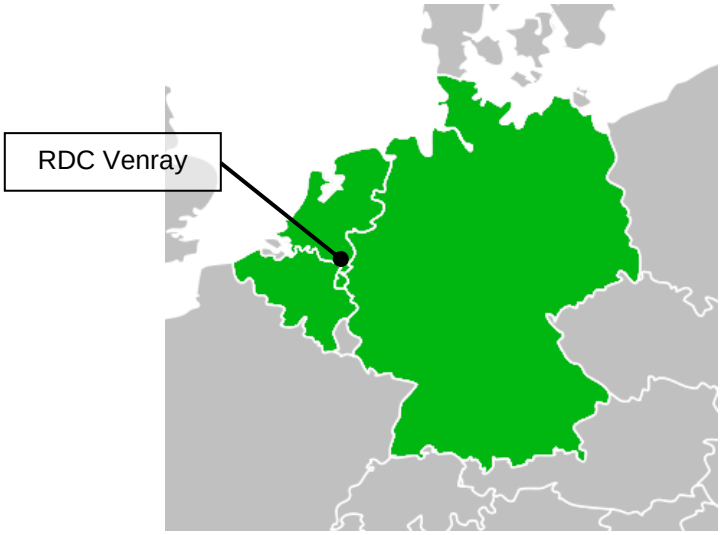
2008 Sales by business

2.1.3.2 Worldwide implementation of Schneider Electric

Schneider Electric footprint is now global and diversified

2.1.4. Regional Distribution Center of Venray

The project took place in the distribution center of Schneider Electric products for Germany, Netherlands and Belgium. This distribution center is located in Venray, a small Dutch city.



Map of the countries delivered from Venray Distribution Center

Schneider Electric chose to implement a distribution center in Venray since it is very close to the three countries it delivers. This facility was built in 2001 as a replacement of three local distribution centers situated in each of the three countries.

> Key figures of the RDC Venray in 2008

15 000 m² including warehouse and offices
30 000 stock locations
13 000 stocked references
115 employees
600 000 parcels shipped every year
8 000 tons shipped every year
200 M€ of yearly turnover

2.2. Vendor Managed Inventory

2.2.1. Definition of Vendor Managed Inventory (VMI)

VMI is a means of optimizing Supply Chain performance in which **the manufacturer is responsible for maintaining the distributor's inventory levels**. The manufacturer has access to the distributor's inventory data and is responsible for generating purchase orders.

First references to VMI appeared at the end of the 90s, even if we "don't actually know how the VMI concept originated"[4].

The manufacturer receives electronic data that tells him the distributor's sales and stock levels. The manufacturer is responsible for creating and maintaining the inventory plan. Finally, Under VMI, the manufacturer generates the order, not the distributor.

VMI does not change the "ownership" of inventory. It remains as it did prior to VMI.

2.2.2. Benefits of VMI

DUAL BENEFITS:

- Both parties are interested in **giving better service to the end customer**. Having the correct item in stock when the end customer needs it, benefits all parties involved.
- **A true partnership is formed** between the Manufacturer and the Distributor. They work closer together and strengthen their ties.

[4] Inventory Classification Innovation: Paving the Way for Electronic Commerce and Vendor Managed Inventory - Russ Broeckelmann (1999)
http://books.google.fr/books?id=kCJylW0ddxAC

DISTRIBUTOR BENEFITS:

- A decrease in stock-outs and a **decrease in inventory levels**.
- **Planning and ordering cost will decrease** due to the responsibility being shifted to the Manufacturer.
- **The overall service level is improved** by having the right product at the right time.
- The distributor gets all the **knowledge of the manufacturer on its products.**
- The manufacturer is more focused than ever on providing great service.

MANUFACTURERS BENEFITS:

- Visibility of the Distributor's Point of Sale data makes **forecasting easier**.
- Promotions can be more easily incorporated into the inventory plan.
- A **reduction in Distributor ordering errors** (which in the past would probably lead to a return)
- Visibility of Stock Levels helps to identify priorities (replenishing for stock or a stock-out?). Before VMI, a manufacturer has no visibility of the quantity and the products that are ordered. With VMI, **the manufacturer can see the potential need for an item before the item is ordered**.

2.2.3. Flows of information in VMI

VMI between two entities implies that the manufacturer and the distributor are exchanging additional data on a regular basis:

Inventory levels – From distributor to manufacturer

This tells the manufacturer the distributor's inventory level. For each reference it contains:

- The current stock quantity
- The quantity in order
- The quantity reserved for some customer orders
- The backorder quantity (stock out)
- The stock status (reference stocked or not)

This information is usually communicated on a daily basis

Sales history – From distributor to manufacturer

This tells the manufacturer the distributor's sales quantities. For each reference it contains:

- The quantity sold over the last period
- The number of sold lines
- Forecasts can also be provided by the distributor

This information is usually communicated on a monthly basis

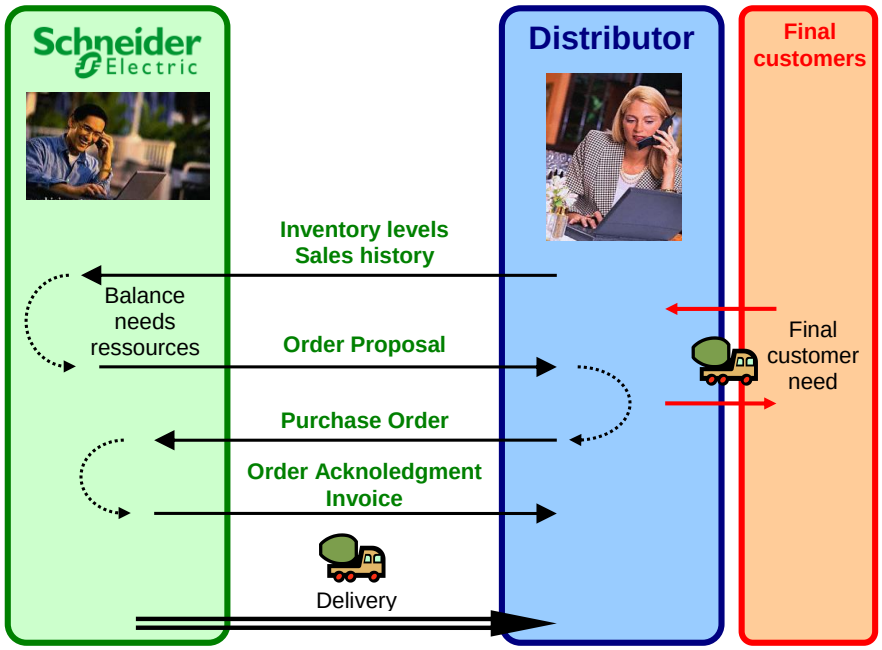
Order proposal – From manufacturer to distributor

This communicates to the distributor the references and the quantities that the manufacturer advices to order. For each reference it contains:

- The ShipTo location (since several warehouses can be handled for the same distributor)
- The order quantity

This information is usually communicated on a daily basis. To increase efficiency agreements can be done between the distributor and the manufacturer to place orders only on certain days of the week.

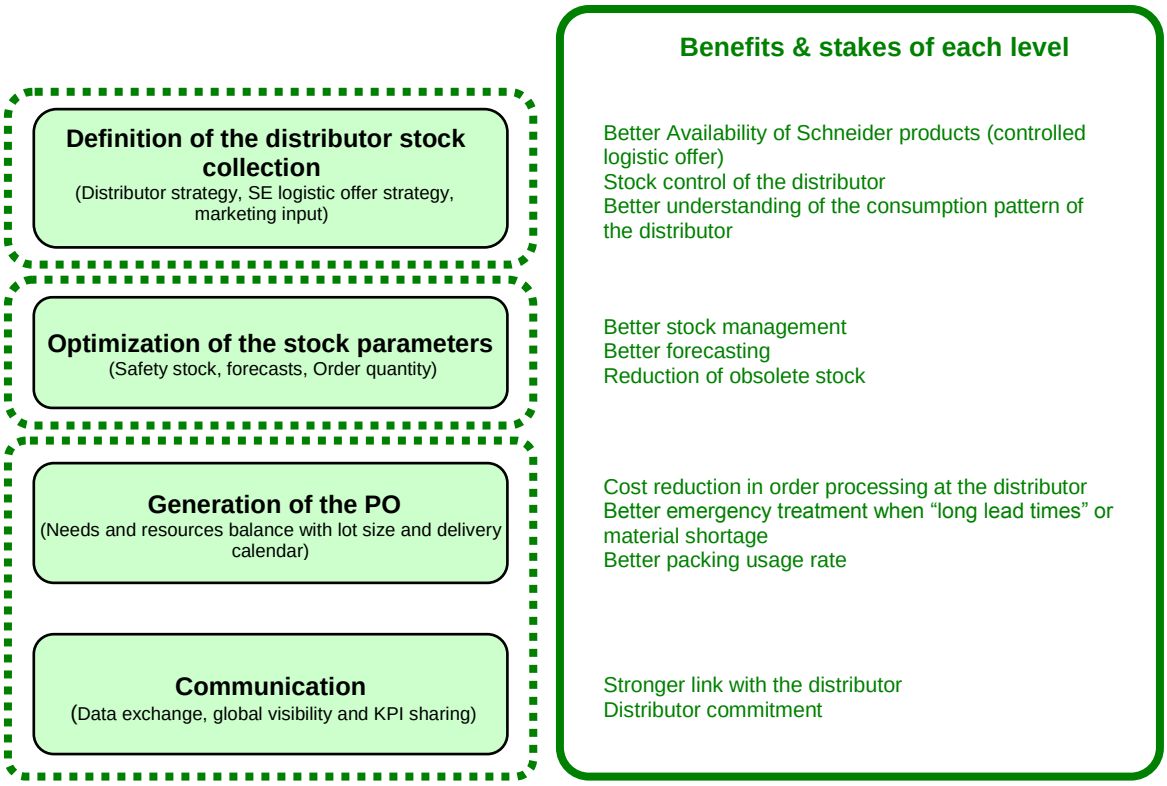
Purchase Order, **Order Acknowledgement** and **Invoice** are sent according to the standard flow



General flows of information in VMI setup

2.2.4. Different levels of implication in VMI

VMI implies an implication at different levels, from the definition of the distributor 'stock collection to the daily ordering activities.



Different levels of implication

2.3. Purpose of the project

Summer 2007 VMI was already implemented as a pilot with one Dutch customer. As this experience was a first try, it was not optimized. At this time the priority was to set up processes to run VMI live with one customer and fully understand the concept of VMI. As it was first designed, the need of resources on Schneider Electric side was high for:

- New project implementation
- Day to day management of customer's inventory levels

Furthermore, the technical solution implemented was based on a simple Excel file which limited strongly the potential of VMI.

One complete resource was affected to VMI only for project management. Another resource was working at 20% as a VMI stock controller on the daily activities (review of the order proposals, adjustment of stock parameters, meetings…)

As Schneider Electric wanted to implement VMI on a larger scale it became obvious that **a more efficient solution needed to be designed**.

I was hired in July 2007 as a project manager to

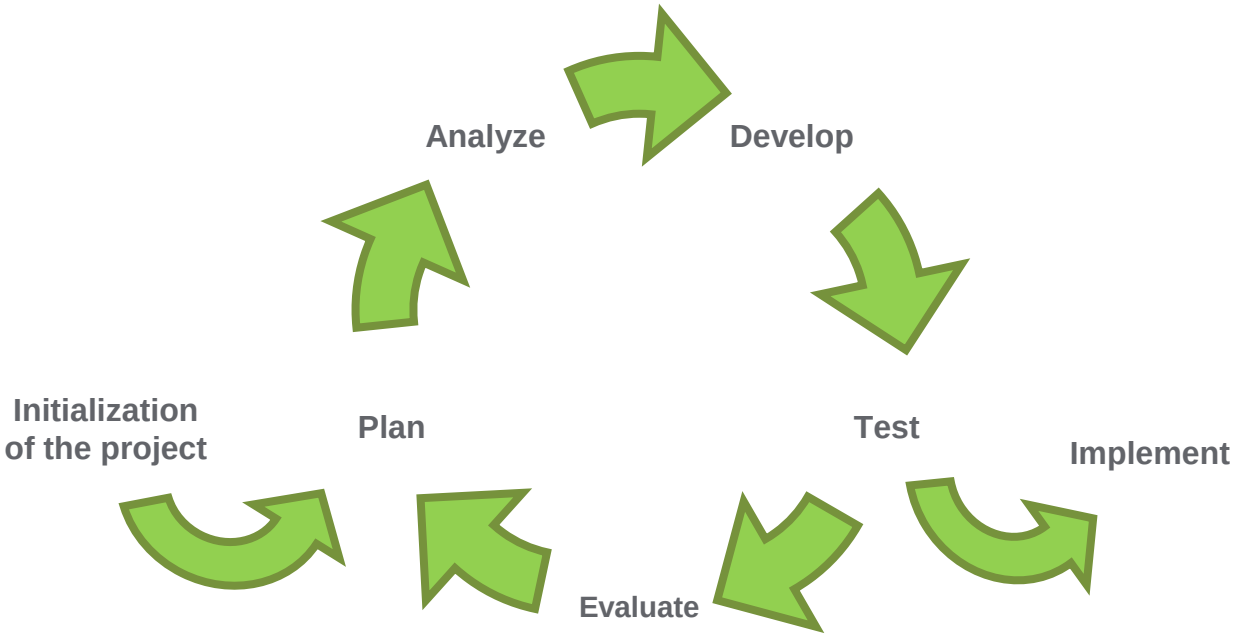
Develop and implement a solution to industrialize VMI

- **Design as solution that can handle several customers**
- **Reduce the time investment per customer**

This specific project took place from July 2007 to June 2008.

3. Development of the project

To drive this project a methodology close to the DMAIC (6 Sigma[5]) has been followed.



Overview of the methodology used

This methodology helps to structure the project and ensure that permanent improvement is going on. The following part of the present PFC will be in line with this structure.

3.1. Plan: Identification of the requirements

The first step of the project consisted in identifying the various requirements in order to have a full picture:

- What needs to be done?
- What is the current situation?
- Which are the points of improvement?

[5] Lean Six Sigma for Supply Chain Management - James William Martin (2006)

3.1.1. Different operations necessary to run with VMI

Here are listed all the actions in the scope of VMI.

3.1.1.1 Daily ordering activities

- Get data from the distributor
- Balance the needs vs. the resources
- Review of the proposal by manufacturer
- Send the order proposal to the customer

3.1.1.2 Append the data sent by the customer

- Management of the file exchanges (sales file)
- Record sales history
- Record stock history
- Record product information

3.1.1.3 Update of forecasts

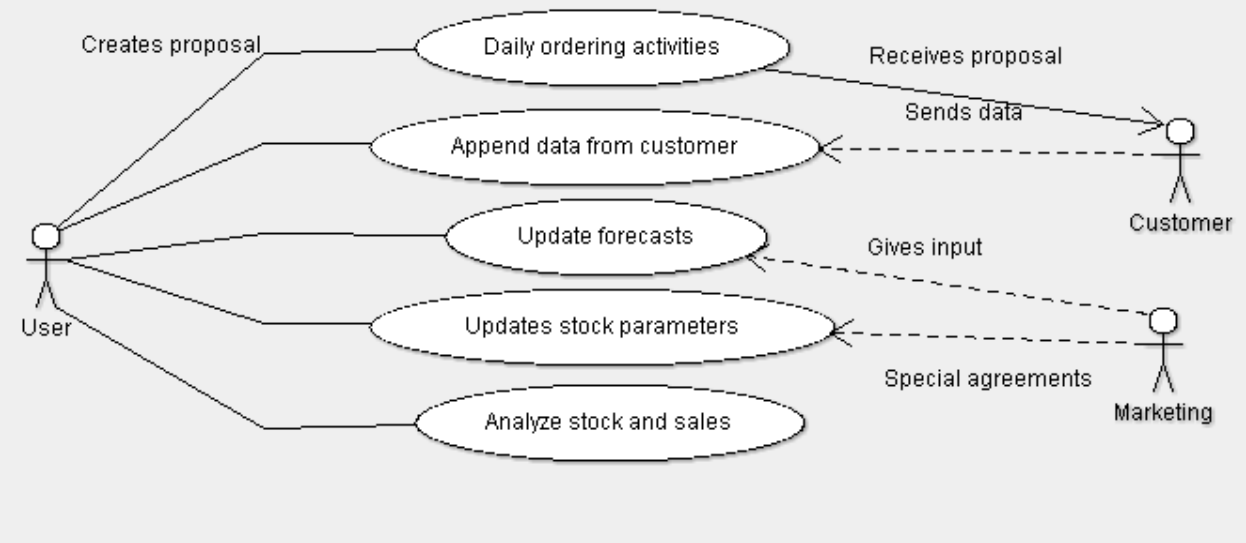
- Get the sales history
- Get the information on trends from Marketing
- Calculation of forecasts
- Update the forecasts in the system

3.1.1.4 Update stock parameters

- Calculation of stock parameters
- Include the special agreements coming from marketing (example: stocking of a new product)
- Update the stock parameters in the system

3.1.1.5 Analyze the data (stock and sales)

- Follow up of stock value
- Input for stock collection definition (based on sales frequency)
- Identification of products to be returned
- Analysis of backorders (products not delivered on time)



Actions and responsibilities in the VMI set up

3.1.2. Situation at project launch

1.1.1 Interface between Schneider Electric and the distributor

As VMI was already live with one customer at project launch, a part of the solution was already in place. In order to manage the **daily flow of information** and make the **balance of needs**, a web based solution from the market was selected.

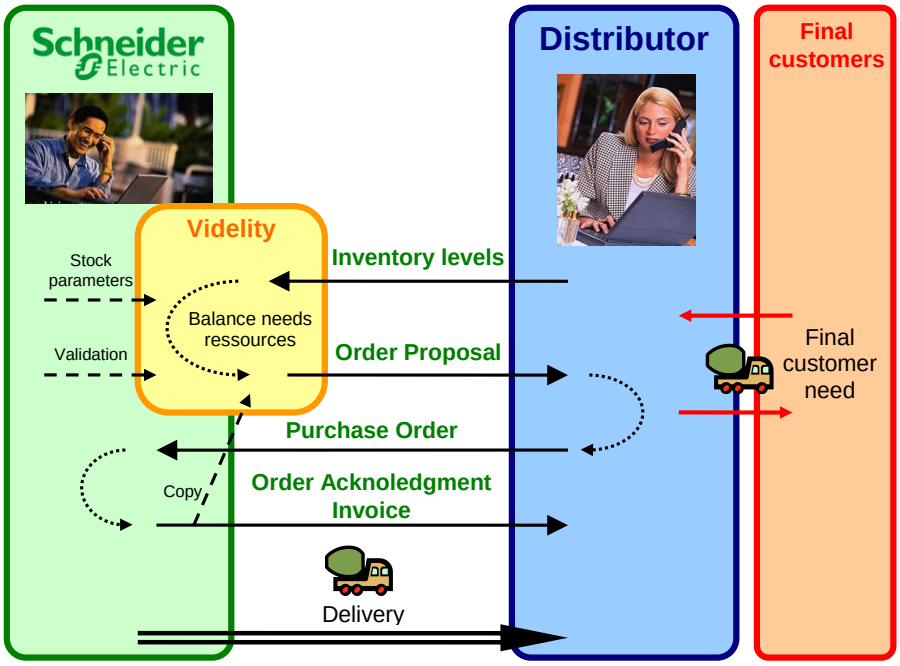
This solution is proposed by the Danish company **Videlity**[6].

Videlity:

- Collects the daily inventory file from the distributor
- Translates the file if necessary (= more flexibility for the distributor)
- Makes the balance needs-resources based on the stock parameters uploaded by the manufacturer
- Creates the order proposal
- Sends the order proposal to the distributor after the validation by the manufacturer

This tool is hosted on a Schneider Electric server.

[6] http://www.videlity.com/



General flows of information in VMI setup including Videlity

3.1.2.1 Available Schneider Electric tools

With its long past, Schneider Electric became expert in Supply Chain and Logistics. Year after year some powerful tools were developed to support these activities.

In 2006 was developed SPO (Stock Parameters Optimizer). This tool is an Access based program specifically developed by Schneider Electric to calculate the stock parameters used in its warehouses.

It appeared clearly that SPO should be used for VMI since

- It is a very **powerful** tool that already showed excellent results
- It is **customizable**; multiple parameters can be modified to fit to the warehouse specifications
- Schneider Electric stock controllers already know perfectly this application: **no need to train** them on a new application
- **SPO is the program that will be used for the calculation of stock parameters**

3.2. Analyze: Measure and find the points of improvements

The main targets of the project were to:

- Design as solution that can handle several customers
- Reduce the time investment per customer

3.2.1. Design as solution that can handle several customers

The existing solution was based on Excel files and macros. The capacity of Excel being limited to 65536 lines, this restricted strongly the potential of the solution. Usually a distributor is usually handling around 4000 Schneider Electric references per warehouse. If this customer has 2 warehouses this means that one file would not be enough to store one year of monthly consumption (96000 records).

- **The capacity of the solution needs to be increased by selecting the right platform**

3.2.1.1 Evaluation of the amount of data

- 4000 references per warehouse in average
- 2 warehouses per customer
- 10 customers
- Data to be recorded for at least 3 years
- 1 update of the parameters per month
- **Around 3 million records only for recording of sales history**

As a consequence it is necessary to use a database.

3.2.1.2 Connectivity

The program developed has to communicate with other modules:

- SPO which is an Access database

- Videlity via an FTP server
- Schneider Electric ERP (SAP)
- Compatible with Excel since most of the distributors are sending their data in Excel format

3.2.1.3 General requirements

The platform used needs to be:

- Understandable for non expert people for future modifications
- Flexible and portable
- Safe
- At a reasonable price

3.2.1.4 Final choice of the platform

The platform finally selected is **Microsoft Access** since it is fulfilling all these requirements.

A 2003 version of Access is already installed on the computer that will be used. The limitations of that version should not be reached (2 Go per database). So there is no need to buy licenses for a newer version.

3.2.2. Reduce the time investment per customer

In order to identify the potential points of improvement, I have used a methodology comparable to the Lean Manufacturing[7] which is one of the basics for Schneider Electric.
I first decomposed all the steps done in the VMI process. By going to a very detailed view I could identify which tasks are bringing added value and which steps are not bringing added value. The target is then to remove or automate all the steps that are not bringing added value.

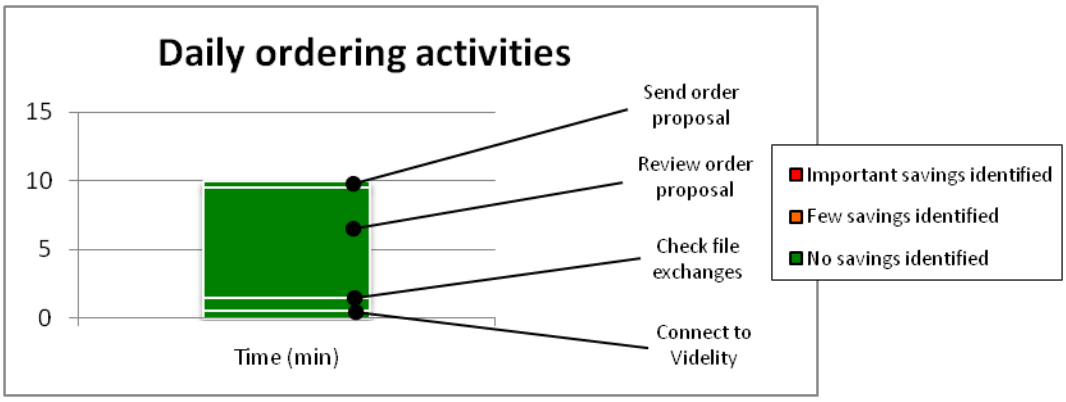
[7] Lean Thinking – James P. Womack and Daniel T. Jones (2006)

3.2.2.1 Daily ordering activities

- Connect to Videlity : 0,5 min
- Review file exchanges : 1 min
- Review order proposal : 8 min
- Send order proposal : 0,5 min
- Total workload : 10 minutes per day per customer

Daily activities were already optimized thanks to Videlity.

No potential savings identified.

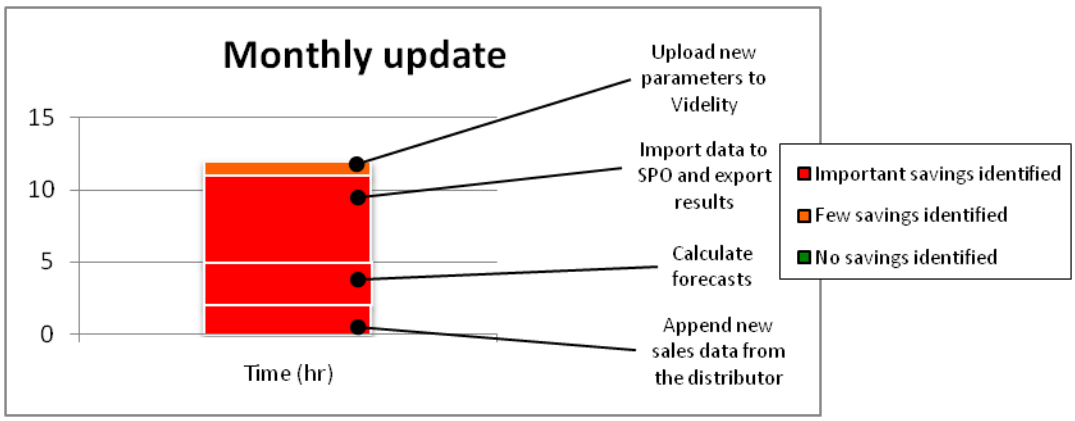


Time decomposition for daily ordering activities

3.2.2.2 Monthly update of forecasts and stock parameters

- Append new sales data from the distributor : 2 hours
- Calculate forecasts : 3 hours
- Import data to SPO and export results : 6 hours
- Upload new parameters to Videlity : 1 hour
- Total workload : 1,5 day per month per customer

Most of these operations are done manually in the current setup. Several time savings have been identified if proper automation is put in place.



Time decomposition for monthly update

> Append new sales data from the distributor : 20 min

Standardization of the files exchanges to have one common format for all the customers.

Upload of new data done via an interface; the operator should u=import new data only with one click.

> Calculate forecasts : 20 min

Automate collection of data and calculation of forecast.

The target is to have no involvement of the operator (calculation done in background).

> Import data to SPO and export results : 3 hrs

Automate collection of data and import/export to SPO

> Upload new parameters to Videlity : 20 min

Automate the upload using an FTP connection

> Targeted workload : 0,5 day per month per customer

3.2.2.3 Extraction of data for analysis and reporting

> Create queries/filters to select the right data : 1 hour

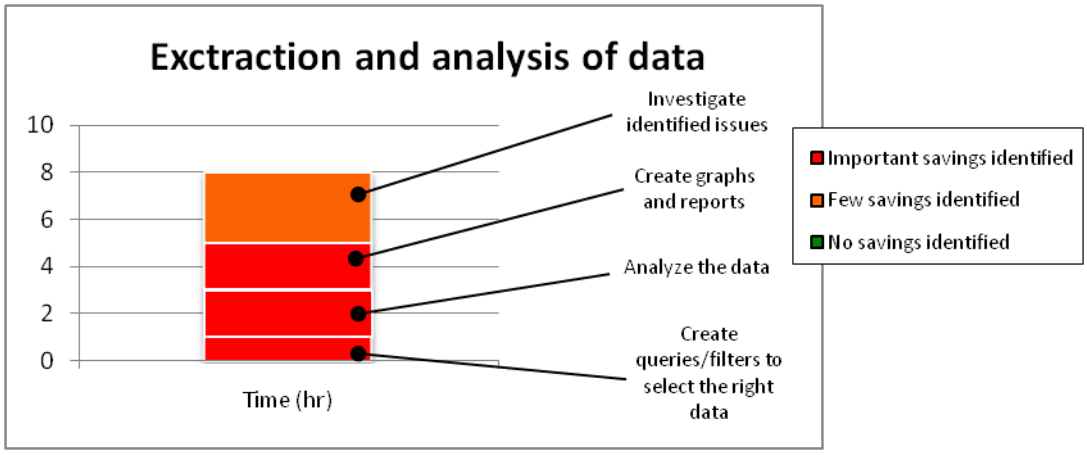
> Analyze the data : 2 hours

> Create graphs and reports : 2 hours

> Investigate identified issues : 3 hours

> Total workload : 1 day per month per customer

All the extractions are done manually, by manipulating data directly in Excel. No standardized way of reporting.



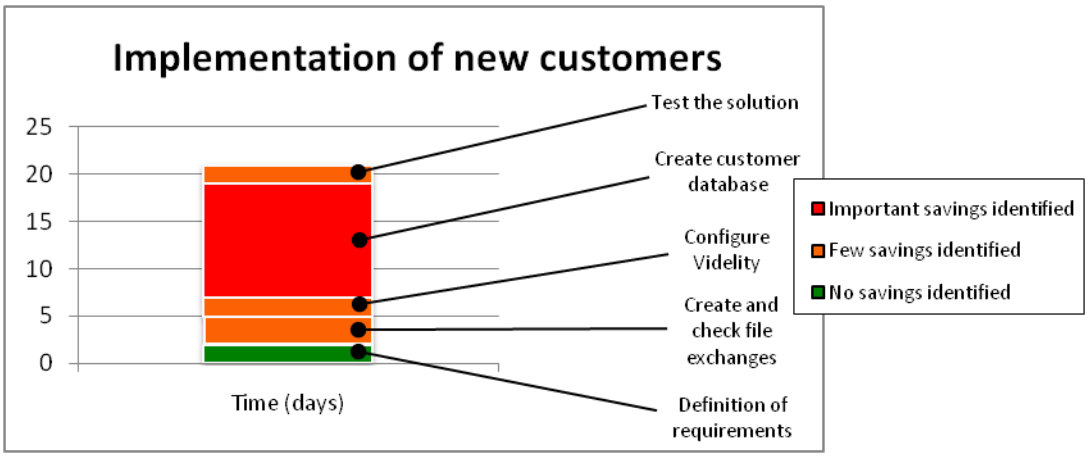
Time decomposition for extraction and analysis of the data

No targeted time saving. The time saved will be used to improve the analysis and as a consequence, improve the performance.

3.2.2.4 Implementation of new customers

- Definition of requirements : 2 days
- Create and check file exchanges : 3 days
- Configure Videlity : 2 days
- Create customer database : 12 days
- Test the solution : 2 days
- Total workload : 21 days per new customer

Implementation of new customers is not standardized. Everything needed to be built manually, starting from the beginning.



Time decomposition for implementation of a new customer

> Definition of requirements : 2 days

Standardize requirements.

> Create and check file exchanges : 1,5 days

Standard files so easier to check.

> Configure Videlity : 0,5 days

Standard configuration so easier and faster to configure.

> Create customer database : 1 day

Standard database, only some parameters to set up.

> Test the solution : 1 days

Standard solution so less “surprises”.

> Targeted workload : 6 days per new customer

3.2.2.5 Training of stock controllers

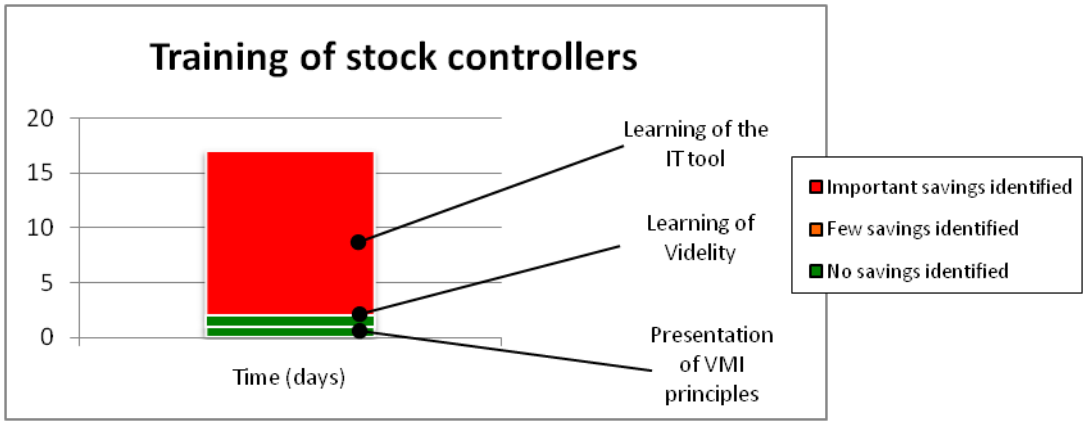
> Presentation of VMI principles : 1 day

> Learning of Videlity : 1 day

> Learning of the IT tool : 15 days

> Total workload : 17 day per new stock controller trained

Due to all the manual steps previously mentioned a lot of knowledge was needed for the stock controllers. Furthermore, as each tool is different there is no standard approach.



Time decomposition for training of stock controllers

- Presentation of VMI principles : 1 day
- Learning of Videlity : 1 day
- Learning of the IT tool : 5 days

  User friendly interface. No need have specific Excel or Access knowledge
- Targeted workload : 7 day per new stock controller trained

3.2.2.6 Conclusions of the analysis

Three points have been identified to reduce the time investment on VMI:

- **Standardize the solution for implementation of new customers**
- **Make it user friendly to reduce the training time**
- **Focus on the calculation of forecasts, update of stock parameters and extraction of the data since they are the most time consuming operations**

Based on these points the potential time saving before the project development was evaluated to:

- 15 days for each implementation of a new customer
- 1 day in the monthly stock parameters update
- 10 days for the training of new stock controllers

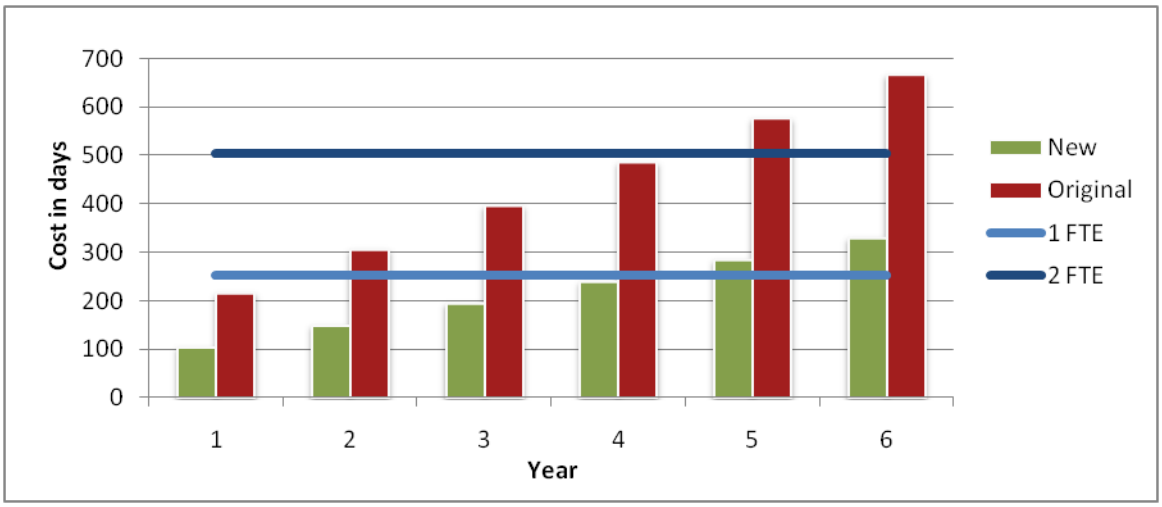


Fig 3.2.2. Estimation of the new costs vs. original costs (detailed calculation in Appendix)

Based on this time measurement, with the original setup, the equivalent of one additional resource (FTE) is needed on year 2 and an additional one on year 5 (cf Fig Fig 3.2.2.).
With the new setup the first extra FTE is only necessary on year 5.

> The cost of the resources needed to run VMI would be divided by two

3.2.3. Evaluation of the project costs

With the actual strong pressure on costs this project had to use as less resources as possible. As a solution was already in place the goal was to reuse as much existing things as possible.

So in order to have a clear view on the benefits of this project, a clear distinction needs to be made between what is needed but already in place and what is needed but new.

Over the 12 months period, the time should be split between:

- Project management (preliminary analysis, project follow up, meetings) 50 days
- Development and testing of the Access tool 70 days
- Experience sharing with other SE organizations 15 days

- Customer implementations and follow up (not directly linked to the project itself) 50 days
- Other task not linked to VMI 30 days

135 working days can be directly invoiced to the project.
With a daily cost of 200 Euros, this makes a total of **27 000 Euros**.

Additional 30 days of meeting with different parties involved for the different phases of the project (stock controllers, managers and other colleagues)
With an average cost of 200 Euros, this makes a total of **6 000 Euros**

Regarding the IT tools, Access 2003 is already available on the computers that will be used for VMI and for the development. Looking at the requirements there is no need to go for a newer version of Access.
No change needed in Videlity.
SPO is a standard Schneider tool so no specific cost. As this tool is an Access based tool, small adaptation can be done locally.
ERP configuration already done, no new developments needed

The total cost for the design and the implementation of this project is 33 000 Euros

3.2.4. Calculation of the Return On Investment

Based on the previous calculation, the ROI is reached when the sum of the savings is equal to the total project cost:

$$Savings = Project\ cost$$

$$n \times (24 \times n + 88) \times 200 = 33\,000$$

$$24\,n^2 + 88\,n - 165 = 0$$

$$delta = 88^{\,2} - 4 \times 24 \times (-165) = 23\,584$$

$$n = -88 - \sqrt{\frac{23584}{2 \times 24}}$$

$$n = 1{,}37\ years$$

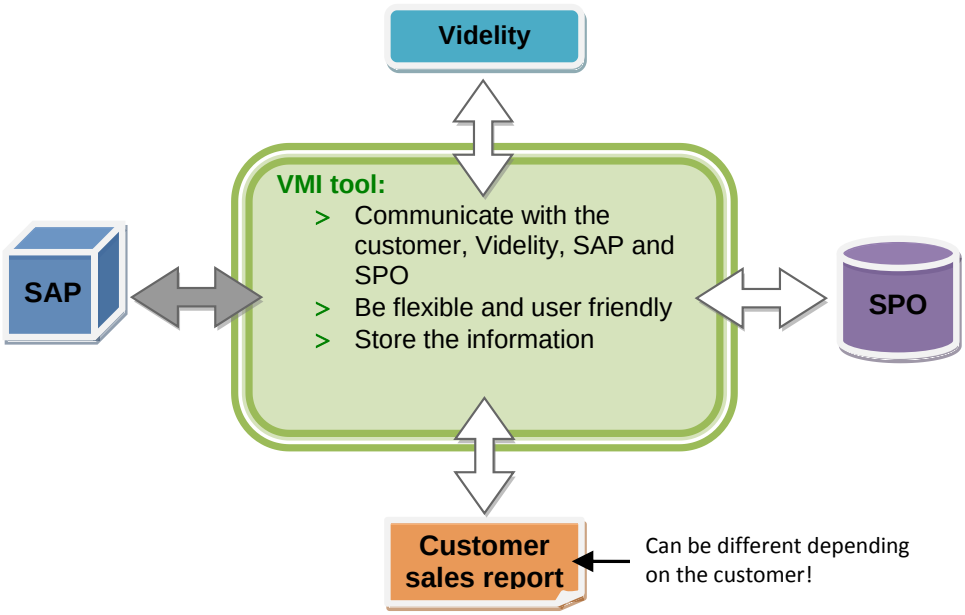
$$\boldsymbol{ROI = 16{,}4\ months}$$

The Return On Investment for this project is equal to 16,4 months.

This means that within the expected conditions and hypothesis for the future the savings generated by this project will be higher than the costs involved after a period of 16,4 months

3.3. Develop: Create the solution complying with the requirements

3.3.1. Design of the architecture



Requirements for the tool to be developed

In order to increase flexibility a **modular approach** is taken. For each of the following activities one module has been created:

> **Importation of data (Import DB)**

This module needs to be customer specific in order to give more flexibility to the customer. It transforms the information coming from the customer into the format used by the program. It is important to have this flexibility since all the customers are not able to provide the information exactly as we would like (blocs set by their ERP).

> **Calculation of forecasts (Forecast DB)**

As there was no forecasting tool that could be adapted to VMI a specific forecasting tool needed to be developed. Calculation of stock parameters with SPO is mainly using the historical data. In the VMI process forecasts are mainly used to estimate how long in advance an order needs to be placed (in order to stay above the safety stock). So a ruff estimation done with simple formulas is enough.

> **Storing of customer sales, inventory and product data (Masterdata DB)**

In order to limit the resources needed as solution is to create one masterdata database per customer. The main advantage is that after a couple of years there is not a file of several Giga Octets. Even if Microsoft Access could handle it, it would run too slow. Having one database per customer also limits the risk of losing all the information.

> **Storing of common product information coming from Schneider Electric (Common DB)**

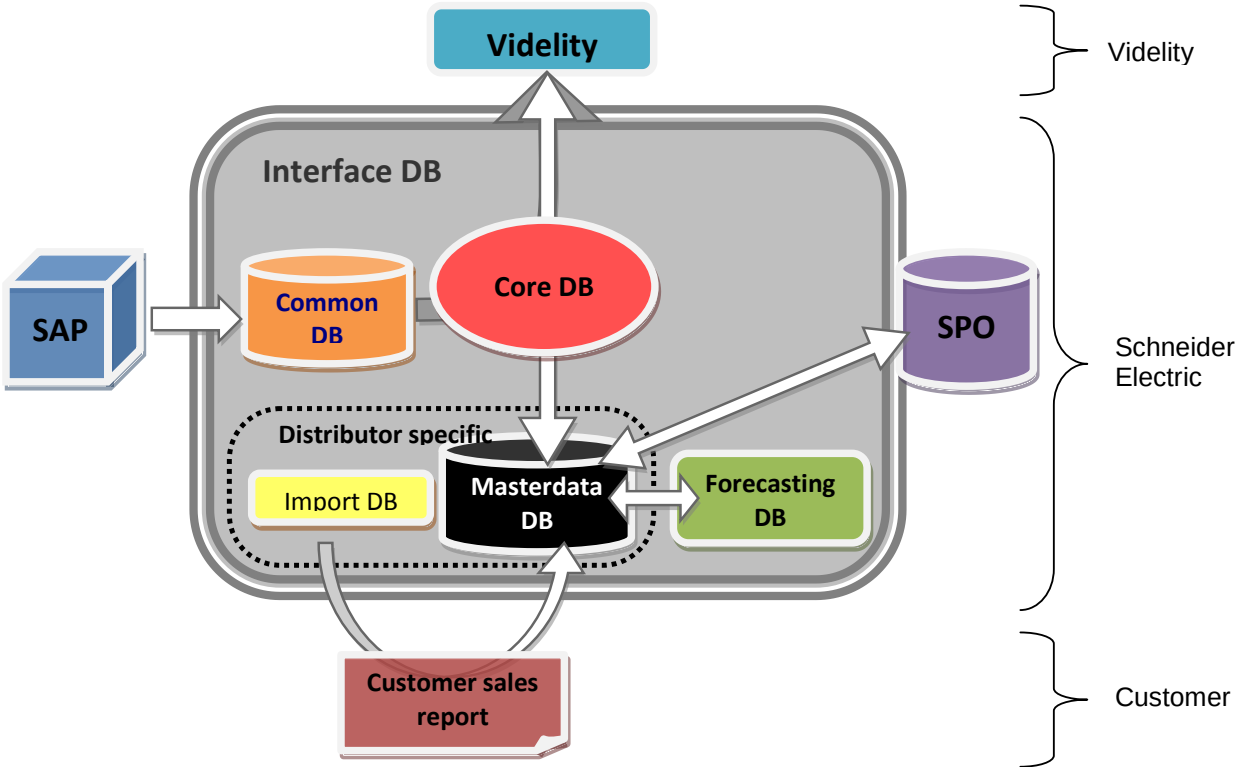
Some of the product information is the same for different customers. It includes the current stock status, the life cycle status of the product, the lot sizes… Some high level customer information and the database users' information also needed to be recorded in a common place. All this information is grouped in one database that is used for all the customers.

> **User interface including reporting (Interface DB)**

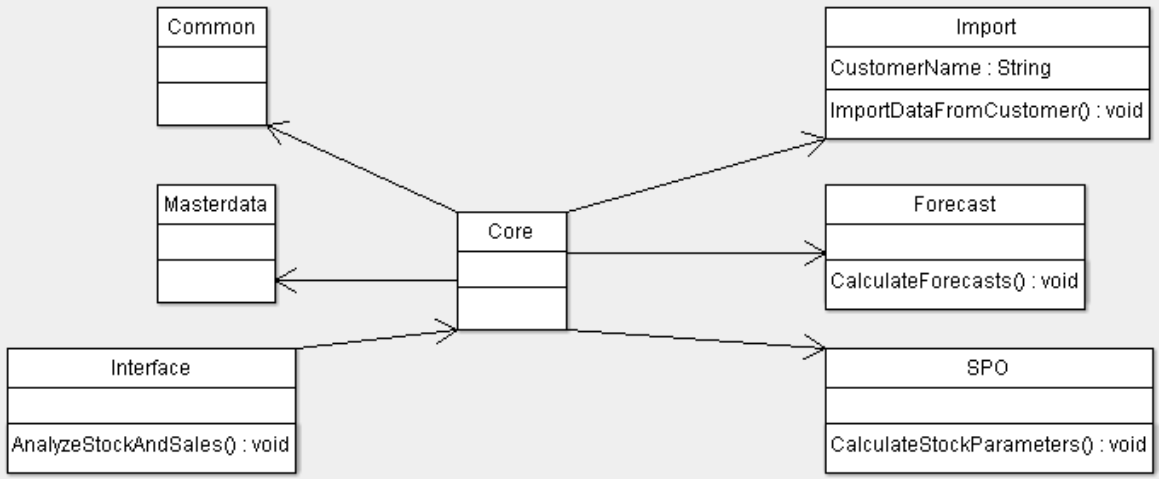
The tool needed to be user friendly in order to reduce the costs of training and reduce the time needed to make the operations. In order to segregate stored data, queries and user interface, a specific module has been done. It is a way to prevent users from modifying the tables or the queries. It also prevents the user from accessing directly the customer data that is confidential.

> **Core of the application to manage and link all the other modules (Core DB)**

All these different modules needed to be linked. In order to make future maintenance easier all the processing of the information and control of the module is done via one database. This database only contains queries and VBA modules.



Organization and interactions between the various modules



Organization of the various modules

The development of the project has been split into 4 different phases.

3.3.1.1 Phase 1: Standardize the requirements

- List all the data that is necessary and the frequency of exchange
- Define standards[8] for the file exchanges

3.3.1.2 Phase 2: Build the data tables and transfer existing data to the new tables

- Build common databases and tables
- Define the model for all customer specific tables

3.3.1.3 Phase 3: Create/Modify calculation modules

- Creation of the forecasting database
- Modification of SPO in order to be able to link it to the VMI tool

3.3.1.4 Phase 4: Build the exchanges

- Create the program (Core) that will supervise all the operations step by step and link the data with the calculation modules

3.3.2. The result

All the process steps are accessible via one interface. A lot of steps are automated > Monthly update is done much faster

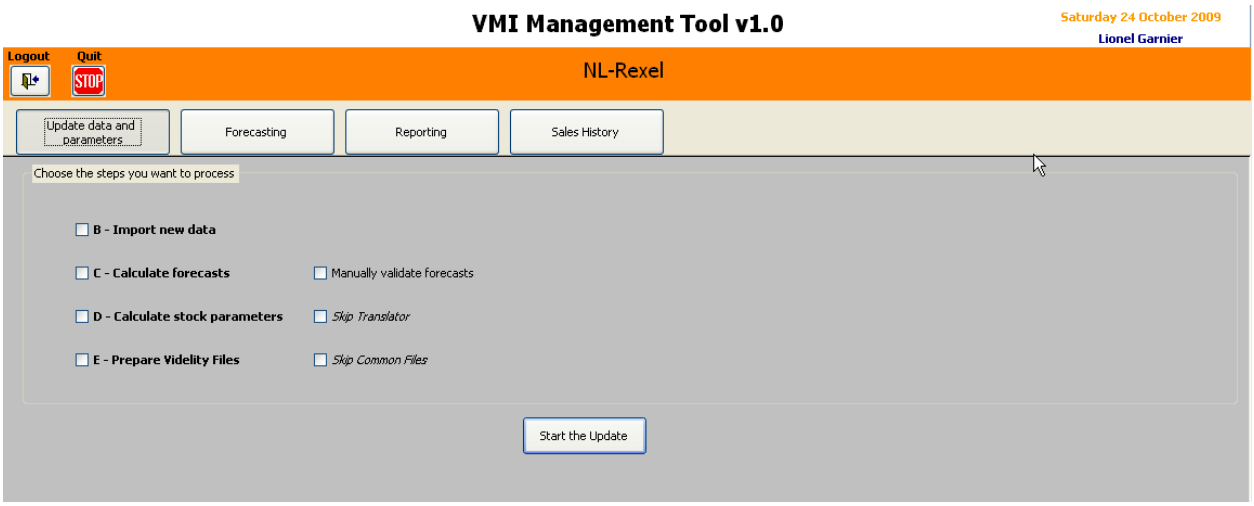
The solution is easy to use > The need of training strongly reduced

Some tools are available for analysis > A lot of time is saved for the analysis of the data

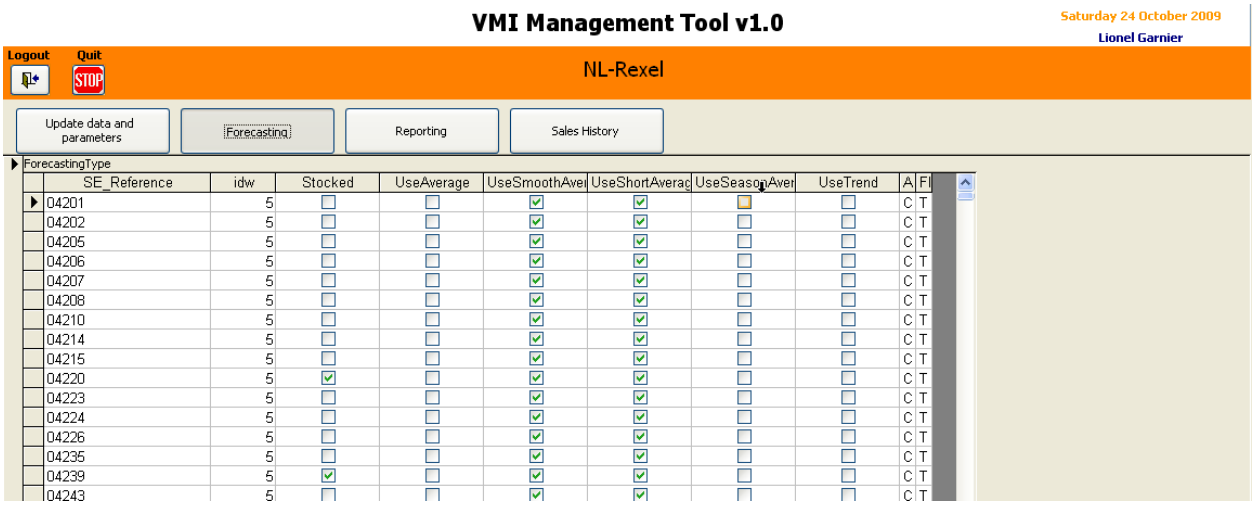
[8] See appendix 5.2.1

3.3.2.1 Connection to the interface

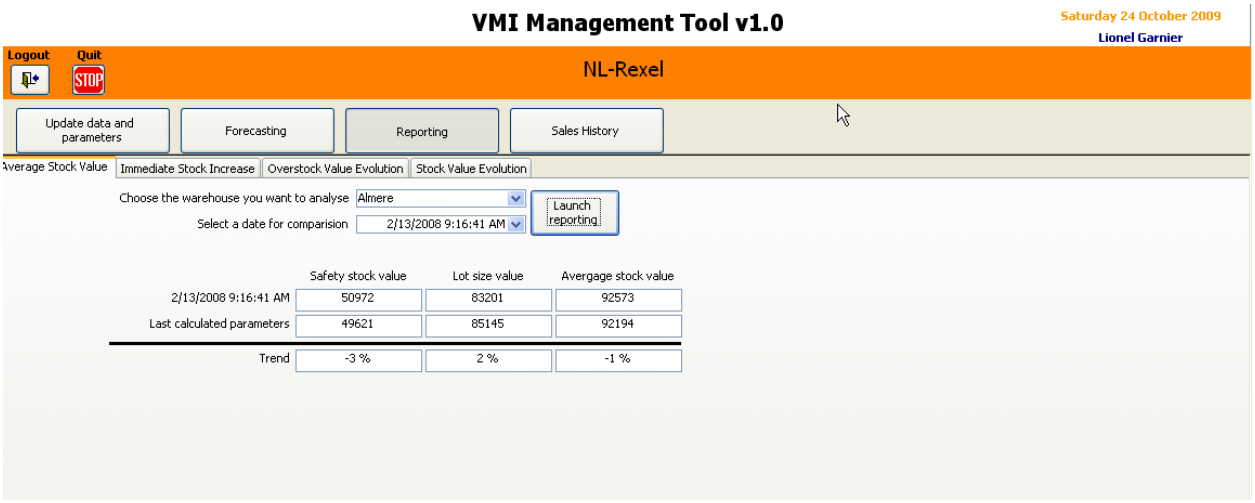
3.3.2.2 Menu update of stock parameters



3.3.2.3 Selection of the forecasting model



3.3.2.4 Example of reporting tool



3.4. Test: Make sure the solution is working properly

The testing of the different modules was done during the development. Once everything was build the complete solution has been tested. No major bugs have been found.

The tool was then tested live with the implementation of new distributor in November 2007.
From this point on an order proposal was sent on a daily basis to the distributor. The distributor was then comparing this proposal with what he was actually ordering out of the VMI process. After one month the distributor trusted our proposals and gave validation to Go Live from the first of December 2007.

Once we were fully satisfied and confident with the solution implemented it has been extended to the previously existing VMI customer.

3.5. Evaluate: Evaluate that the solution designed meets the requirements

The result is satisfactory. Both Schneider Electric and distributors are very happy of the service provided.

Financial impact

The savings identified at the beginning of the project are met on Schneider Electric side.
On distributor' side, with a comparable level of product availability (cf Fig Fig 3.5.1.) the stock coverage strongly reduced (cf Fig Fig 3.5.2.) That means that the distributor has lower value in his stock so more cash in his hands. This is due to the fact that the right products are put on the shelves of the distributor.

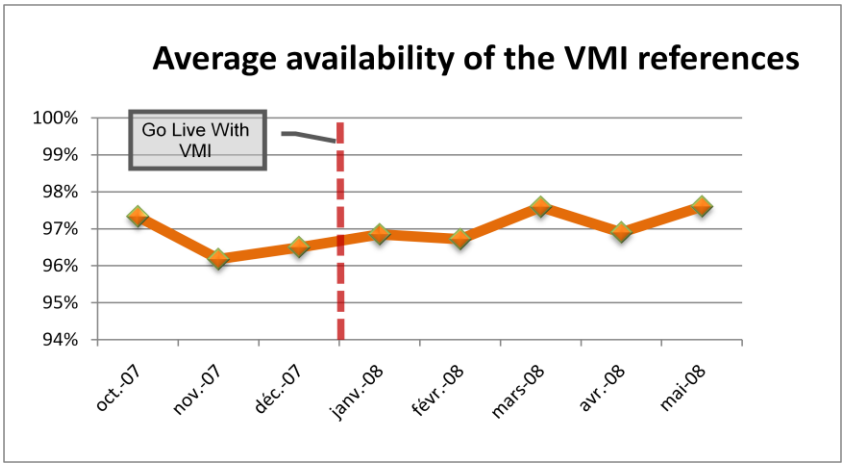


Fig 3.5.1. Evolution of the product availability[9] with a customer implemented with the new designed solution

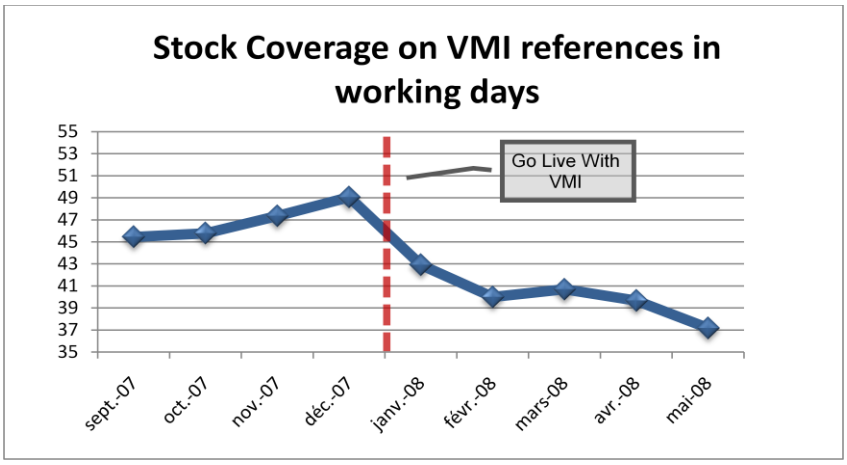


Fig 3.5.2. Evolution of the stock coverage[10] with a customer implemented with the new designed solution

Social impact

Tasks that were not bringing added value are now automated.

> The Schneider Electric worker's job is more interesting.

[9] The product availability is the percentage of sales order lines to the final customer that are really delivered from the stock for products that are supposed to be stocked (no stock out).
[10] The stock coverage represents the average number of days of inventory that the distributor has on its shelves. Stock coverage = Value of the stock / Average daily sales value on stocked products.

> Unfortunately the project implies that fewer jobs are created. But no position has been cancelled.

The project also supposes a very collaboration between Schneider Electric and its distributors. So this is promoting a business model there the various companies involved are working together.

Environmental impact

The efficiency of ordering between the distributor and Schneider Electric is increased. As a direct result:

> Reduction of the ordering and delivery frequency since delivery calendars are implemented. Instead of being delivered 5 days a week the distributor is now delivered 2 or 3 times a week. So a clear environmental impact is the reduction of the number of trucks going to the customer.

> Increase of the usage of complete boxes (cf Fig Fig 3.5.3.): This reduces the volume of goods to transport. So here as well this leads to a reduction of the trucks on the roads. This is also reducing the number of carton boxes used

> A direct consequence of VMI is a reduction of CO2 emission during transport

> Another consequence is a reduction of carton used

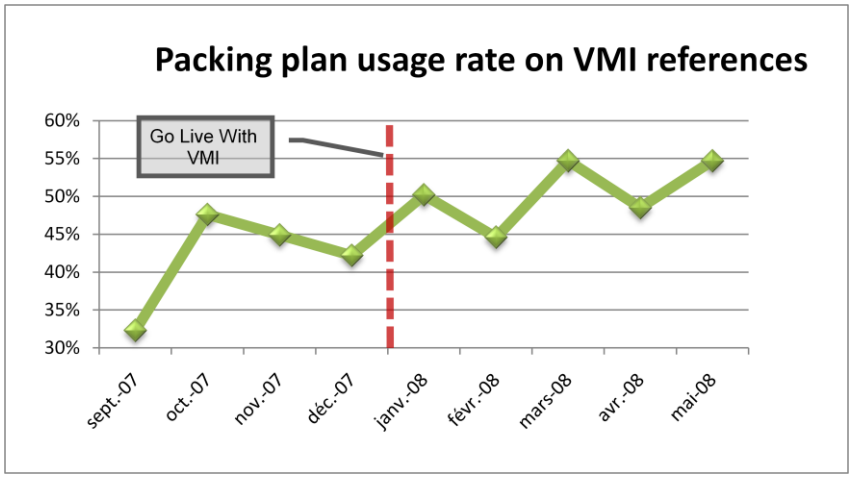


Fig 3.5.3. Evolution of the packing plan usage[11] with a customer implemented with the new designed solution

[11] The packing plan usage is the percentage of lines that are ordered by the distributor toward Schneider Electric according to a full box quantity. This is a mean to increase operations' efficiency on both sides.

Conclusions

1. Conclusions of the project

The solution was implemented live on time and without any issue. During the months after this implementation a clear workload reduction was visible. The time invested for each customer was even lower than forecasted. Thanks to the improvement of forecasting it was then acceptable to update the stock parameters every two months instead of every month.

The reduction of training needs was also very clear. The stock controller that was initially in charge of VMI and that strongly involved in that project dismissed a few months after the implementation. The training of a new stock controller took only a week plus a few hours of support during the first runs.

This tool has been identified as a best practice in Europe. It has been for example copied in Italy for their VMI implementation. I have been part of the team responsible for implementing VMI in the future worldwide ERP of Schneider Electric.

Unfortunately, due to the economical crisis, the group decided to stop the implementation of VMI at a worldwide level. VMI is indeed very costly for the company, even with the improvements achieved. The advantages of VMI are existing for sure but it is difficult to put a saving or an increase of business in front of it.

2. Recommendations

More than a year after I have now more insight to be able to give some recommendations for the one that would like to run such a project.

The elimination and automation of non added value task is a real key factor of success. By using this lean methodology you can easily identify and evaluate the savings that you can expect. Nowadays this principle is mainly used for manufacturing, logistic is starting with it. But its potential is also huge when we apply it to other domains.

On the VMI part, my experience tells that this kind of organization is more adapted to a company that has only a limited number of references. Schneider Electric is selling more than 60 000 different references with a lot of different configurations which make the stock management quite complex. By experience I have seen that he customer is giving us the keys of its warehouses locations but he keeps a double! This can potentially be the cause of disputes since the responsibilities are shared; everyone will kick the ball back in case of overstocks. The high number of references makes the investigations more difficult.

VMI is also complex for the customer since today there is no existing standard defined for VMI. Each manufacturing company can come with its vision and specifications. This makes the life of the customer very hard if he has a lot of supplier.

As the VMI had to stop within Schneider we then tried other methods. We have seen that the most beneficial thing is in fact the close collaboration at the different levels of the manufacturer's and the customer's organizations. So today regular logistic performance meetings are done with different customers and this is also bringing added value but with a lower cost than VMI.

VMI would be more adapted I think to businesses involving fewer references on manufacturer and distributor's sides.

3. Acknowledgements

First of all I would to give thanks to Saïd Charah, General Manager of the Schneider Electric distribution center in the Netherland, who gave me the chance to work on that project and who gave me his full support during the project.

I also want to thank Nancy Langeslag who was my direct manager. She helped me to reach the level required for that position.

Then I want to thank Ramón Salvador for accepting being the tutor of my project and who gave me good advices to create the present document.

4. Personal impressions

This project was very interesting. It gave me a very good view of the supply chain, from procurement to the availability to the final customer. The problems linked to supply chain are often underestimated. A supply chain that is not properly though can have a terrible impact on the manufacturer, due to high costs, but also on the customer.

Additionally to this I had the chance to be directly in contact with the customer via regular meetings. I have learned a lot on commercial side. These skills were not innate to me and were not deeply developed during my studies. It has been a great opportunity for me.
Finally, this project helped me to develop and improve my IT related skills.

Appendix

A. Calculations

A.1. Estimation of the savings

Hypothesis: 1 new customer implemented every quarter and one controller being able to manage 4 customers:

First year:

January : One customer already in place + Implementation of a new customer
April : Implementation of a new customer
July : Implementation of a new customer
October : Implementation of a new customer + Training of a new controller

> Savings linked to implementation of a new customer

4 new customers the first year

$$Saving\ new\ customer\ =\ 15\ \times\ 4\ =\ 60\ days$$

> Savings linked to implementation of the faster calculation of stock parameters

1 day is saved for each calculation of stock parameters

The calculation is done once a month per customer

For the first two customers, the saving will be made over the 12 months

For the customer implemented in April the saving will be made over 9 months

For the customer implemented in July the saving will be made over 6 months

For the customer implemented in October the saving will be made over 3 months

$$Saving\ calculation\ of\ parameters\ =\ 1\ day\ \times (2\ \times\ 12\ +\ 9\ +\ 6\ +\ 3)\ =\ 42\ days$$

> Savings linked to the training of stock controllers

One stock controller needs to be trained during the first year

$$Saving\ training\ =\ 10\ days$$

The total expected saving for the first year should be around 112 days. This represents almost half of an employee!

Generalization:

With this model of implementation (4 new customers per year) the general formula of the savings generated during the year n is:

> Number of customer already implemented at the beginning of the year n:

1 already implemented at the project startup

4 implemented every year

$$Number\ of\ customers\ at\ the\ end\ of\ year\ n\ =\ 4\ x\ (n\ -\ 1)\ +\ 1$$

$$Savings\ linked\ to\ implementation\ new\ customers\ year\ n\ =\ 15\ days\ \times\ 4\ customers\ =\ 60\ days$$

$$\begin{aligned} Savings\ linked\ to\ calculation\ of\ parameters\ on\ year\ n\ = \\ 1\ day\ saved\ per\ month\ and\ per\ customer\ \times \\ (Total\ number\ of\ customers\ at\ year\ n\ start\ \times\ 12\ months\ + \\ First\ customer\ of\ the\ year\ \times\ 12\ months\ + \\ Second\ customer\ \times\ \ 9\ months\ + \\ Third\ customer\ \times\ \ 6\ months\ + \\ Fourth\ customer\ \times\ \ 3\ months\ ) \end{aligned}$$

$$Savings\ linked\ to\ calculation\ of\ parameters\ on\ year\ n\ =$$
$$1 \times ((4 \times (n - 1) + 1) \times 12 + 12 + 9 + 6 + 3)$$

$$Savings\ linked\ to\ calculation\ of\ parameters\ on\ year\ n\ = (48n - 6)\ days$$

$$Savings\ linked\ to\ training\ on\ year\ n\ = 10\ days$$

$$Total\ savings\ on\ year\ n\ = 60 + (48n - 6) + 10$$

$$Total\ savings\ on\ year\ n\ = 48n + 64$$

With this formula it is then possible to calculate the cumulated savings obtained at the end of year n.

$$Cumulated\ saving\ on\ year\ n\ = \sum_{i=1}^{n} (48n + 64)$$

$$Cumulated\ saving\ on\ year\ n\ = 24\,n \times (n + 1) + 64\,n$$

$$Cumulated\ saving\ on\ year\ n\ = n \times (24\,n + 88)$$

With an average cost of 200 Euros per day, the total savings on year n corresponds to $10560\,n + 12800$ euros

A.2. Estimation of the costs

With an estimation of 1 new customer implemented every quarter and one controller being able to manage 4 customers:

First year:

January : One customer already in place + Implementation of a new customer

April : Implementation of a new customer

July : Implementation of a new customer

October : Implementation of a new customer + Training of a new controller

> Costs linked to implementation of a new customer

$$Cost\ linked\ to\ implementation\ of\ new\ customer = 15\ days\ for\ implementation \times 4\ customers$$

$$Cost\ linked\ to\ implementation\ of\ a\ new\ customer = 60\ days$$

> Costs linked to the calculation of new stock parameters

$$\begin{aligned} Cost\ linked\ to\ the\ calculation\ of\ parameters\ = \\ 0{,}5\ day\ per\ month\ and\ per\ customer\ to\ run\ the\ calculations \times \\ (Customer\ already\ in\ place \times 12\ months + \\ First\ customer\ of\ the\ year \times 12\ months + \\ Second\ customer\ of\ the\ year \times 9\ months + \\ Third\ customer\ of\ the\ year \times 6\ months + \\ Fourth\ customer\ of\ the\ year \times 3\ months\ ) \end{aligned}$$

$$Cost\ linked\ to\ the\ calculation\ of\ parameters = 0{,}5\ day \times (12 + 12 + 9 + 6 + 3)$$

$$Cost\ linked\ to\ the\ calculation\ of\ parameters = 21\ days$$

> Costs linked to the training of stock controllers

$$Cost\ of\ training = 7\ days$$

> Costs linked to the daily ordering activities

$$\begin{aligned} Cost\ linked\ to\ the\ daily\ ordering\ activities\ = \\ 10\ minutes\ day\ per\ day\ and\ per\ customer\ to\ order \times \\ (Customer\ already\ in\ place \times 21\ days \times 12\ months + \\ First\ customer\ of\ the\ year \times 21\ days \times 12\ months + \\ Second\ customer \times 21\ days \times 9\ months + \\ Third\ customer \times 21\ days \times 6\ months + \\ Fourth\ customer \times 21\ days \times 3\ months\ ) \end{aligned}$$

$$Cost\ linked\ to\ the\ daily\ ordering\ activities\ = 10 \times 21 \times (12 + 12 + 9 + 6 + 3)$$

$$Cost\ linked\ to\ the\ daily\ ordering\ activities\ = 8820\ minutes$$

$$Cost\ linked\ to\ the\ daily\ ordering\ activities\ = 18{,}3\ days$$

The expected **costs for the first year should be around 106 days.**

Generalization

With this model of implementation (4 new customers per year) the general formula of the costs generated during the year n is:

$$Total\ costs\ on\ year\ n\ =$$

$$\begin{aligned} & 15 \times 4 + && \textit{Cost of implementation} \\ & 0{,}5 \times 12 \times ((4 \times (n-1) + 1) + \frac{12 + 9 + 6 + 3}{12}) + && \textit{Cost of parameter calculation} \\ & 7 + && \textit{Cost of training} \\ & 10 \times 21 \times \frac{\left(12 \times (4 \times (n-1) + 1) + (12 + 9 + 6 + 3)\right)}{(60 \times 8)} && \textit{Cost of daily ordering} \end{aligned}$$

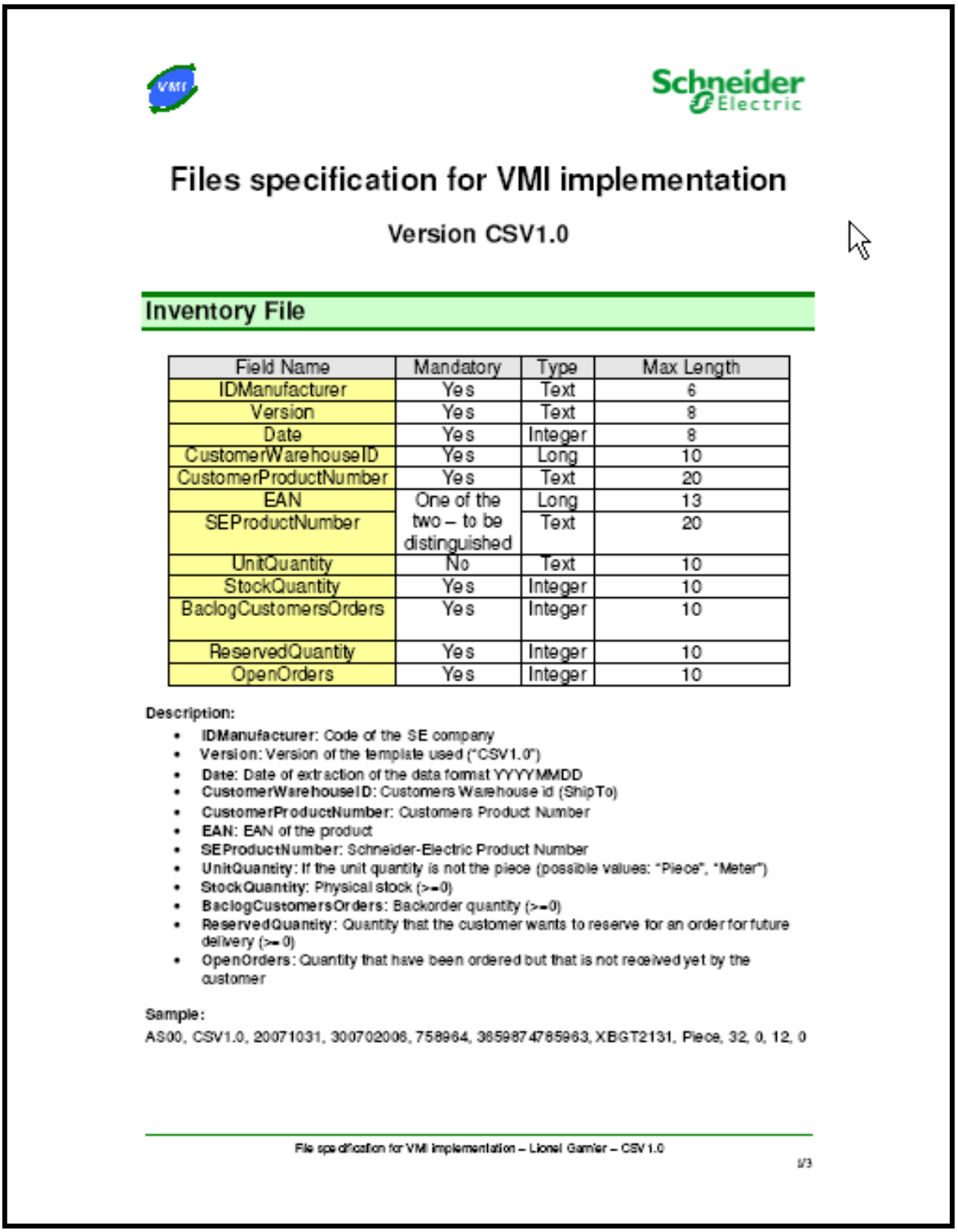
$$Total\ costs\ on\ year\ n\ = 45n + 531 / 8$$

$$Total\ costs\ on\ year\ n\ \approx 45n + 66$$

Year	1	2	3	4	5	6
Original cost in days	215.4	305.4	395.4	485.4	575.4	665.4
New cost in days	104.4	149.4	194.4	239.4	284.4	329.4
Savings in days	111	156	201	246	291	336

B. Documents

B.1. Specification of file exchanges



Schneider Electric

Files specification for VMI implementation

Version CSV1.0

Inventory File

Field Name	Mandatory	Type	Max Length
IDManufacturer	Yes	Text	6
Version	Yes	Text	8
Date	Yes	Integer	8
CustomerWarehouseID	Yes	Long	10
CustomerProductNumber	Yes	Text	20
EAN	One of the two – to be distinguished	Long	13
SEProductNumber		Text	20
UnitQuantity	No	Text	10
StockQuantity	Yes	Integer	10
BacklogCustomersOrders	Yes	Integer	10
ReservedQuantity	Yes	Integer	10
OpenOrders	Yes	Integer	10

Description:

- **IDManufacturer**: Code of the SE company
- **Version**: Version of the template used ("CSV1.0")
- **Date**: Date of extraction of the data format YYYYMMDD
- **CustomerWarehouseID**: Customers Warehouse id (ShipTo)
- **CustomerProductNumber**: Customers Product Number
- **EAN**: EAN of the product
- **SEProductNumber**: Schneider-Electric Product Number
- **UnitQuantity**: If the unit quantity is not the piece (possible values: "Piece", "Meter")
- **StockQuantity**: Physical stock (>=0)
- **BacklogCustomersOrders**: Backorder quantity (>=0)
- **ReservedQuantity**: Quantity that the customer wants to reserve for an order for future delivery (>= 0)
- **OpenOrders**: Quantity that have been ordered but that is not received yet by the customer

Sample:

AS00, CSV1.0, 20071031, 300702006, 758964, 365987476596 3, XBGT2131, Piece, 32, 0, 12, 0

File specification for VMI implementation – Lionel Garnier – CSV 1.0

1/3

Schneider Electric

Sales Report

Field Name	Mandatory	Type	Max Length
IDManufacturer	Yes	Text	6
Version	Yes	Text	8
FromDate	Yes	Integer	8
ToDate	Yes	Integer	8
CustomerWarehouseID	Yes	Long	10
CustomerProductNumber	Yes	Text	20
EAN	One of the two to be distinguished	Long	13
SEProductNumber		Text	20
UnitQuantity	No	Text	10
SoldQuantity	Yes	Integer	10
SoldNumberOfLines	Yes	Integer	10

Description:

- **IDManufacturer**: Code of the SE company
- **Version**: Version of the template used ("CSV1.0")
- **FromDate**: Beginning date of the period YYYYMMDD (included into the period)
- **ToDate**: End date of the period YYYYMMDD (included into the period)
- **CustomerWarehouseID**: Customers Warehouse id (ShipTo)
- **CustomerProductNumber**: Customers Product Number
- **EAN**: EAN of the product
- **SEProductNumber**: Schneider-Electric Product Number
- **UnitQuantity**: If the unit quantity is not the piece (possible values: "Piece", "Meter")
- **SoldQuantity**: Quantity sold during the period
- **SoldNumberOfLines**: Number of lines sold during the period

Sample:

AS00, CSV1.0, 20071031, 20071031, 300702006, 758964, 3659874785963, XBGT2131, Piece, 30, 11

Forecast File (optional)

Field Name	Mandatory	Type	Max Length
IDManufacturer	Yes	Text	6
Version	Yes	Text	8
Date	Yes	Integer	8
CustomerWarehouseID	Yes	Long	10
CustomerProductNumber	Yes	Text	20
EAN	One of the two to be distinguished	Long	13
SEProductNumber		Text	20

UnitQuantity	No	Text	10
Min	No	Integer	10
Max	No	Integer	10
ForecastQuantity	No	Double	10
ForecastDays	Yes if ForecastQuantity	Integer	3

Description:

- **IDManufacturer**: Code of the SE company
- **Version**: Version of the template used ("CSV1.0")
- **Date**: Date of creation of the file
- **CustomerWarehouseID**: Customers Warehouse id (ShipTo)
- **CustomerProductNumber**: Customers Product Number
- **EAN**: EAN of the product
- **SEProductNumber**: Schneider-Electric Product Number
- **UnitQuantity**: If the unit quantity is not the piece (possible values: "Piece", "Meter")
- **Min**: Minimum quantity to have in stock
- **Max**: Maximum quantity to have in stock
- **ForecastQuantity**: The forecasted Qty for the period
- **ForecastDays**: Number of business days corresponding to the communicated value of the forecast (Period)

Sample:

AS00, CSV1.0, 20071031, 300702006, 758964, 3659874785963, XBGT2131, 2, 15, 5, 21

Purchase Order Number

Field Name	Mandatory	Type	Max Length
IDManufacturer	Yes	Text	6
Version	Yes	Text	8
Date	Yes	Integer	8
CustomerWarehouseID	Yes	Long	10
PurchaseOrderNumber	Yes	Text	15
SalesOrderNumber	Yes	Long	15

Description:

- **IDManufacturer**: Code of the SE company
- **Version**: Version of the template used ("CSV1.0")
- **Date**: Date of creation of the file
- **CustomerWarehouseID**: Customers Warehouse id (ShipTo)
- **PurchaseOrderNumber**: Customer's purchase order number
- **SalesOrderNumber**: Vendor's sales order number

Sample:

AS00, CSV1.0, 20071031, 300702006, PO123, SO987

C. Publications

Publication in Rexel newspaper that is distributed worldwide.

Rexel is distributor implemented worldwide. It is a 35 000 employees company.

Cover of the Rexel Magazine dated from April 2008

The Magazine For REXEL Group Employees | April 2008

NETHERLANDS

Partnering For Efficiency

Rexel Netherlands has established a Vendor Managed Inventory (VMI) relationship with supplier Schneider Electric to replenish stock in their central warehouse. The main objectives behind establishing the VMI system were to reduce inventory, improve customer service and increase sales. Schneider Electric sends order proposals based on Rexel forecasts. Once the order is confirmed, these are returned by EDI[1] to Schneider. The system has worked so well that Rexel Netherlands is planning to implement more VMI relationships in the future.

> Contact: e.stam@rexel.nl

[1] Electronic Data Interchange

UNITED STATES

Moving With The Market

Rexel, Inc. has expanded its network with a new branch in Cedar Park, Texas. A rapidly growing town 50 miles northwest of Austin, Cedar Park has plans for large medical and commercial projects.
The branch opened in December 2007 and has been established to serve both the residential and commercial markets. It covers 743 m² and includes a warehouse, showroom and offices. The branch sum includes existing Rexel, Inc. employees who have strong industry contacts in the area.

> Contact: rnwooley@rexelusa.com

ACQUISITION

Rexel And Hagemeyer: A Major Industrial Merger

On March 4, Rexel closed its bid for Hagemeyer at 4.85 euros per share. This acquisition marks a major stage in the electrical equipment distribution sector. It allows Rexel to consolidate its position as world leader in the sector with a pro forma turnover of over 14 billion euros in 2007 and to reinforce its presence in Europe with over 3.4 billion euros in turnover generated in particular in the UK, Germany, Spain and Scandinavia. Rexel has also concluded an agreement with Sonepar to transfer to it Hagemeyer's activities based in North America, the Asia Pacific region and in certain European countries. This acquisition gives Rexel a growth platform that reinforces its competence in the management of major accounts and positions the Group in markets with strong growth potential. Detailed information about Hagemeyer will appear during Communications Week in May 2008 and in the next issue of Interaxion.

VMI article on the second page

From left to right: Eric Stam (Logistic Manager Rexel NL), Eric Sips (Operations Manager Rexel NL), Yuri Van de Veerdoonk (Engineer Logistic Offer SE), Rob Boesten (IT Manager Rexel NL), and Lionel Garnier (Project Manager Logistic Offer SE)

D. Bibliography

http://www.schneider-electric.com/

http://www.vendormanagedinventory.com/

2008 Fortune Global 500
http://money.cnn.com/magazines/fortune/global500/2008/index.html

Allen G. Taylor, Virginia Andersen - *Access 2003 Power Programming With Vba* (2003)

Edward A. Silver - *Inventory Management and Production Planning and Scheduling* (2001)

James William Martin - *Lean Six Sigma for Supply Chain Management* (2006)

James P. Womack and Daniel T. Jones - *Lean Thinking* (2006)

Jun Rua and Yunzeng Wang - *Who should control inventory in a supply chain?*, An article from: European Journal of Operational Research (2009)

Schreibfeder, J. - *Vendor Managed Inventory: there's more to it than just sell products* (1997)

Williams, M. - *Making Consignment and Vendor-Managed Inventory Work For You.* APICS International Conference (1998)

Russ Broeckelmann - *Inventory Classification Innovation: Paving the Way for Electronic Commerce and Vendor Managed Inventory* (1999)
http://books.google.fr/books?id=kCJylW0ddxAC

Tristan de la Broise, Félix Torres - *Schneider, l'Histoire en force* (1996)