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MANAGING SEASONALITY IN A WAREHOUSE

Bachelor's thesis
Business Management

2017



South-Eastern Finland
University of Applied Sciences

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Thesis title Managing seasonality in a warehouse		
		70 pages 2 pages of appendices
Commissioned by Rivolier SA		
Supervisor Heli Aaltonen		

Abstract

Efficient supply chain management is a crucial factor in any company. Warehouse management is in the heart of the supply chain management. Seasonality brings challenges to warehouses and for the logistics/supply chain in general. For organizations it is crucial to identify and measure the seasonality to plan the future.

The commissioning party Rivolier must cope to the seasonality. The research is aimed to answer this question: How to improve the supply chain management and the warehouse management to face the seasonality issues?

The theoretical part discussed about the main topics related with seasonality. The main topics described were seasonality, forecast, planning, warehouse management and workforce management. The research was executed in three different phases. Data of the company have been analyzed and a forecast have been made. Data analysis shows that the company has a regular seasonality but with a significant growth every year. The forecast was made to suggest further action in the warehouse. In addition, 4 interviews have been executed. The last part of the research concerned personal observation. Data were collected during a working period of 18 months.

This research brought some interesting results. To face the seasonality issue and especially the peak period, the company must anticipate. To be able to anticipate, the company must forecast the sales. Planning presents many advantages: it helps for the requirement planning and avoid stock shortage, to avoid emergency decisions, it helps to manage the occupancy of the warehouse, and it can be used to set up a hiring plan and to manage the human resources more efficiently. Anticipating helps also for the operational tasks. Management must consider the forecasted sales to hired additional temporary workers. To avoid too much training time, the company must employ temporary workers for a long period. During the peak, the warehouse staff must be focused on receiving goods and shipping goods. No time should be used for background work; therefore, it is important to do it beforehand. The warehouse manager must apply what is working during the normal period of activities but with a bigger scale during the peak period.

Keywords

Supply chain management, Logistics, Warehouse Management, Inventory Management, Seasonality, Peak period

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1 INTRODUCTION

Supply chain management is a major strategic issue for industrial and commercial companies. It is a crucial way to add value to the services and products provided, especially concerning the lead-time, the production reactivity, and performances. Logistics plays the main role concerning profitability and customer satisfaction. It improves the production capacities, the inventory management and the distribution costs. Having a good logistic process is an important feature to improve the competitiveness. The importance of logistics and supply chain management have become more important nowadays. The global market and its requirements force the companies to be more efficient and reactive. The competition is bigger, the number of partners has increased, the life cycle of products is shorter and new companies are growing. However, the number of opportunities is also high as the market is bigger and the number of potential customers is higher. New technologies and software have been created to support management.

One important challenge in supply chain management is seasonality. Nowadays numerous companies must face this challenge. Seasonality is a phenomenon in which the level of the sales is influenced regularly by the seasons, a period of the year, or special recurring events. The activities of a company will have a slack period, when the activities will be lower than average and a peak period when the activities will be at their highest. There are different ways to face the seasonality, by increasing the capacity of production and work, or by trying to reduce the difference between the peak and the slack periods. This thesis will focus on the activities in a warehouse, the works and projects that to be lead to face seasonality.

The commissioning party is Rivolier SAS. This company is a wholesaler of a large range of products such as weapons, ammunitions, optics, gear and clothing.

Logistics is a crucial element for the company. The aim of the company is to buy products from many different foreign suppliers, then store them and dispatch them to all different customers. Everything should be done well and fast. All customers are important and must be served as fast as possible with no issues. Good logistics are key to success for the company. However, the warehouse is facing a challenge

every year. From May to September there is a big peak period of activities. The company must face different aspects, such as workforce management, summer leaves, a bigger amount of product to store and ship and a lead-time to respect.

Research questions:

How to improve the supply chain management and the warehouse management to face the seasonality issues?

Research objectives:

The thesis work is aimed at the following objectives and outcomes:

- Analyze the current state of the warehouse
- Make suggestion about possible improvement and future project in the warehouse
- Showing how the peak could be anticipated and faced

Theoretical research will be carried out to reach these objectives. The seasonality and its issues will be presented. Will be discussed seasonality identification and forecast. Then it will be shown how the forecast can be used to set up scheduling. Warehouse management is another important aspect of the research. Its global function and workforce management will be presented.

To collect data, a qualitative research will be presented. Several persons related with the supply chain/warehouse management will be interviewed. These interviews will bring additional information related with their work experience. This will complete the theoretical part.

2 SEASONALITY AND ITS ISSUES

In this chapter first seasonality will be discussed. After it, an explanation about the detection of seasonality will be given. Then, forecasting process will be described. Finally, an introduction about scheduling and its importance in the business world will be exposed.

2.1 Seasonality

In the business world, seasonality is the presence of changes in sales occurring at regular intervals. The intervals can be weekly, monthly or quarterly. Different factors can be the reason of seasonality, like the weather, holidays, and sport seasons for example. It is essential for the organizations facing the seasonality to identify and measure seasonal variations in their market to be able to plan the future. This helps organizations to plan future sales, purchases, or labor needs according to the increases or decreases of transactions. (Investopedia, 2016)

The seasonality can affect the supply chain. There is generally a low season concerning shipping during the summer and spring. The peak occurs during the autumn and winter when most employees do not have holidays. The demand in logistics services especially in the exportations differs. During the autumn, when all employees are back from their holidays, factories are fully effective, and it could happen that the demand for transportation is higher than the offer. Consequently, the prices are getting higher. Companies must think about that aspect before purchasing or shipping goods. (Fender M., Bardon F. 2012)

Seasonal coefficient is an interesting way to identify the seasonality. A company will understand precisely how much represents the sales of a semester/month in the annual turnover. It is determined over several years, and a coefficient is calculated for each semester or month. (E-Handbook of Statistical Methods. 2012)

Calculation of seasonal coefficient can be shown through Equation 1.

$$\text{Coefficient of the semester 1} = \frac{\text{Average of semester 1}}{\text{Average of averages}} \quad (1)$$

If the company does not have seasonality, the coefficient of each month will be 1. If the coefficient is superior than 1, the activities of the month will be more important than the average. If the coefficient is less than 1, it will be the inverse. The coefficients are thus an easy way to notice the peak periods of the company. A peak period is a period when the activities are at their highest. A peak period is the opposite of a slack period.

The seasonal adjustment is a way to fight against the seasonality. This is aimed to change periodic variances. Marketing can help to face periodic variances, by putting a bigger communication effort during a slack period. Companies can for example try to impose the whole year a product that use to be bought for a special event. (Les outils d'analyse de la demande: les coefficients saisonniers. 2017)

It can be faced by operating in different geographical markets. For example, European company commercializing school supplies will have a big seasonality. Before going back to school, (in August/September in Europe), all schoolchildren and students are buying their supplies. Once equipped they rarely need to buy new supplies during the year. To face seasonality, this company can operate on other continents where students are going back to school is in a different date, like in Argentina for example (in February/March). To face the seasonality, some organizations are using the same concepts than "happy-hour" used in restaurants or bars. If a company has a weekly seasonality and for example a slack period for one or several specific days, it can propose discounts to boost the activities on these specific days. (Charbonnier V. 2009)

Companies must be able to identify their potential seasonality. There are several ways to identify the seasonality or a probable peak period. This identification can help them to face problems, anticipate peak periods and to make changes in the company strategy.

2.2 Identification and forecast

A sales forecast is the process of estimating future sales. Forecasts allow companies to make commercial decisions and to predict performances for a short,

middle and long term. Companies can base their forecasts with data of past sales, by making comparison and by having a look to economical tendencies and trends. It is easier for companies already running activities for several years. They have access to the data of their previous years' sales and can use it to make calculations. New companies should make their predictions on less concrete information, like market research or competitive intelligence. Their future activities forecast will be less accurate. (Lambert S., Scheid J. 2011)

Forecasting the sales gives, a preview on the way a company should manage its workforce, budget, marketing, and the financial flow or resources. Beside that the company could make a forecast of the possible income, then assign the right resources and plan the future growth. Being aware of the potential future helps you to develop and improve the strategic plans. Sales planning is also an interesting way to give the right objectives to the sales representatives. Giving a rational objective is a good way to involve them and thus increasing the sales. (Fender M., Bardon F. 2012 and Lambert S., Scheid J. 2011)

The sales forecast is a good tool to get an estimation of the demand of a specific product. With a precise sales forecast the supply chain and logistics will be improved. A global idea about the future order will be available, and thus companies can purchase or/and stock the right quantity of products to be delivered to customers without any delays. This fact will increase the customer satisfaction and decrease complaints. It is a way to have a competitive advantage. The company will also be more accurate and prepared to manage its inventory. Only the right number of products will be stored. This will be time saving concerning the operational work in the warehouse. Moreover, this will be a good way to avoid surplus goods. Surplus goods are expensive for companies. They should be payed, stored, and most of the time the companies must get rid of them without profit (and even at a loss). For the finances, anticipating the sales gives information. The financial department will know approximately the potential turnover and profit. Having information in advance helps to explore the possibilities to increase the revenues and the profit. For the internal control and management, the sales forecast is interesting. Knowing the future activities can give information about the hiring (temporary or not), how to manage the current workforce, to know if some

employees need to be trained and helps to schedule the coming activities. (Fredendall, Lawrence D. 2001)

Besides determining how to allocate the resources, forecasting give also clues for the marketing effort. It can help to plan future promotions or advertisements. All companies are looking for continuous improvement. Sales forecast helps to have a better overview over the company and its activities, this is a good way to implement continuous improvements. (Launch Marketing. 2014)

To get a good forecast, it is needed to have a good sales strategy. Good sales strategies take into consideration the results forecasted. To get a good strategy, companies must use such tools as the SWOT (Strength – Weaknesses – Opportunities – threats) or understand customers' needs. Big or important customers' accounts must be prioritized. Good forecasting requires a good understanding of the buyers. Companies must take into consideration the work of the sales representative because he plays a role in the sales. Besides that, it is also important into take in consideration the buyers and their needs. Many companies underestimate the importance of the buyer. The reasons why the customer is buying must be understood, and the potential risks must be evaluated. Customer intelligence is the key to understand potential opportunities or threats from customers. The environment must be controlled thanks to, for example market intelligence. (Fender M., Bardon F. 2012)

Forecasting is not an exact science, it is just an estimate. Some factors can drastically change the forecast, for example the acquisition or the loss of a market, the creation of a new law concerning a product, and potential entrants. If a big change appears, the forecast will have to be recalculated. During a year many improvements can be done. The aim is to match a forecast close with the future reality. (Fredendall, Lawrence D. 2001)

Forecast error is an aspect to be taken into consideration. It could have a big influence on the company management and planning. Statistically speaking, a forecast error is the difference between the real values and the predicted values. This comparison can be done only with values from the same scale. In the easy situation, the forecast is compared to a result of a specific period. The forecast will

be evaluated using the difference between the value of the result and the value of the forecast. Another forecast error could be related with the date of a prevision.

The prediction, was correct, but the date of the event (e.g. a big sale, or a peak) was not correctly predicted. The statistics of the forecast error plays a crucial role in the follow up of the forecasting accuracy. It detects exceptions, and analyses the forecasting process. The principle of prevision is that forecasts are, most of the time, false. Because of that, organizations must follow up their forecasts according to the real results of the demand, and find ways to measure the dimension and the type of error. The importance of an error can be measured in a unit or in a percentage. Some company like to measure the error by using a certain amount of money.

Calculation of forecast error can be shown through Equation 2.

A = Actual demand

F = Forecast demand

Forecast error = A – F

Forecast error as percentage = $(A - F) / A$ (2)

To have a good use of the forecast, and to avoid a big forecast error, it is crucial to make it accurate. For this, according to the type of goods commercialized, to the market and the environment, a company must choose the right category of the forecasting method. (Hyndman R., Athanasopoulos G. 2013)

How to choose the right forecasting method?

The selection depends on many different factors: the context of the prevision, the availability and the relevance of historical data, the forecast error acceptability, the period of forecast, the costs and the time available to make the analysis. The forecaster must choose the technique which operates the data in the best way. To get a better forecast accuracy, companies must spend a bigger amount of time and money to make more research and analyses. To succeed in forecasting, a

collaboration should be implemented between the manager and the forecaster. Before starting to do the forecast, some questions must be answered: What is the aim of the forecast? How will it be used? Answering these questions will determine the accuracy and the strength required for the forecast and therefore influence the selection. If the company wants to enter a new market, their estimations will be more inexact because the forecast will be made on gross estimations. If a forecast must be done in a controlled market by the company, the accuracy must be high. Moreover, if a forecast is aimed to define a standard to evaluate the performance, the forecasting method will not consider special actions such as promotions. Promotions will change the historical models, and everything related. Forecasts that are simply showing what will be the future of an organization, without considering tactic and strategic decisions cannot be used to set up a plan. If a company wants a forecast to be able to show the impact of a new marketing strategy, the forecast technique should be more sophisticated. It should take into consideration the marketing action and special events involved in the strategy. (Hyndman R., Athanasopoulos G. 2013 and Chambers J., Satinder K., Mullick., Smith D. 2017)

The techniques change according to the budget a company wants to allow, according to the accuracy required and the scope. A manager must define the inaccuracy tolerance. This accuracy is decided according to the decisions that will be made with the forecast. A manager should balance the cost of the forecasting process, and the money that could be saved with an accurate forecast. If a forecast is accurate, the planning will be accurate too. A good planning can save money, especially concerning the inventory costs. Estimate the future based on the past is most of the time relevant, especially in the short term. However, for the long term, the forecasting method must consider the entrance of new products, of new competitive strategies, potential opportunities and potential threats. The collaboration between the forecaster and the manager is the key. Together they should clarify their thoughts about the flow chart, distribution, sales, and the production system. (Goh G. 2014)

After the discussion and its conclusion, the manager and the forecaster will decide the method. There are 3 main forecasting methods: qualitative techniques, time series analysis and projection, and causal models.

Qualitative techniques use qualitative data, information on special events and could consider historical data. Time series analysis and projection uses only historical data. Finally, causal models use deeper information and more specific information concerning the relations between system elements, and is efficient in taking into consideration special events. The past and its historical data are also important. It is interesting to use this technique when a company is introducing a new product in the market. Therefore, they do not have historical data. They can see the tendencies of their previous product introductions and can set up the forecast thanks to for example market intelligence or other qualitative information.

This topic is aimed to describe and face a seasonal issue. It is thus relevant to explain and describe an adequate method deeply. For seasonal variations, a time series analysis and projection are to be used. Forecasting sales for the coming year is important, but this is not enough. Seasonal variations must be considered. For many companies, December is for example is a big month in terms of sales since many customers are buying Christmas presents. (Chambers J., Satinder K., Mullick., Smith D. 2017)

Forecasting the sales with the least square method:

Table 1 shows the historical data from the previous years. The company is fictive and the numbers are used as examples. One line represent the year, and the other represent the sales.

Table 1. Historical data from the previous years

Year	2008	2009	2010	2011	2012
Sales	600 000 €	605 000 €	610 000 €	625 000 €	630 000 €

Data are organized in a table while using the least square method. Table 2 shows the different calculations to operate to calculate the least square method. X_i represent the years, Y_i the amount of the sales. $X_i * Y_i$ shows the first calculation to make. X_i^2 is the second calculation to make on this table. The total of each column is written because these numbers will be used for further calculations.

Table 2. Least square method for the company X

	X_i (years)	Y_i (sales)	$X_i * Y_i$	X_i^2
	1	600 000	600 000 (600 000 x 1)	1 (1 x 1)
	2	605 000	1 210 000 (605 000 x 2)	4 (2 x 2)
	3	610 000	1 830 000 (610 000 x 3)	9 (3 x 3)
	4	625 000	2 500 000 (625 000 x 4)	16 (4 x 4)
	5	630 000	3 150 000 (630 000 x 5)	25 (5 x 5)
Total:	15	3 070 000	9 290 000	55

The further calculation of the least square techniques is shown in Equation 3.

$5 = \text{number of years}$

$X = \text{average of } X_i$

$$X = 15 / 5 = 3$$

$Y = \text{average of } Y_i$

$$Y = 3\,070\,000 / 5 = 614\,000 \quad (3)$$

$$a = \frac{9\,290\,000 - 55 \cdot (5 \cdot 3 \cdot 614\,000)}{80\,000 - 10 \cdot 8000} = \frac{9\,290\,000 - 55 \cdot 18\,420\,000}{80\,000 - 80\,000}$$

$$b = 614\,000 - (8000 \cdot 3) = 590\,000$$

The final equation is: $Y = 8\,000 X + 590\,000$.

To calculate the sales of the year 6 (2013) the equation must be resolved: Y (Sales)
 $= 8\,000 \times 6 + 590\,000 = 638\,000 \text{ €}$

Calculation of the seasonal coefficient compared to the previous year

The companies should gather the data from the previous year. The turnover is the most relevant element. The calculation is made in two time:

- for each month a seasonal coefficient will be calculated.
- With this seasonal coefficient and the forecasted turnover for the next year (previously calculated), the forecasted turnover for each month will be calculated.

Table 3 shows in an organized way the different data and calculations required to calculate the seasonal coefficients. In different columns, months, monthly turnover, monthly coefficient, calculations to get the forecast for 2013 and the result of the calculation are presented.

Table 3. Calculation of the seasonal coefficient compared to the previous year.

Month	2012 turnover (in M €)	Monthly coefficient	Calculation made	Forecast for 2013	Calculation made
January	40	0,063	40 / 630	40,63	640 x 0,063
February	30	0,048	30 / 630	30,48	640 x 0,048
March	50	0,079	50 / 630	50,79	640 x 0,079
April	50	0,079	Etc...	50,79	Etc...
May	50	0,079		50,79	
June	60	0,095		60,95	
July	20	0,032		20,32	
August	20	0,032		20,32	
September	50	0,079		50,79	
October	70	0,111		71,11	
November	90	0,143		91,43	
December	100	0,159		101,59	

Total	630 (Turnover 2012)	1		640 (Forecasted turnover for 2013)
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This table shows the monthly calculations, but this could be also done for a week, a quarter, or a semester.

Calculation of seasonal coefficients compared to the average of several years:

To be even more accurate, several past years could be included to calculate the monthly sales. The method is the same than the previous one, but the average turnover must be calculated over the past 3 years (or even more). Coefficients are then calculated on this average turnover.

Table 4 presents in different columns, the months, the monthly sales for 3 years, the averages of these monthly sales, the monthly coefficient and the forecast for 2013. The multiplication of a specific monthly coefficient with the global forecast of 2013 gives the monthly coefficient for a specific month.

Table 4. Calculation of seasonal coefficients compared to the average of several years

	2010	2011	2012	<u>Average</u>	Monthly coefficients	Forecast for 2013
January	45	45	40	43,33	0,070	44,61
February	32	30	30	30,67	0,049	31,57
March	45	50	50	48,33	0,078	49,76
April	45	50	50	48,33	0,078	49,76
May	40	45	50	45,00	0,072	46,33
June	60	60	60	60,00	0,097	61,77
July	30	20	20	23,33	0,038	24,02
August	15	20	20	18,33	0,029	18,87
September	45	40	50	45,00	0,072	46,33
October	65	70	70	68,33	0,110	70,35
November	90	90	90	90,00	0,145	92,65
December	98	105	100	101,00	0,162	103,98
Total	610	625	630	621,67	1,00	640

The calculation of the forecast represents important work and information sources. With that, a relevant scheduling can be set up. (La prévision des ventes et les variations saisonnières. 2017)

2.3 Scheduling

Scheduling is one of the most important tools for marketing and management. It affects also human resources management, logistics, finances and accounting. The sales forecast helps the scheduling. It identifies the necessities, the moments of sales, and the inventory requirement.

This is an important tool for being competitive. Every planning is made to succeed. This is aimed to get a better management and a better competitive position, either for the brand or a specific product. Objectives are aimed in scheduling. Having objective is a good way to involve and motivate employees. Planning the success requires to show and explain the best method to reach the objective. Continuous improvement will be part of the plan. It will improve the organizations' management. For decision making, planning also plays a central role. Thanks to forecasting information about the future will be known. It is thus easier to set rational objectives. As you have an overview over the potential future, the reactivities to make decisions is increased. You will also have a better idea of the influence of your decision either in a short or a long term. (Fender M., Bardon F. 2012 and Bloomberg D., LeMay S., Joe H. 2002)

Scheduling is also a good way to improve the flexibility, and to avoid emergency decision making. Planning can allow the companies to be more reagent in case of unexpected event. Unexpected event could be a new law concerning one of your product, it could be a brand-new innovation and product release of one of your competitor, it could be a price rise of raw material. Anticipating such problem and having a solution for every potential problem allows to avoid panic. The new plan will be applied, and therefore the activities will continue as it was before. Scheduling creates synergy. It will gather all the activities departments. They will

have common objectives, and they will have to make activities, project, and workshop together. Thus, a better organization and coordination will be implemented in the company. Concerning evaluation and control, scheduling defines aims, and shows how to reach it. Managers know what they must expect from the employees. Scheduling allows the manager to know if the goals are in the right track or not. If the sales of a good are lower than expected, this will give a clue, and help the manager for decision making (e.g. boost the sales, putting a bigger effort in marketing). If conversely, the sales are higher than expected, the company must prepare itself to purchase or product more goods, to be sure to reach the customer's needs. (Fredendall, Lawrence D. 2001 and Fender M., Bardon F. 2012)

Scheduling allows to know which factor to observe in the activities, it guide the company to make changes. If the schedule is correctly respected, companies will have more chances to be reliable and profitable. Planning is a continuous project. Before a plan ends, another must be set up. New aims will be defined considering previous aims and sales.

Concerning logistics, there are 3 main kind of scheduling. The long term, the middle tern and the short term. All different periods of scheduling are made according to the company activities, its objectives and its forecasts.

Long term planning is a strategic planning according to the vision of the company and its commercial development willingness. This kind of plan could be for example aimed to increase the production capacity by increasing the workforce or starting the production of new items or by using outsourcing.

Middle term planning consists of estimating how the production must be managed on a full year. It consists of setting up a detailed plan in terms of product (type, feature), quantity and defining, how, who, and when the work will be completed.

Short term planning considers precise features and parameters in a shorter period. Different techniques are used by factories and warehouses to build their scheduling in a short term. The short-term planning helps to face issues for a small amount of time, and especially for a peak period of activities. Thus, one technique will be described more precisely. This scheduling is mainly related with operational work.

Material Requirement Planning (MRP) allows to forecast the utilization or shipping of stored goods. MRP uses technical and commercial data. The MRP method was the first logistics method using computers. This technique inspired Enterprise Resource Planning (ERP) and Warehouse Management Software (WMS). It is based on the lead-time to deliver a product, in a time needed to sort and receiving goods. It calculates the quantities of goods stored or to be purchased. (Fender M., Bardon F. 2012, 88 - 92)

This method makes the distinction of the company needs into two categories, independent demand and dependent demand. Independent demand is the external needs transmitted by customers for example order of goods, sales forecast estimated beforehand. Dependent demand represents the internal needs concerning raw materials, spare parts and components needed for the manufacturing of finished products. It is calculated based on the nomenclature. MRP system is a good tool to calculate net requirements for raw materials, spare parts, or components. It uses the data of the production management software/database. Considering the current stock and the outstanding amount, net requirements are calculated. It is the first step to calculate the capacity needs. By knowing this, MRP calculates the workload and the production means necessary to be able to run the production on time and efficiently. It is using commercial data (like the forecast of the order) and technical information (resources, management, capacity) to simulate and then balance the workload and production capacity. It is an informational system generating automatically manufacturing. (Fender M., Bardon F. 2012, 88 – 92 and Bloomberg D., LeMay S., Joe H. 2002)

The main data used by the MRP are data about the articles, the nomenclatures, the production process, the production materials, the forecasts, the stock available, and the orders. The files concerning the sales forecast contain data about customer's future needs and the forecast will be updated when needed by the commercial department. A file will contain all the spare parts and components needed to assemble and manufacture a finished good. Another will show the updated number of items available, in stock or in the production line. The application included in the informational system uses information and calculates the net requirements, the expenses, and the production, supply and purchasing

orders. To be optimized the MRP system must be updated every day and be supplied by new and reliable data/information:

Forecast data of sales or demand must be reliable. A non-reliable forecast can cause problems in overproduction and overstocking. Many companies reduce the importance of the forecast, and just use the actual customer orders to avoid overproduction. The anticipation is thus reduced.

Nomenclature management must be rigorous and up-to-date. The omission of a component in a product will cause a false calculation and supply order, and thus can bring a shortage on stock or delays.

-Inventory/stock management must be strict. The quantity and quality of the raw material and components stored must be regularly controlled. Stock must be updated and controlled often. Faulty and defectives article will be removed from the stock. The aim of the inventories and controls is to avoid potential problems.

-The production process must be perfectly set up. If a production line is not set up correctly, the production time per unit will not be accurate.

-The data included in the product sheets must be exact and updated according to the evolution of the demand. The forecasted data must be especially updated (stock min/max, indulgence, security stock, purchase planned). Updating helps to avoid having useless stock (e.g. in case of ancient and big order), or a stock shortage in case of increasing demand. (Fender M., Bardon F. 2012)

Nowadays MRP is part of management software (such as ERP or WMS) and makes the scheduling of needs easier. It is a good and fast way to manage a big quantity data. It considers the changes of the activities (including seasonality) and helps the decision making in case of overload of work. However, this tool needs qualified employees to be used. The issues are too important. Adding a mistake in a data will have a big influence on the accuracy/reliability of the MRP. This is a standardized system and works for standardized products. This kind of system would not be profitable for a company proposing personalized products for instance. (Bloomberg D., LeMay S., Joe H. 2002)

3 WAREHOUSE AND MANAGEMENT

The warehouse management plays a decisive role for the global management of a company. Having stock implies to set up an efficient warehousing strategy. The warehouse management is in the middle of the supply chain of the company and plays a key role. Warehouse management is a key success factor. It is essential in the strategy of many companies (the size does not matter), and especially for companies operating worldwide and doing e-business. It is a performance factor.

Indeed, the warehouse management is an important factor concerning customer satisfaction. A well-organized warehouse allows an efficient delivery time without errors (unexpected stock out due to an inventory error, a wrong product shipped). If the promises regarding deliveries used to be difficult to keep, the computerization of warehouses allows today to control and manage more clearly. A global vision of the warehouse function allows to ship goods in ideal conditions, and to optimize the storage and its costs. Nowadays conditions permit to improve the profitability of the logistic operators.

The warehouses are storage places, but also a place through which many goods are passing. This place must carry out many physical operations and handlings, but must also carry out administrative issues. This implies that every place of warehousing should be created like a real logistic platform. In this frame it is important for the company to define a clear organization from the inbound dock to the outbound dock. The warehouse management implies the optimization concerning the different flows (physical and informational). This must allow to manage the supply process and the stock in real time, and thus optimize the warehouse management. With a good management, supply chain coordinators can know in real-time what is the available stock for each product and are able to make an accurate follow up. (Fredendall, Lawrence D. 2001, 209 – 213 and Fender M., Bardon F. 2012, Warehouse Management System)

3.1 Warehousing process

Every warehouse has three main activities: inbound, storage and outbound. This applies for every kind of warehouse, no matter the size or the type of products. They all receive products, store them and then dispatch them. Administration could be considered as the fourth main activities. This includes all the work necessary to have a tracking and a follow up for the products and the global activities. The activities are managed thanks to the computer software such as Enterprise Resource Planning (ERP), or a Warehouse Management Software/System (WMS). Microsoft Office could also be used. All the activities in the warehouse are important, they are all connected, and they all have an influence on each other. It is important to understand that warehousing is a global process, and that every employee must think about the global activities. Warehousing is a chain so employees must think that the work of someone will have an influence on someone else's work. (Bloomberg D., LeMay S., Joe H. 2002)

3.1.1 Inbound process

The inbound process is the action of receiving goods, namely taking an item and storing it in the right location. Concretely it is a little bit more difficult and complicated than this. The inbound process is divided into different actions.

Received goods are controlled before being stored. Workers check if the supplier has sent the right products and the right quantities. The state of the goods and packages can be checked when necessary. When all the products have been checked and all quantities verified, products are ready to be stored. The products returned from a customer are also checked and verified, with even more precision. Some goods are received for some specific customers. In this case, the person in charge of the reception should identify and show (computationally, or by putting the item in a special storage location) that the product is reserved for a special customer or for a special request. Some products could also not be sold for legal

reasons (e.g. waiting for the authorization). In this case the worker should identify and “block” the product. Thus, no order picker will use the stock to prepare an order. Collecting the information and transmitting it is also part of the work in the reception area. For new products the information concerning the size, and the weight is collected and diffused. The new information will then be added to the product sheet. Before being tidied up some products must be packaged in a standardized plastic or cardboard box. This will speed up the storage process.

Labelling is an important aspect to be considered. Some products are not labelled, or barcoded by the suppliers. In this case, if barcode or label are being used in the warehouse, employees will have to add it by their selves. Labels can be used for identifying an article (via an EAN for example), a serial number or an item code (every item of a product will have its own number). It is interesting to use item codes and serial numbers to have a better tracking and follow up of the products.

Cross docking is a logistics technique used to gain time and storage place. Coming goods will be directly transferred from the receiving dock to the picking dock. The goods will not be stored, and the picking will be executed in the same time than the goods are received. Products will just be controlled, packed and labelled before being sent to the shipping dock. The reactivities, time and cost saving are high using this technique. A good coordination of the purchase, the sales and the transportation must be established. (Bloomberg D., LeMay S., Joe H. 2002 and Fender M., Bardon F. 2012, Warehouse Management System)

3.1.2 Storage

The storage process defines where and how the products will be warehoused. All articles are different, and they will be tidied up according to their characteristics. For example, frozen products should be stored in a cold room. Basic products will go in normal shelf or rack. The Warehouse Management Software or ERP will advise a location for the product. According to the place available and the number of goods to be stored, the employees will decide or not whether to use the location

advised. Software advises location according to the previous location of the goods or according to the type of goods (e.g. dangerous or regulated product). For new products, the operative must choose a location if there is no special specification on the item.

Most of the time a warehouse has two kinds of storage, bulk storage, and picking area. The picking area stores a smaller number of products. These products are easy to reach. The bulk storage stores a bigger number of products but are more difficult to access, most of the time it is stacked on pallet. The process of supplying picking storage from bulk storage is called replenishment. This should be executed before launching the picking order. This will allow time saving for the order pickers, they will not have to pick up products on a high stored pallet for example.

Pallets are in a special pallet racking. To load or unload pallets, a fork lift truck or a stacker must be used as the pallet racking are most of the time located high. The part of the warehouse where the pallets are loaded has a high ceiling to allow a several layers of stacking. From these locations the goods will be brought if needed to a picking location (before a picking order). The picking area is most of the time composed of shelves. Shelves allows to store a limited number of items. Goods can be brought there after a small reception of goods or after a replenishment. Shelves have an easy access, are easy to reach, and allow an easy moving. Almost every product can be stored in this kind of storage location, however the quantity is limited. Some specific storage place can be used. For small and numerous items, shelves with different drawers can be used. Some shelves are inclined and equipped of small rolls to allow an automatic replenishment and an easy access to the goods. (Bloomberg D., LeMay S., Joe H. 2002 and Fender M., Bardon F. 2012, Warehouse Management System)

3.1.3 Outbound process

Identifying, controlling, labelling, and storing are important aspects for in the warehouse. However, once stored, goods must be shipped. The outbound process includes all actions required to satisfy a customer concerning order and lead time. The main actions are order preparation, packing/packaging and shipping. Order picking could be executed with different manners and processes. The manager can decide to split the order picking. A single order picking means that the order will be picked in one time. The order will not be divided, and all the goods will be picked, their location does not matter. For the small order this is not efficient, employees would have to walk in different zone and walk a long distance just to pick a few items. However, for a big order this could be efficient, it will be worth going to each zone to pick different products. When an order is prepared in several pickings, goods must be regrouped. This is called consolidation. The consolidation will gather all the items from the different order picking in diverse zones. The consolidation is made in a special area: meeting zone/area.

Batch collection is also a way to prepare orders. The order picked will pick goods in the same location for different orders at the same time. This is efficient when the order from different customers are the same or almost the same. However, this technique implies a risk of a mistake by consolidating one order with a different one. Technology helps to avoid mistakes. Before the order of picking goods was done by hand. The manager or employees were choosing manually where they must pick goods in a fast and efficient way. Nowadays ERP or WMS can define the shortest way for an order picking. The order picking is thus faster and the chance of mistakes is reduced. The number of mistakes are also reduced by using a bar code. Bar codes help the operators to know if they are choosing the right storage place or the right article. All items or storage locations are identified by a unique code. In most of the systems, to avoid mistakes during the picking process, workers must flash the storage location, and then the product before picking up the product. Shipping the right product to the customer add value to the service the company is providing. Good logistics guarantees a better customer satisfaction.

The packaging is another important aspect to be taken into consideration. After the gathering of all the items of an order, goods must be packaged before being shipped. Packaging refers to the action to put articles in a box, to stall the article to

avoid movement, to tape/hoop the box, and to stick the shipping label. Pick-anpack is a way to gain time. The order picker puts the collected article directly in the box which will be used for the shipment. The pallets are also conditioned, wrapfilmed, taped and labelled. A good looking, standardized and solid package which protects the goods correctly is a guarantee of quality, and gives a good image. (Bloomberg D., LeMay S., Joe H. 2002 and Fender M., Bardon F. 2012, Warehouse Management System)

3.1.4 Administration

Warehouse management is the most important aspect in a warehouse. A manager will guide and train the workers, and together they will try to reach objectives, either of quality or quantity. For this, the administration should be set up efficiently. Earlier, the administration was made with pen and papers. Later computer programs have been used, as for example Microsoft office and especially Excel. The problem of paper and excel is updating and sharing information.

Nowadays, in most structures, an ERP (with Warehouse Management function) or a Warehouse Management Software/System are used to administer the work and to get information. With such software, the number of mistakes decreases, and the discrepancy is lower. WMS are important for the company in its totality. All information generated by the software are constantly updated and shared to the whole company. Thus, the executive and commercial department will have instant information concerning for example the stock amount, the turnover of the day. Knowing the real-time stock is an important factor for sellers as they will have a constant update on the availability and will inform the customers with precision. (Bloomberg D., LeMay S., Joe H. 2002 and Fender M., Bardon F. 2012, Warehouse Management System)

3.1.5 After sales service

Most companies need an after sales service. For logical and practical reasons, it is in a warehouse. Refused packages or returned products are received in the same area than the goods coming from suppliers. Products restocking will also be performed in the warehouse. The person in charge of the after sales service has different missions to accomplish. The first is to open the packages related to after sales. He must identify the sender and identify each product returned, and to understand the reason of the return. Products are all checked, and their functions are tested. Customers can ask to be refunded, or they can ask for a service such a maintenance or replacement. Once identified, the product must be temporarily stored in a special place to wait a decision and instructions. The instructions are given by the representative, the warehouse manager or even an executive if the goods returned are expensive. The temporary stored products can be returned to the customer, can be sent for maintenance (in the company, to a subcontractor, or at the supplier), or can be restocked. If products are restocked, customers will be refunded. The products restocked are considered like new products and can be shipped to other customers. A good after sales service is also a guarantee of quality for a company. (Reinders, M. 2016 and La RSE et le développement durable en entreprise. 2017)

3.2 Workforce management

Nowadays, technologies take an important role in the management, and especially in warehouse management. ERP and WMS are great tools to avoid mistakes and creating efficient service. Automation is also taking a bigger place in industrial and commercial companies. However, the human work remains the main and the most important factor. Employees are running the software, checking packages, packaging, thinking, organizing and handling. All their actions are important and cannot be replaced by machine. This part will discuss human resource management and its relevance with a focus on warehouse management.

Human Resource Management (HRM) includes all the practices set up to administer, and develops human resources involved in the activities of an organization. These human resources are the set of all collaborators inside an organization. Subcontractors are also part of a company's human resources. This is an operational function. It is aimed to administer the staff, its number, and to spread it to different hierarchy or qualification levels. It manages payments, the labor law and the employment contracts. It must improve the communication between services and processes. It should also set up a development of the collaborators during all their working time the organization (e.g. career management, recruitment, and training). (*Investopedia*, 2016 and Management Study Guide. 2008.)

Human resource management intervenes at every stage of the life of the employees, from the moment they apply for a job and their hiring till the moment they leave. It is divided into several parts: the definition of the task, recruitment, career management, training, payment management, performance evaluation, solving conflict, social relations, motivation and involvement of employees, communication and working conditions. To empathize the competences, motivation, information, and management, some management tools must be considered:

-recruitment: by analyzing the competences and the motivation during the recruitment, a company ensures that the staff has the skills and qualifications required.

-training or coaching: To improve the level of competences of the employees. Training is also a good way to involve and motivate the staffs. It proves their importance.

-motivation: Motivation could be positive or negative. It can motivate positively by giving recompense (e.g. giving congratulation, bonus, promotion, and training) or negatively by giving sanctions (cancelling a bonus, or firing). (Sanders J. 2012)

Human Resource Management in a Warehouse:

The global activities in a warehouse are managed by the supply chain department. The supply chain coordinator gives instructions and information concerning the strategy to the warehouse manager. The warehouse manager is managing the operational work. He carries out the operations with the help of the different team leaders. Every dock of the warehouse is supervised by a team leader who report the work done and the problems to the manager. The manager defines the priorities and allocates a number of employees according to the priorities.

In case of peak period of activities, sick leaves or if there are some delays in the warehouse, the company can use temporary workers. To have a temporary worker effective quickly it is important to use employees who are used to work the in company. If temporary workers are the same every year, their training will be shorter. To make the temporary workers loyal, it is crucial to give them good bonuses and working conditions. If it is difficult to use employees from the previous periods, to avoid a long training period, an interim worker must have easy tasks, without special qualifications required. Globally, if tasks are easy in the warehouse, it will be easier to find and to trust interims. Having good management, good software, and a team leader is important to guide interim workers. (Gazanhes D., Leoty A. 2009)

Leave management is another aspect to consider. During the summer time all organizations must face this problem. To face this aspect, an important factor to consider is anticipation. Without anticipation a manager can be obligated to take into consideration the leave requests of all the employees at the same moment. He will have to face potential conflicts and will have to refuse some requests. With an anticipation of several months, it is easier to manage the leaves and to find a good agreement with all the employees. The manger should prioritize according to the number of remaining days the employees have. The manager must support the employee to take an early decision concerning their leave to find a solution in case of refusal. Persons with responsibility of the same sector should agree to take they holidays in different times. For the employee must split the leave over the 2-main holidays month (July and August in Europe). Splitting correctly avoids hiring too many untrained temporary workers. (Gazanhes D., Leoty A. 2009 and Sanders J. 2012)

Leave management is an important aspect and strategy of management. Rules must be carried out according to the global interest of the organization. The manager must inform in advance the projects of the company. If employees are informed they will not be surprised in case of refusal. To avoid protestation, the company can set up some priorities. For example, employees with children's can have the priority to take holidays during school holidays. If an employee gets the advantage over another employee one year, the manager must give to priority to the others for the next year/request. When rules are established in advance, employees cannot complain or create conflicts.

During the summer time, it is important that all the departments of a company stay functional. Employees must inform their colleagues of their current project and tell them about their work. Employees from the same department must be able to substitute each other. Before leaving every employee must give the key elements to be able to work during their absence. (Gazanhes D., Leoty A. 2009 and Sanders J. 2012)

4 RIVOLIER AND CURRENT SITUATION OF WAREHOUSE MANAGEMENT

This chapter will present the commissioning party. A description of the company, its activities, and its partners will be executed. Then a focus on the logistic service and the warehouse will be made. Finally, the issue occurring in the warehouse will be explained.

4.1 Rivolier

Rivolier is the French leader concerning the distribution of hunting, shooting and defense goods. The company was created in 1830. The offices and the warehouse are in Saint-Just-Saint-Rambert, France. Approximately 70 employees are working, including traveling salespersons.

The company is an exclusive importer of several brands. Most of the brands are American, German, Italian and Turkish. The partnership with these brands allows

Rivolier to have a strong position in the market. In France, the company is the biggest importer of weapons, ammunitions, optics, gears, clothes and hunting accessories. The mains suppliers are Remington, Blaser, Sauer, Zeiss, Bushnell, and Fiocchi. Garmin is also a partner in France but exclusively concerning the commercialization of their Dog Tracking Systems. Beside hunting goods, the company is developing another activity. They started approximately 20 years ago to commercialize products related with security. Equipment for police, the fireman, the customs officers, the soldiers and so on are sold by Rivolier. The company is only commercial, it does not have its own industrial production. The company is exclusively working in Business to Business. All products are either sold to gunsmiths, administrations or other resellers. The final customers cannot order any goods in the company, not even on the website. Marketing plays a big role in the commercialization of the goods. The target of marketing is the final customer/consumer. It permits to reinforce the brand image. The catchment area is the whole France. Even during the last economic crisis, the sales of Rivolier increased, thanks to important commercial efforts.

The hunting market is a complex market. There are a lot of regulations and laws concerning especially firearms and ammunitions. The importation is regulated, customs are very scrupulous to check declarations, waybills, and the content of each container or pallet. All weapons commercialized in the European Union must be certified by a European proof house. All these regulations and controls hinder fast innovations and the introduction of new products.

Rivolier has an advantage with a big number of suppliers. The partners are popular around the world and known for their quality and performance. This fact is an important advantage for Rivolier which benefits of this notoriety. It is important to consider the fact these brands are the most selling in their respective market (weapon, ammunitions, gear, dog tracking systems). The main competitors of Rivolier are also importer having partnership with other brands. Some other competitors can be industrial companies producing weapons, or brands running their own distribution like Browning or Swarovski Optics for example. Rivolier owns a strong selling power with a team of approximately 15 representatives, visiting customers or working in the office. To keep a strong competitiveness, Rivolier

participates in numerous fairs related with hunting or security in France. The company is also using specialized media to communicate. They lend some material (e.g. new product) to journalists to make them write articles about the products.

4.2 Warehouse and its operations

Supply chain management is an important aspect for Rivolier as most of the suppliers are foreigners. The warehouse is in the middle of the supply chain process and plays a key role. Rivolier is in the suburb of Saint-Etienne, in the middle of the Auvergne-Rhône-Alpes region, easy to reach. A team of approximately 15 workers work 5 days a week (from Monday to Friday). The supply chain is managed by one director and one coordinator. The warehouse has a main manager in charge of the global functions of the warehouse. He is assisted and substituted when needed by one sub-manager. Approximately 14000 products are stored in the warehouse, and in average 300 orders are delivered every day. The warehouse is divided by 3 different sectors: The main warehouse, the bulky items warehouse, and the ammunition warehouse. In total the warehousing surface is 9500m². A renovation and enlargement of the warehouse was made in 2015 to face the increasing demand and to optimize the process. The same years the company acquired a new Warehouse Management Software (WMS): MagiStor®. Before that, to manage the warehouse, Rivolier was using the Enterprise Resource Planning (ERP) module. Today, the ERP is still used in the warehouse for the aftersales service or to have information concerning the products, and order forecasts. The ERP is mainly used for the commercial, accounting, purchasing and marketing department. The information of the WMS is constantly updated to the ERP and vice versa.

Magistor® allows the management of the whole warehouse activities and process. It manages at the same time the storage warehouse and the order preparation. All movements are automatics and updated constantly to allow a follow up in real time. There is an interface between the WMS, the ERP, and every different technical equipment of the warehouse, such as scales, paper or label printer. It manages the

different types of storage locations, the cartography and advises for the replenishment. It optimizes the movements of the workers, and allows a better yield and quality.

The workers in the warehouse are all equipped by PDA barcode scanner. The scanners are used in every activity of the warehouse, from the inbound dock to the outbound dock, and are also used for the tracking and follow up. The workers can scan the EAN (or bar code) of products, the storage location (a bar code is assigned for every storage locations), or shipping label. In the warehouse 8 computers are available for various type of use. They are all equipped with the WMS and ERP module, Microsoft Office and with the internet access for emails. Besides that there are 3 paper printers, used for example to print picking order, or waybill. There are also 1 shipping label printer, and 2 product label printers.

Four employees are working on this area in the inbound dock. The same employees also proceed to the storage of the goods.

In this dock, goods are received. Packages or pallets from different suppliers are received every day. The goods are first stored in a special location. Some dangerous goods such as machine guns and hand guns are stored in a locked place where only a few employees have access to. The pallets and packages destined for the After Sales Service are moved to the after sales area. The waybill and invoices are collected and sent to the purchasing department which generates a reception voucher. This "reception" will also be recorded in the WMS. Products and quantities are controlled before being stored. Products are stored in standardized cartons and labelled. The bulk stock is conditioned on pallets, labelled and stacked. The supply chain department allows 48 hours to store the goods.

Some goods are stored in the customs bounded warehouse. The dutiable goods can be stored there without paying any duties. When the company decides to use the goods stored there, the duties are payed.

Once identified, controlled and conditioned, the goods must be placed in their storage location. Big quantities are stacked on pallets in high rack. These racks have a standardized size able to store a standardized European pallet. The worker assigns a product and its quantity with the PDA bar code scanner. The product is scanned, then the quantity is manually typed, and finally, the storage location is

scanned. If a product has a serial number, the serial numbers must be scanned or typed to be registered. In this case the worker will not have to type the number of goods. The number of good will correspond with the number of the serial number typed. Goods with a serial number are easier to track. High rotation goods have a special location. If a product already has a location, the PDA will guide the employee to the storage location. Products are tidied according to their type, brands and the rotation/turnover of the article. Mistakes are avoided as all articles and storage places must be scanned/flushed. The reception of regulated goods is more complicated. Weapons must be speared in two parts and must be stored in two different locked houses. The process is longer. One worker is specialized in the replenishment.

Four persons oversee the order picking and three oversee the packaging. The order pickers are the first actors in the outbound dock. They have a picking voucher (called pool). A customer's order generates a pool voucher. In this "pool", they see what they should pick up. The order picker chooses the size of the carton according to the number and the sort of goods. The technique is called pick-and-pack. Order picking is optimized thanks to a storage of the articles considering the rotations of the article. Besides that, the shortest way is drawn automatically by MagiStor®. The articles close to each other will be collected one after the other.

When the order is ready, the order picker leave the carton(s) with the goods and the voucher on a "pickup point". A barcode is assigned to every carton. The order pickers assign the order (which have a number) to a specific pickup point. The pickup point is aimed to regroup the goods of the same order when the picking is divided by zone. The picking could be divided by zone to avoid too much movement. Going to another zone to pick only one or two items is not efficient. An order picker usually picks the order in the same zone, and goes to the meeting point just several times a day.

The second actors in the shipping area are the packers. A packer takes the cartons on the pickup point according to what the manager tells them. If there are specific requests, the manager gives instructions to the packers. The manager also says which order must be packed first. The packer fills in the carton with foam and then

tape it. If there are ammunitions in the package, they must put a special label on the carton.

The manager controls and guides the packers and the order pickers. He also deals with administrative issues, such as customs declaration for foreign shipping. According to the customer, there are different ways to proceed. Foreign customers order need to be declared. Customers who order online have priority. Important customers should be delivered faster than the others. All these facts must be managed and prioritized. Once packaged and labelled, the packages or pallets are dispatched according to the carrier. The freight transportation is provided by local, national and international carriers.

One person oversees the after sales service. In average, 15 packages or pallets are returned daily. The packages are opened, checked, the customer and the products returned are identified. Some of the products returned by customers can be restocked in the warehouse.

The most common type of inventory consists to count and check all the warehouse items in a couple of days involving most of the company employees, and temporary workers. This implies a temporary pause of activities. With MagiStor® the inventory is made part by part during the year. The activities are not stopped. The zones or shelves are counted one by one, and the stock is constantly updated. All shelves or products must be counted at least once a year.

4.3 Warehousing issue

Every year the company, and especially the supply chain department is facing a big challenge. The activities of the warehouse are increasing a lot due to the seasonality. From May to September there is a big peak. Besides the peak activities, the company gets new markets every year and the sales are constantly growing. This high demand gives more work to the warehouse.

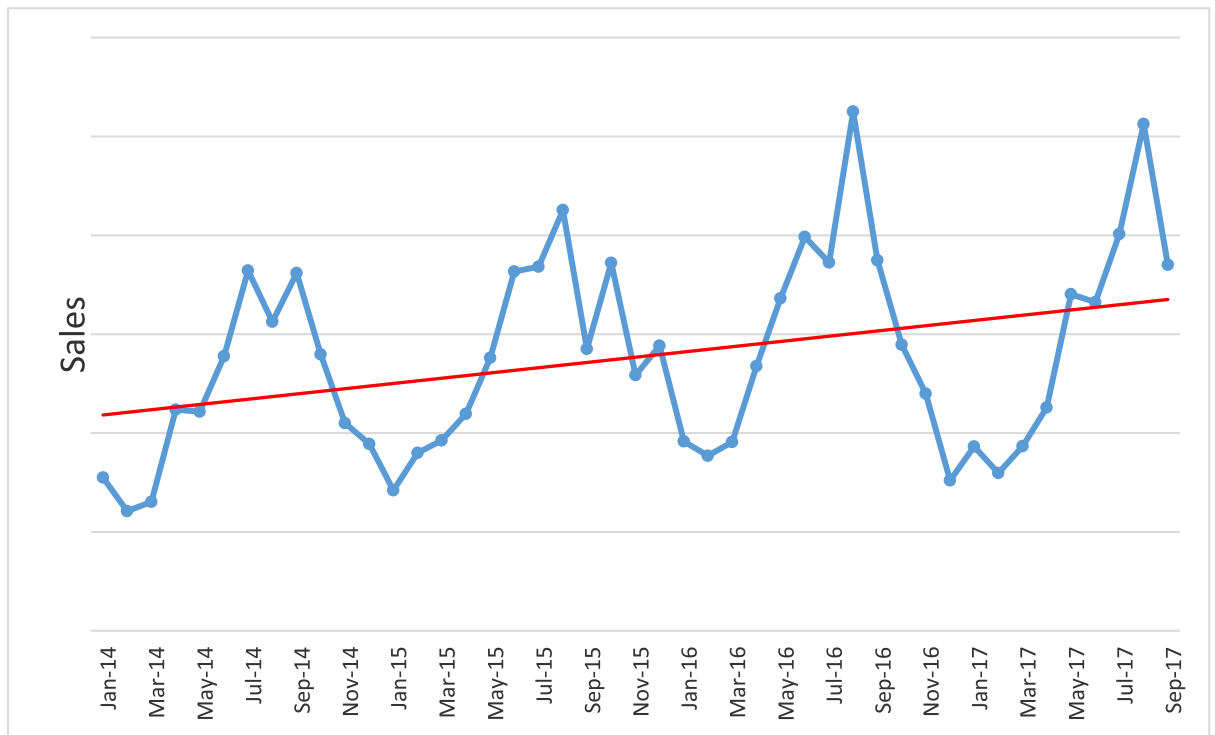


Figure 1. Rivolier's turnover over the last 4 years with the trend line of the sales

Figure 1 has been made thanks to the data given by the company Rivolier. The data corresponds to the sales of the company from 2014 until now. The blue curve represents the monthly sales from January 2014 until 2017. The red line is the trend line of the sales. This allows to see the sales' seasonality. The blue curve is going once much higher than the trend line and then much lower. This event is repeated every year at the same moment: this is seasonality. Moreover, the trend line shows that the sales are increasing, they have been rising constantly from 2014 to 2017.

Because of the peak, the warehouse is lacking reactivity and there are some delays concerning the reception of goods and order picking. Moreover, the occupancy rate of the storage location is high. Goods reception must be managed efficiently to save maximum of place.

The hunting season in France starts in September and is the main reason for the peak. Gunsmiths are anticipating the hunting season and order a lot of goods from May to September. During these months, delivery deadline must be respected, clients must get what they ordered, and the goods receives must be on time. To face this increasing demand, more products must be received and stored. Beside that fact, the peak activities happen during the summer time when employees are

on holiday. This is particularly challenging. Leave management and temporary recruitment must be optimized to avoid workforce problems.

Some other issues must be considered. Most of the suppliers are foreigners, and some big brands such as Remington or Bushnell are from the United States. The delivery cost is more important for goods coming from there. The lead time is also longer and difficult to calculate. To reduce the cost, it is more efficient to place big orders. The goods coming from America are sent in containers and it is more profitable when the container sent is totally filled. When a full container is received, a big good reception is engendered, and thus, the occupancy rate is getting quickly higher.

During the summertime another factor can slow the process down. Weapons coming from a non-European (EU) country must be certified by a European Weapon Proof House. The good reception must be done in a special way, and the goods must be stored in a special location where they cannot be picked up. Once stored, these goods must be sent to the proof house. It is almost impossible to define the lead-time. It depends on the number of products the proof house is receiving. The proof house is a non-profit organization governed by the State; they do not have the agreement with companies and do not make priorities. They are working in First in First out (FIFO). The brand manager and supply chain coordinator must consider this proofing to be able to deliver the customer on time.

5 RESEARCH METHODS AND RESULTS

In this chapter, theoretical information will be exposed to introduce the research. After it, a description of the data collection will be given. Then, the results of the research will be presented in three different phases. The result of the secondary data will be presented first, after the interviews will be described, and finally personal notice and observations will be exposed.

5.1 Semi-structured interviews, primary and secondary data

Semi-structured interviews

Semi structured interview is a technique to collect data commonly used. Using nonstandardized interview permit to guide in several parts the speech of the questioned person. The speech can be divided in different themes defined beforehand by the interviewer. A questionnaire must be prepared in advance by the interviewer. The fact numerous questions are asked is interesting to get a lot of data in different kind of topics. There is a plan to follow to ask the main questions, but the interviewer keeps a certain freedom. The right questions have to be asked to collect maximum of data.

This kind of interview is interesting to get data in order to carry out a comparison. The interviewer has possibility to control the interview and to refocus the topic on what is relevant in the research. Semi structured interview helps to ask additional questions or to get extra explanations. (Saunders M., Lewis P., Thornhill A. 2009, chapter 10)

Secondary data analysis

Secondary data are information already existing when a research is undertaken. The secondary data can be internal or external. Internal data are available in the organization for example activities reports, surveys, archival, files, customer information and data base. Having such data implies a strict storage and an easy access in order to be gathered and used. The external secondary data can be obtained with the help of information center, research center, banks, commercial offices, professional federations...

The secondary data are already existing and could be sometimes analyzed. When these data come from a trustworthy source, organizations or researchers can rely on it. For them it saves time and costs. (Saunders M., Lewis P., Thornhill A. 2009, chapter 8)

Collecting primary data through observation

Participant observation is a method in which the researcher participates in activities on these whom they are studying. Participant observation can be done during a training or a working period for instance. The employee will adopt a role of researcher. Potentially any kind of role can be played by the researcher. The purpose is to develop theory. The aim of the observation is to generate primary data. (Saunders M., Lewis P., Thornhill A. 2009, chapter 9)

5.2 Conducting interviews, analyzing secondary data and observing

Interviews

To carry out the research, 4 interviews were executed. One interview has been done with a manager of the company Rivolier. This interview has been made to get additional information concerning the current actions lead in the company concerning seasonality. Having information concerning the company is crucial to make a comparison with other companies. This interview has been done in the company Rivolier. It lasted approximately forty-five minutes and was made using a semi-structured interview. Speaking with a person of the company was also useful to get secondary data. Some data related with the sales of the previous years and information related with the summer holidays have been asked.

To continue the research, being able to compare situation and get additional information, three more interviews have been carried out. To make a comparison, it is relevant to choose the same type of company that can potentially face the same problem. Therefore three international companies have been chosen. Moreover, all these companies have a seasonal demand. As forecast in an important aspect of the research, one of the interviews has a focus on the forecast and scheduling. This interview lasted approximately thirty minutes as less questions have been asked. The two last interview lasted about one hour. These three interviews have been made via Skype, a questionnaire have been sent few days before the interview. The interviews have been carried out after the theoretical part to have a sufficient level of competences during the interviews.

For every Skype interviews an audio record have been recorded. Results have been compared individually. Only the most relevant information has been summarized and developed.

Analysis of secondary data

During the interview with the commissioning party manager, some data and information have been requested. Some data could be relevant to analyze for the research.

Data concerning the sales of the previous years and the summer leaves have been collected. Having these data are interesting for such a topic. Analyzing the sales data are interesting to show the seasonality and potential evolutions. Concerning the sales, the turnover of every month of the last years have been transmitted. Some comments about seasonality and the trend of this seasonality have been made. Thanks to these precise numbers, a forecast of the sales for the future year have been calculated and analyzed. Lately, information concerning the summer leaves can be used to analyze human resources and to plan a temporary hiring.

Observation

The observation has been carried out through complete participation. Complete participant is part of a group and takes part of the activities. Taking part of the group and the task helps to collect even more data, especially concerning the operational work. Collecting data by observing is interesting and helps to collect additional data, and to collect information that even manager do not have. Systematic observation is a way to collect maximum of information. The collection process has been long (approximately fifteen months). This observation is useful to see how managerial decision are applied operationally.

5.3 Results of the secondary data

The sales of the 4 previous years are going to be presented and analyzed. This will highlight the fact the company has a seasonal demand. It will permit to make some observations and affirmations.

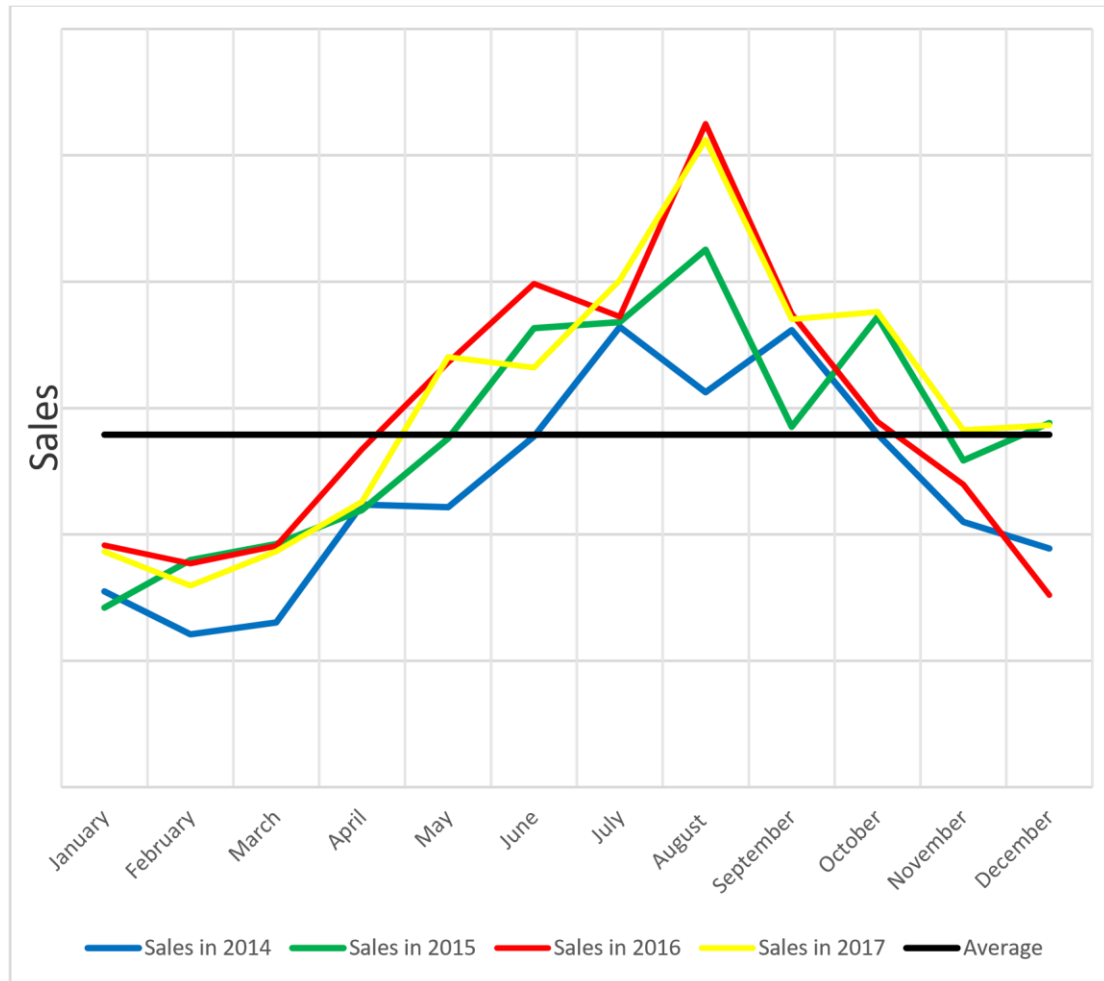


Figure 2. Rivolier's sales from 2014 to 2017.

The average has been calculated for the monthly sales from 2014 to 2017. The average is represented by the black line. The sales of 2014 are represented by the blue line. The sales of 2015 are represented by the green line. The sales of 2016 are represented by the red line. The sales of 2017 are represented by the yellow line (the sales of October, November and December have been forecasted).

Figure 2 allows to see the actual seasonality in the sales of Rivolier. Indeed, seasonality refer to episodic fluctuations that happen in a specific moment/season. The line of average helps the reading. We can see that sales tend to be more important every year in June, July, August and September. The global trend is the

same every year. From 2015 the sales have been at their highest in August for 3 consecutive years. The peak period can be divided in two parts:

-The climax in June, July, August and September. The activities are at their highest. The workload is important.

-The rise in April and May and the decline in October. The activities are not at their highest but are still higher than the average. The workload remains important.

Besides the peak period, it is also possible to notice that the sales are rather low in the beginning of the year. The sales start to grow slowly in March. This growth is accelerating in April and May. After the peak period, the sales are starting to decrease from October. The slack period is then in November, December, January, February, and March.

Figure 2 also allows to see that the sales are growing constantly every year. Even though the peak has been a little bit higher in 2016 than 2017, the sales are getting higher every year.

Using this figure is a good way to identify the seasonality and to have a good overview of what happened in the previous years. Forecasting the sales is a good way to identify the peak activities with precisions. Identifying allows to be prepared in advance and to be able to manage the logistics during the peak period.

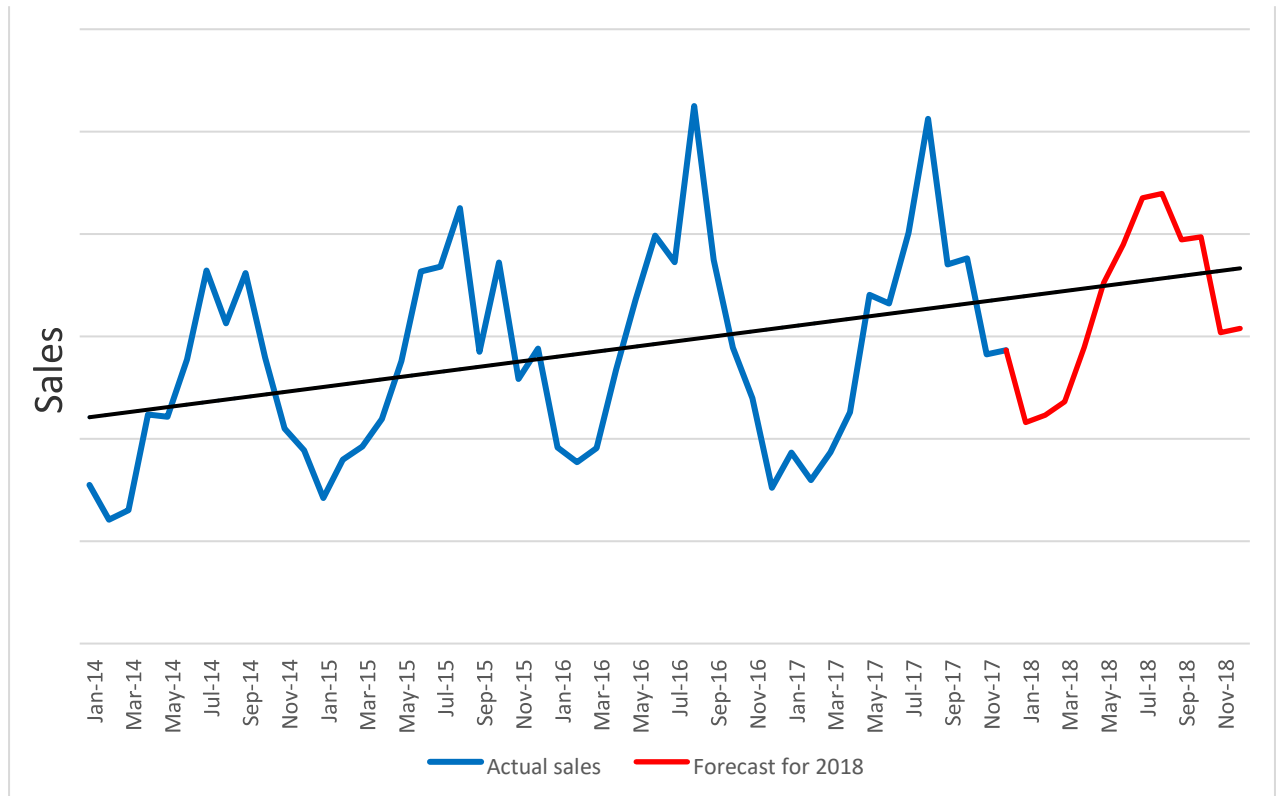


Figure 3. Rivolier's sales from 2014, and the forecast of 2018.

Figure 3 presents the sales of Rivolier over several years, and a forecast for the twelve coming months. The blue line represents the actual sales of the company. The red line represents the forecast for 2018. The black line is the trend line of the sales. The forecast is evidently following the trend line. It is easily possible to see that the sales are also going to be seasonal, with a slack period and a peak period. An observation can be made concerning the growth of the sales: the growth continues. The peak period seems to be longer but with a lower climax unlike 2016 and 2017. Compared with 2015 the peak looks more regular in 2018.

A focus on the forecast for the year 2018 will give more accuracy.

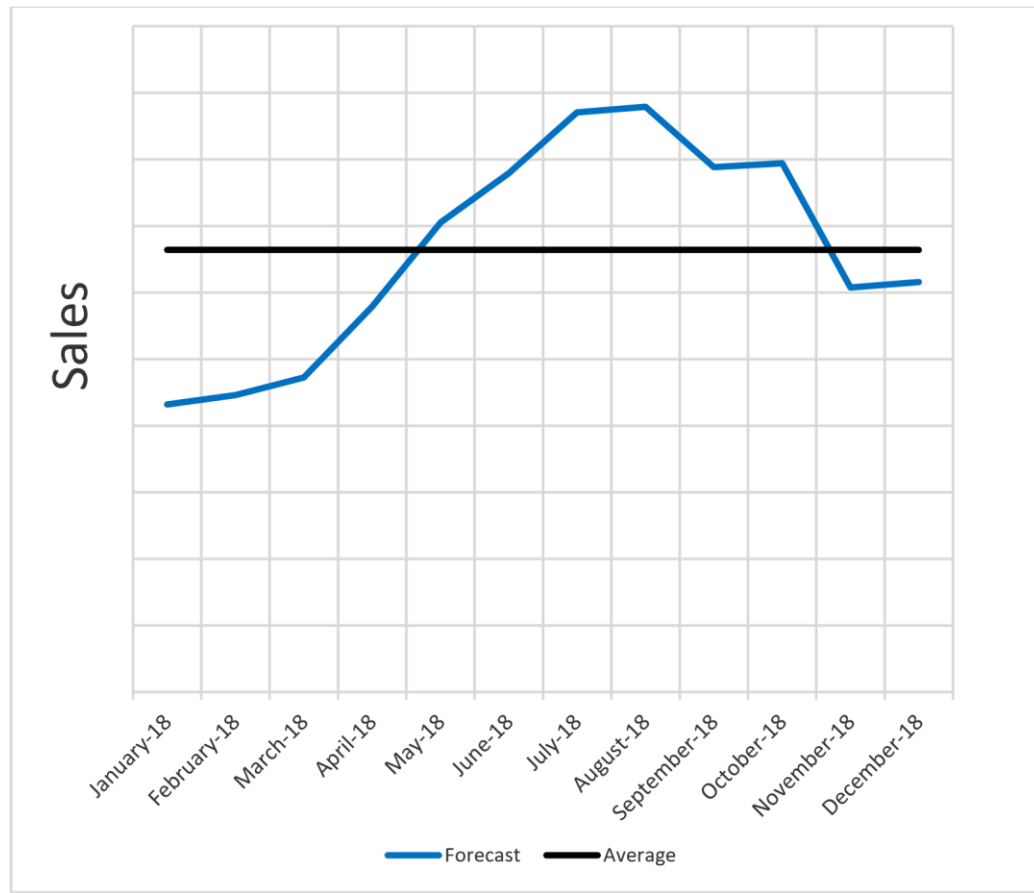


Figure 4. Rivolier's sales forecast for 2018.

Figure 4 introduces the forecast for the year 2018. The blue line represents the sales forecast for 2018. The black line represents the monthly average of the forecast sales in 2018. This figure shows that in 2018 the seasonality will be still significant. July and August will be the climax of the peak. And the "long peak" will be from June till October. This year October will be still part of the peak, unlike the previous years when it was already the decline of the peak. From October and November the difference of sales is going to be significantly lower. The beginning of the year will be like the previous years. It will start slowly with low activities. It will start to increase between March and April and rise constantly until the climax in July and August.

5.4 Results of the interviews

The results of the 4 interviews will be discussed in the following part.

Interview with the person in charge of quality at Rivolier

The person in charge of quality at Rivolier has a long professional experience and used to work in several companies. He leads different works in the company to improve the quality. An important part of his work is related with supply chain management.

Different topics have been discussed during this interview. Several aspects such as seasonality, warehouse management, planning, and quality. Open questions were asked to get long answer with reflection, opinion, and feelings. Not just facts.

The main part of the interview was related with seasonality. The questions were focused on the seasonality and the activities in the warehouse. The commercial action that could be led to avoid seasonality were not discussed.

To fight against potential problems created by seasonality, several actions must be carried out. Mr. Fabregue stressed the fact that planning is the most important aspect to consider. Planning is imperative especially concerning the material requirement. The company must be able to order and store goods in the right moment to avoid over stocking, or to avoid a big number of good reception at the same time. The order must be placed according to the planning of the sales. This implies a good sales forecast for each product or brand. Planning helps to know when big tasks will have to be executed. Having the information about a big task of a long period of activities helps to schedule. Thanks to this information the manager will know when he will have to hire more employees (or temporary workers). The warehouse manager will be also able to assign employees to a specific sector (e.g. good reception, order picking, replenishment) and to give them the most urgent tasks. Knowing the need in advance helps to plan the hiring. It also avoids emergency decision.

Marc also insisted that operational work is an important aspect that needs to be considered. Even if the forecast, the planning, the purchases, and the order are carried out in the offices, all the operational logistics work happens in the

warehouse. Having a good management is a crucial aspect for the company. To maintain a good management, it is important to give individual and team objectives. Objectives help to involve the employees. To dictate the daily objectives, the manager is advised to start the day by a global meeting with the warehouse workers. He then makes a report about the activities of the previous day and gives the objectives. The manager has the information from the supply chain department and will manage its operation in order to anticipate.

When a company has an effective software all the capacities and features must be exploited. The software is an important tool. It shares easily the information and updates it constantly. Controlling this tool and knowing how to use it perfectly will make the process easier. Training concerning the software is important. Every employee must share his experiences, and train other employees to share the knowledge. A real cooperation must be created between all the employees and clear instruction from the manager must be given.

Interview related with forecast and planning

I made this interview with a German worker specialized with forecast. The company and he will remain anonymous. This international company is specialized in sales of electric components. 600 employees are working worldwide in 10 production plants and offices.

In every production plan approximately three persons oversee forecasting. They are collaborating with product planners and supply chain partner from different production plants. Each employee is responsible for different business units. The company has more than 20000 different articles. The production needs to know the correct demand to produce the right amount of products. The forecasters analyze the forecast themselves. To forecast, a collaboration is set up with the product manager, the supply chain department, the production plants, and the distribution center.

The forecast concerns the number of pieces to produce for the next 18 months. The demand for many materials is forecasted. The forecast is based on the history

of sales. Trend, constant, and season are considered. The management software calculates which model is correct for the material, suggests a forecast technique, and the employee checks if it is fine.

For the company it is important to forecast because they have different plants, where different parts are manufactured, thus a wide portfolio of articles, since the production needs to see which articles they must produce in which amount. The data created is analyzed manually and thanks to the management software. The forecast team has access to edit the forecast when needed. The production sees the forecast in a different IT system where it is uploaded. Thus, they have information and know how to plan the purchases and the production. The forecast is used for operative planning but not for strategic planning for the board.

The management software sees which material is behaving seasonal and offer a seasonal pre-planning. This is only working for articles which are already used over a long time. The sales history helps to detect seasonal demands. To face some seasonal issues the company uses a safety stock. Defining how long an item should be stored in the warehouse is part of the work. It is crucial to recheck the safety stock values to have an optimized storage.

Interview with a supply chain coordinator

This person is working in the supply chain department of the company BSHBytowije-Pribory. BSH is a German manufacturing subsidiary in Russia. The company produces electric household appliances such as refrigerators and washing machines under Bosch and Siemens trademarks. The production site, offices, and warehouse are in St. Petersburg. Approximately 500 employees are working in St. Petersburg's site.

The suppliers are numerous and provide different types of raw material, spare parts, and components to manufacture the appliances. Most of the suppliers are international. The two main suppliers are Würth and ThyssenKrupp. The customers

are retailers. In Russia the main customers are Eldorado and MVideo. The company is selling appliances in whole Europe and Kazakhstan.

BSH-Bytowije-Pribory is using an ERP to manage its operation. The ERP includes a WMS for the management in the warehouse. This ERP is also specialized for the material requirement planning. The production planner gets information from the customers and the forecast department. The customers give production orders according to what they want to buy. The orders are integrated in the management software. Thanks to this information, and the information related with the current stocks (either finished goods or components), the production planner can place orders to the suppliers or make a production order.

The company has a seasonal demand. During the winter the sales of electric appliances are decreasing. There is a low period from November. Sales start to rise again from March and reach a peak in the summer. The high period of activities happens when the activities of the suppliers is lower (summer holidays). The supplier cannot prevent the demand in every case.

Some problems can occur in the company e.g. during the peak period the company suffers from a lack of employees; this lack affects particularly the production. Besides that, the suppliers are mainly foreigners and lack capacity or reactivity. It is difficult to define an exact lead-time, and an exact number of items to be sent. The storage places are not big and the occupancy rate is most of the time high. The company must find the right balance between lacking a product and not being able to receive a new one. The stock could also be high because the suppliers give a minimal order quantity (e.g. a pallet, a truck, a container).

The company is acting differently when the activities are higher. When the activities are low, working week starts Monday, and ends on Friday. When the demand is higher, Saturdays are also working days. The number of working hours increase significantly. As a compensation the employees are payed more on Saturday than on normal days. To increase the workforce the company also uses temporary workers. A special outsourced company oversees temporary recruitment, Kelly Service. Most of the temporary workers work either in the production line or are fork lift drivers. Temporary workers hired by the company have mostly had previous

experience in the company. For new temporary worker they offer short training programs.

To fight against the small capacity of storage and a high occupancy rate, the production planners try to reduce the amount of weekly orders. More shipments are delivered daily. The security stock is reduced and the just-in-time delivery is applied.

To apply this, forecasting is an important aspect. The production plan is made according to the forecast. Planning the production line includes component requirement and workforce requirement. Component requirement implies purchases and deliveries. A forecast even with errors helps to see the trend and helps to make decisions. However, decisions need to be taken carefully.

A collaboration is set up between the warehouse manager and the person in charge of purchase and production plan. The employee in charge of the purchases watches the orders and informs the warehouse management when a purchase is placed. He gives information concerning the date of arrival, the type of items, and the number of items. The job of the purchaser is to avoid too early delivery. If a delivery arrives earlier than forecasted, it can be a problem for the warehouse. The warehouse may have not enough storage. Controlling the reception time is vital when the just-in-time is applied. Goods must be stored not too early but also not too late.

Lately, when the activities are higher than average and this peak cannot be managed like usually, the company can externalize a part of the stock. Outsourcing the stock helps especially when a big quantity of the same item is received.

Interview with a logistics planner

This person is working in the French company Pasquier. This company is specialized in the production of bakery products and especially rusks. In this production plant, 160 permanent employees and 100 interims are working. The main supplier is Chinese and supply flour, other suppliers provide other kind of raw

material such as milk and eggs. This international company sells most of its products worldwide to large retail outlet.

The management of this production plant is decentralized. Even if this production center belongs to Pasquier, it is free to make its own decision. This logic is the same for all production plants of the company. The main thing is to fulfil the requirement and the objectives aimed by the headquarters.

The company has lower activities from May to September. This is due to the drop of the transport activities. The production plan must adapt its production to the market of transport. The production cannot produce more products than carriers can transport. The activities are rising in September and have a peak from October to March.

To compensate the increase of sales the company extends the working time for the employees. A bigger number of temporary workers are employed during this peak period. The company is collaborating with Manpower who chooses the employees. The interims have a trial period of two days before being able to have a longer contract. The production line manager decides to keep an employee or not. To make them efficient quickly the manager gives them a small training and gives them the easiest tasks.

The production rises and thus, results in a rise of the quantity of stored products. To be able to store the products newly produced the company lowers the stock of other references. To lower the stock the production is reduced, or stopped if the storages are enough to satisfy the customers' needs. To lower the stock a bigger commercial effort is applied to accelerate the sales.

To know if the customers' needs will be matched, the company forecasts the sales, and consequently, will know the production needs. The company uses a software to forecast the sales. Forecast is made according to statistics of previous years' sales and according to the position of the company in the market. The loss and win of customers will be considered as well. The production orders are all made according to the forecast. This helps to manage the stocks and the logistics. The forecasts are accurate and give the potential date of shipping for the finished goods. Objectives are aimed according to the sales forecast.

5.5 Personal notes and observation

During my working time in Rivolier, I had many tasks. I was present during the two peak periods. During this time I made some observations and analyses. Working in different teams and docks is a good point to observe the global functions of the warehouse management and functions. Understanding the goods' reception, the picking order, the after sales services, the packaging, and shipping area is a key to understand the global logic of logistics. Transportation is outsourced and is not included in this topic. Being a field worker helps to understand directly the problems operational workers have. Being involved in administrative tasks also helped to understand all the activities directly related with the logistics in the company. The brand managers and their purchase assistants order goods and manage the relations with the suppliers. They play a role concerning the goods reception (they help to control the goods and check if they correspond to the order) and they play a role concerning the after sales. The sales department plays also a role in the logistics. They send the information concerning the orders in the WMS. They are also involved in the after sales service, as they have the customers' information. The financial department can also be involved in the logistics, as they give the authorization to deliver the goods to a customer.

Anticipation

The slack period is the best moment to start to anticipate the peak period. During the slack period, the activities are lower, and the manager can give tasks nondirectly related to the activities. Different background tasks are set up to solve problems and to prepare for the future. Slack period allocate time and the manager must use this time in the most efficient way. During the peak activities the focus must be on the reception and shipping.

An important work during the slack activities was to arrange the picking area. The picking area is a crucial place for the warehouse. If this area is arranged correctly and efficiently, the goods reception and the pick-up of the order will be faster and

easier. The storage has been adapted to the WMS. Standardized boxes fitting in the standardized shelves have been installed to optimize the storage place. Different sizes of standardized boxes were added. Some goods necessitate big boxes and others small boxes, e.g., big boxes are used for goods with a big rotation. This arrangement gave the opportunity to proceed to a global replenishment. Identical items stored in different storage places have been regrouped in the picking area to avoid emergency replenishment during the peak period activities. This also left places for the bulk storage which has a high occupancy rate. Besides that, the dead stock stored in the picking area was moved to a special storage place. This storage place stores only dead stock or goods unfrequently picked. This left more space in the picking area and reduced the occupancy rate. New items could be stored faster.

During the slack period employees have more time for background work. The WMS system and the supply chain department decided to use rolling inventory rather than global inventory. This aspect is interesting especially for a company with a seasonal demand. During the low period of activities, the inventories of the warehouse can be made. It is not necessary to make the inventory of the whole warehouse. When the time allows the manager to assign some employee to inventory, the manager does so. The manager can also execute inventory for a sector if a big discrepancy was detected. Keeping inventory up-to-date is crucial for the company. When the stock is not up-to-date some problems can occur. It is a problem for the commercial department who cannot give the right information to the customer. It is also a problem for the purchase department which will not place an order to resupply in the right moment and lately some problem occurred in the logistics department where some order could not be picked up in totality.

When a reception is made employees must think that they are the first in the chain. They need to do their job perfectly to make the further phases easier, faster, and more importantly to avoid mistakes. Mistakes are a loss of time. Spending more time to prepare an order or to store good is not a loss of time. Checking several times the amount of a product or knowing if the product to store/pick is the right one is crucial. Fixing an error takes a lot of time. Avoiding mistakes is a gain of time, even if the storage process or the picking process has taken a longer.

Anticipation is a vital aspect. Employees must think about potential mistakes and must try to avoid it. Identifying properly a product and put a label on it (or its storage box) is a way to avoid mistakes. Making a distinction between the products is important. To avoid mistakes employees must think about the order picking and must avert confusion. It is better to store products which look like each other in a different shelf or a different row. If a good reception is made intelligently mistakes will be avoided and a lot of time will be saved.

Problems to be solved

One of the main problems during the peak period is the high occupancy rate. This slows down the process. To store new recently received pallets it can be difficult to find a storage location. The good reception takes a longer time than usually. This fact is also a problem for the bulk storage. Most of the time in one pallet only products of the same reference must be stored. This lack of storage place prevents that and some pallet can be used to store different references of product. This fact increases the chances of mistakes and divides the products in several locations.

Getting rid of the dead stock is a good way to reduce the occupancy rate. A collaboration with the brand manager can be set up or even the executives can be interesting. The executives can decide to throw away old and obsolete articles. For articles still sellable, the brand manager can propose a destocking with a low price. Selling these goods will create space for new goods. The lifecycle of an article must be also included in the warehouse and after the decline of a product, the company must discard it from the stock.

Another problem occurring during the high activities is the reactivity. The activities are higher, more products are received every day, and more products must be picked and packaged. Some delays can occur there are not enough employees or they lack efficiency. If some delays occur in the inbound dock, delays will be transmitted to the rest of the activities since it is a chain.

The most important aspect is to understand that all problems must be solved before the peak activities. During this period employees do not have enough time to take care of that, whereas, during the normal period they do.

Replenishment is an important part of the process. It should never be forgotten. Replenishment is useful to keep the order picker efficient and fast. If a replenishment is not made, the order picker will have to pick the product stored in another warehouse or stacked in a high pallet by himself. The picking process will be slowed down. During the peak period employees cannot afford to waste time, that is why the replenishment management must be applied perfectly and efficiently.

Strengths

The warehouse and the company in general have several advantages that help to manage its logistics during normal time and during peak period.

The warehouse uses a WMS, that is perfectly adapted to the structure and the nature of the goods sold. This WMS helps to reduce the mistakes. The fact employees must scan (with PDA scanner) every storage location, every product, and even serial numbers helps to identify and to ensure that the right product has been taken to/from the right place. If a wrong storage location or product is scanned the worker will be alerted and will not be able to pick it. The logic is the same for the good reception. EAN helps to identify products.

The WMS is also beneficial because of its easiness to use. The WSM use is intuitive especially when using the PDA scanner. The scanner guides the employee, for instance, during the whole picking process. According to the order, the PDA says where the employee must go, what he must pick, which quantity, and where he should leave the box of goods. This easiness is important especially during the peak activities. This permits temporary workers to be quickly efficient. A small training and an explanation of the warehouse's cartography are required.

Once the logic is understood the employee will be fully efficient.

Tracking and follow-up given by the WMS is crucial. Having a good follow-up of the activities is vital. When a mistake is made, tracking helps to know who made the mistake (every employee is identify that to PDA account) and at what date. This is interesting to have this information (not to blame the employee) but to understand

why and how the mistake was made. This helps to prevent future mistakes and helps to solve the current one.

The company can count on well-trained and experienced employees. Keeping them is important. Experience helps to reduce the number of mistakes, helps to be fast thanks to the knowledge of the products, and to the knowledge of the management software. Moreover, most of the employees are adaptable and can work in all docks. This adaptability is interesting and gives more possibility to the manager who can assign employees according to the working needs in the warehouse.

The company has a great network of temporary workers. From summer to summer, Rivolier tries to keep the same temporary workers. Using employees, you already know is interesting because you already know what they are worth. The training period of these workers is also shorter as they already know the system and the warehouse.

Aspects to improve

There is a lack of collaboration between the different departments and the warehouse. The communication is not shared from one department to another. When some modification is made on the software, on a product, or a brand, often employees are not informed. Lack of information is a bad aspect. To involve the employees even more it is important to give them the information, especially, when workers are directly concerned.

Improving this collaboration could help to improve the planning. The purchase department and the brand manager must inform the supply chain department for every big order and give with precision the date of arrival. The departments must control that the date will be respected. Knowing that information would help to anticipate the goods receptions.

Employees working in the warehouse must inform the brand manager when they find a problem or have an idea to improve something in the products (for example, when there is no EAN code on the products, when the boxes are not solid enough to be handled, or when there is an issue with the serial number). The brand

manager does not handle the products and is not a logistics expert. Giving them information (related with logistics) helps to find a solution or a way to improve the warehousing of the products. The brand manager can thus inform the supply and try to find a solution.

Operational worker is in the heart of the warehouse, they are proceeding to a different kind of handling, and they control their action better than anyone else in the company. However, their remarks/critics are not taken into consideration enough. A better dialogue must be set up between the employees, the warehouse manager and the supply chain coordinator. Their knowledge can help to solve some problem and to improve the process.

Giving objective must be done in a smart way. People must think more globally and should not only be focused on their objectives. Everyone will try to reach his objective while forgetting the global objectives.

6 CONCLUSIONS AND RECOMMENDATIONS

In this chapter, first the conclusion will be exposed. After it, some recommendations will be given. Finally, the reliability of the study will be presented.

6.1 Conclusions

The theoretical research is an important phase to become familiar with the topic. Theoretical aspects bring knowledge and help to understand the rest of the thesis. For this topic understanding what is seasonality and the consequences related with this phenomenon is crucial.

To detect seasonality an analysis of the sales must be executed. An analysis of the sales also permits to set up a forecast of the sales. Forecasting the sales is crucial to set up scheduling. There are several ways to forecast and companies must find the most suitable forecasting technique to have the most accurate forecast. Scheduling is essential for the company, it allows to anticipate the future actions. Thanks to forecast the company will know when the activities will be bigger, and when there will be slack periods. Thanks to that some projects can be carried out and a temporary hiring can be anticipated. Scheduling avoids making emergency decisions. It is also a good way to aim objectives. Objective is an efficient way to involve the employees.

For this topic warehouse management is an important aspect to consider. The warehouse is the place where all goods circulate. Every warehousing process has importance from the inbound process to the outbound process. Every process in the warehouse has importance on each other, this is why it is important to manage every phase properly.

The last topic in the theoretical research discussed workforce management. Employees carry out the operational work in the warehouse, managing them efficiently is crucial. Anticipating the summer leaves and training the temporary workers are important aspects of the management. To keep efficient employees their level of competences must be kept or even improved. Motivating the employees is another important factor. Motivation helps the employees to be involved and makes them more efficient.

To understand more deeply the topic, the issue of Rivolier's warehouse has been explained. The company and its activities are also explained on a global level. The

company has a peak of activities, when the amount of activities in the warehouse is high and some problems like delays occur.

In order to understand the peak and its trend over the years, an analysis of data has been made. Several figures were used to show the seasonality in a more transparent way. These figures show that the sales of the company are constantly increasing. Besides that, an observation concerning the seasonality and the peak have been made. The peak was clearly defined, July and August are the biggest months concerning sales. A trend has been detected year after year the peak tends to be longer, but with a lower intensity. Forecast based on the presented data was developed, shows that the seasonality will be still present, and how the company can anticipate the peak for the coming year. Anticipation can be made thanks to background works.

To complete the research four interviews were conducted. These interviews allowed to gather additional information. Internal interview brought information concerning the current management of the company. The importance of scheduling and having an efficient operational management was emphasized. Interview with employee of other companies added more information, and can allow a comparison.

The interview administered with employees from different companies emphasized different aspects. Forecast must be done during a long period (18 months) and constantly updated. To calculate the forecast companies must use historical data and consider the market. During a peak it is important for companies (especially international companies) to keep a safety stock to avoid stock shortage and lose sales. To avoid stock shortage and have the goods in an appropriate time, the forecast must control the delivery date. In order to avoid a high occupancy rate, orders can be smaller but with a bigger frequency. The last element mentioned by the persons interviewed was related to the global working time in the company.

This time must be raised during the peak. Working week can be extended, or companies can resort to temporary employees.

The last part of the study was made after personal notices and observations during a working time. The analysis of these notice permitted to make conclusions. When the activities are low it is important to spend time to set up background work.

Background works prepare the future and makes the global process faster. Some background work can be similar to the previous year, like the arrangement of the picking area. However new projects can be executed. Getting rid of the dead stock is an important action to face a high occupancy rate. Having a high occupancy rate can slow the process down, and create delay during the peak. To make the process faster, it is crucial to maintain a good quality in the good reception. Goods reception is the first action of the warehousing process and has influence on every other action. Spending more time in that process to identify the products correctly and store them properly will save time for the future and avoid mistakes. Solving problems takes a lot of time, therefore mistakes must be avoided.

6.2 Recommendations

Workforce management

This research shows that workforce management is an important aspect to consider. The first feature mentioned about seasonality and peak period of activities was about employees and the workload.

Forecasting the sales helps to plan the hiring. With the forecast, the company can detect the peak period of activities. Detecting that helps to set up a hiring plan.

When the sales are increasing, the workload also increases. To fight against this growing workload, the global working time must be raised. For that companies have three options:

- hiring more employees

- increasing the weakly working time per employee

- hiring more employees and increasing the weakly working time per employee.

For several reasons it turns out that increasing the weakly working time is difficult. Employees can complain about that fact and can refuse if their contract does not mention that the working time can be increased. To avoid such complaints or issues, many companies decide to hire temporary workers to increase the global working time.

To make the temporary workers more profitable it is important to keep them for a long time. Hiring temporary workers implies training them. During the training time the temporary workers do not perform any actual work. During the peak period, this training time must be reduced. If a temporary worker stays a long time, he would have to be trained once, then after his training he will be fully efficient for all of his working period. To make their training time shorter it is recommended to give them easy tasks. Having a good forecast will help to know the workforce requirement in advance. Knowing that will help to hire temporary workers in an efficient way. Planning also avoids making emergency decisions.

Having a network of temporary workers can help the company for the recruitment. The employees with existing experience in the company do not have to be train once again. This will make them directly efficient and productive.

Leaves management also must be managed correctly. The manager must stagger the holidays efficiently. Permanent workers should be able to find someone to substitute them in their field during their leaves. This substitute can be another permanent worker or a temporary worker. During the leaves the number of employees must remain the same. No delay must be generated.

During the normal period of activities in the warehouse it is crucial to have versatile employees. Permanent workers must be able to train any temporary workers. The versatility of employees gives more freedom to the manager. He can decide to dispatch the employees anywhere according to the priorities of the warehouse. If a dock has a delay, the manager can decide to send an employee from one dock to another to prevent the delay or an increasing workload.

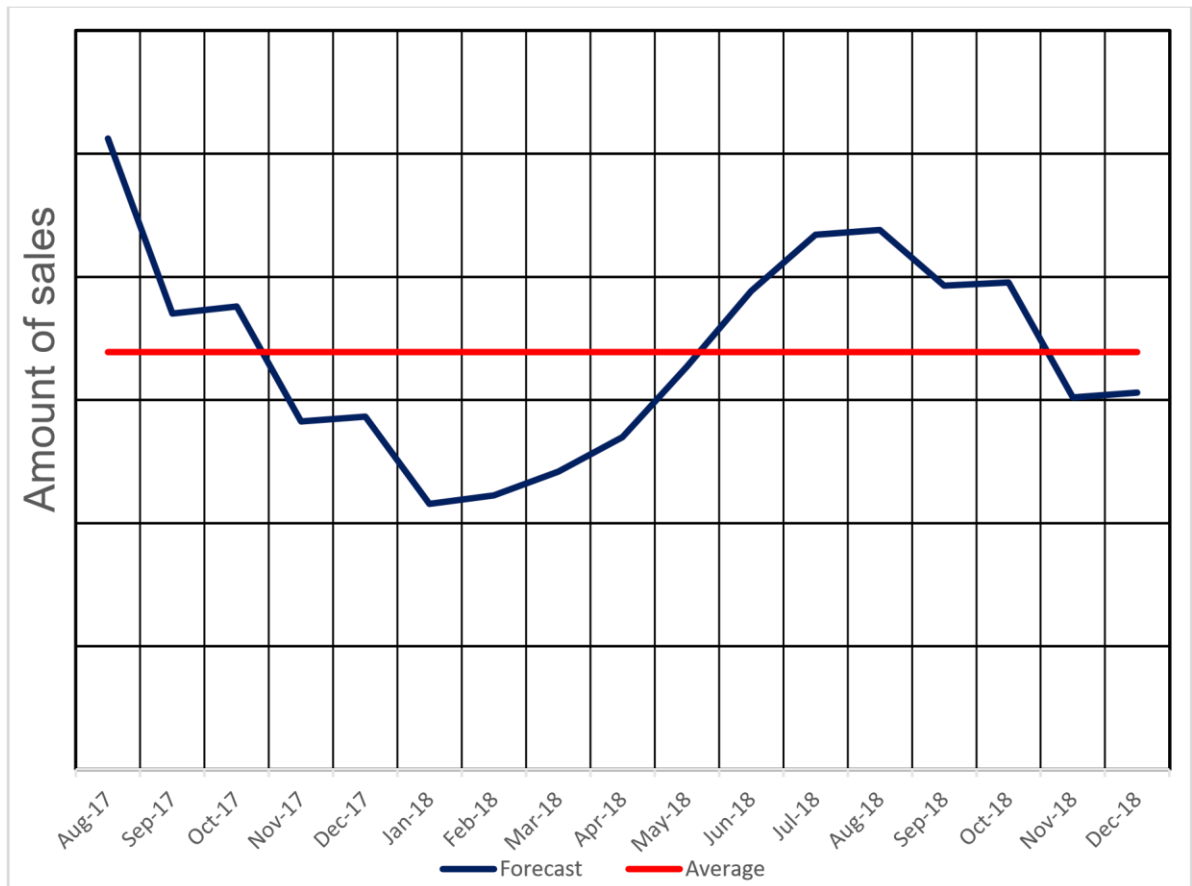


Figure 5. Sales forecast for 2018 and the sales monthly average

Recruitment to prevent the peak period

The company does not have to hire temporary workers when the activities are below the average of sales. The team of 13 employee is enough to carry out the activities and to apply background work.

When the sales are getting higher than the average, a recruitment can be made in two phases. The peak period can be divided in two segments:

- the climax of the peak with an important need of additional workers
- the rise and the fall of the peak with a relative need of additional workers

From May to October one employee can be hired. For July and August two additional employees can be hired and one of them can see his working time extended in September and October.

During the peak period of activities, the employees will be focused on the goods storage, and the shipping. Even if the activities will be two times bigger than in the low period activities, it does not mean that the number of employees must be twice as much.

Recruitment to replace employees in holidays

The warehouse has a team of 13 employees. Each employee takes in average 2.5 weeks of holidays (based on previous year). The summer holidays are taken from the 3rd week of June until the 3rd week of September. This represents 12 weeks. In totality, 32.5 holidays weeks will be taken during the summer. Total of holiday weeks divided by the number of weeks available during the summer holidays: 2.7. This means that in average 2.7 employees will be constantly missing during the summer leave. The company must hire three temporary workers to compensate the fact that permanent workers are missing.

To optimize the summer leave, if it is possible, not more than three employees should take their holidays at the same time. To make this possible the manager should anticipate the summer leave with the employees a long time before.

Equation 3 explains how to calculate the average of employees missing.

Calculation: $(e*w)/s$ = number of employees missing in average. (3)

e = number of employees *w* = average of holidays week by employee *s* =

number of week during the summer holidays

= $(13*2.5)/12 = 2.7$

Anticipation

This research has emphasized the fact that forecasting and planning are crucial elements in the management of the company, and especially for the supply chain

management. Forecast is vital to set up a plan, since it helps to know when the sales will be higher or lower. Forecast can be made thanks to data from the previous years, and thanks to market intelligence. According to the sales forecast different projects can be set up to improve the management efficiency.

The warehouse can improve its capacity and productivity by anticipating the peak activities. A lot of different tasks can be done in the months before the ultimate period. The projects which have been successful during the previous years have to be reiterated every year, or every time it is needed.

Arranging the picking area can be an interesting project to anticipate the peak period and to spend time during the slack period. The arrangement can consist in making replenishment, inventory, and relabeling like it has been done in the winter 2015-2016.

But this project can be done even deeper. The supply chain department can set up a collaboration with the warehouse manager and the brand manager. The warehouse can ask an 80/20 (or ABC) list of the products sold to the brand manager. Knowing the products with a high rotation is interesting for the logistics. The picking area can be adapted according to the goods. Currently, the picking area does not take into consideration the turnover of the products. When a good reception is made, products are placed in their previous location or are placed where there is some place left. There is not a real logic of storage and this has to be improved.

Goods with a high rotation can have a bigger storage place, to reduce the number of order placing, of goods reception or replenishment. Thus, some storage places will be saved, and the occupancy rate will decrease. This will also help to gain time for the goods reception and replenishment during the summer peak. The high rotated goods can be placed close to the aisle to avoid a long walking time for the order picker. This will also help to save time for the numerous order picking during the summer. This will necessitate a lot of work and a lot of time.

The data collection (of the 80/20 lists) of the warehouse manager will be the first work to do. Once collected, the data must be used by the operational workers. Operational workers will be in a first time arranging the picking area in a way to

leave one of the 8 shelves it includes totally empty. These shelves must be as close as possible to the aisles.

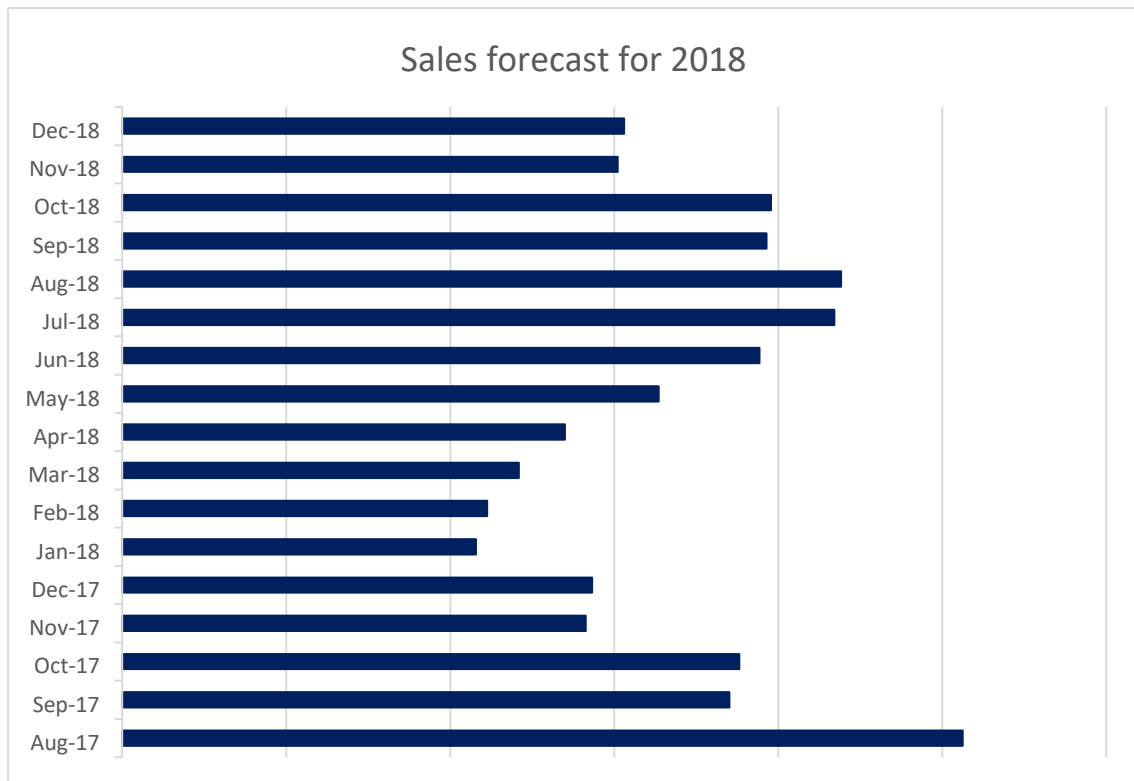


Figure 6. Sales forecast for 2018 organized by month

Figure 6 shows the sales forecast for 2018. Each month's forecast has its own value in the figure. This figure is useful to identify the month with low activities. Knowing when the activities are low, it is important in the phase of planning. Low activities can be suitable to set up background works.

According to this figure it seems relevant to carry out big projects in January, February, and March. For a long project like the arrangement of the picking area, it seems appropriate to start it directly in the beginning of January to make sure everything will be done before the activities increase.

The additional time available during the low period of activities can be used to keep inventories up-to-date. During the peak, employees must be fast to be able to reach the objectives and not to generate delay in the process. When employees are fast, they have more chances to make mistakes (especially during the picking). These

mistakes engender discrepancy: the theoretical stock does not correspond to the actual (physical) stock. This could be a problem for the requirement planning and for the sales department which cannot rely efficiently on the theoretical information available. For the logistics it could be a problem also during the replenishment process or the picking process. Not being able to find a product which is supposed to be at a special storage location implies search and wastes time. Updating the inventory is a long process but it must be done every year. Such a project can be executed just after the arrangement of the picking area (it is a long process as well, that is why it could be interesting to start the arrangement of the picking area early). It is easier to count when the products are gathered in one single storage place, and when the products are properly placed on the shelves.

A last project can be set up in the warehouse during the low period. The manager can set up different actions to get rid of the dead stock. Dead stock takes place for article that can be sold regularly and avoid a better fluidity. The article that have not been picked for more than a year (dead stock) can be stored in another location than the picking location. The picking location is optimized for the order picking and is in the heart of the warehouse. The dead stock can be placed in another place location because its picking does not have to be optimized. The list of the dead stock can be extracted by the brand managers or the supply chain coordinator.

During the peak period

Anticipation is an important characteristic to prepare the peak period. However, the actual work occurs when the sales are high. Companies must have a well-working function and management to cope seasonality.

The warehouse manager must apply what is working during the slack period, but on a bigger scale. The hired temporary worker will bring an additional workforce to apply it in a bigger scale. The number of order pickers will be increased, as a consequence, more employees must be placed in the packaging/shipping area. More products will have to be controlled and received, thus more employees must be assigned to these activities.

The manager will support the employees to get to the point. The activities will be focused on receiving goods and sending them. The background works executed during the low period of activities, will help to get to the point faster. No background work will be applied during this period. Nevertheless, some inventory may have to be updated during the peak.

Having suitable infrastructures is a critical element. The peak implies that more goods will be stored. The infrastructures must be able to receive all the goods necessary to supply the customers.

If the occupancy rate is high, the management will have to be even more precise especially concerning the requirement planning and the reception of goods. A collaboration can be set up with the warehouse manager and the person in charge of the purchase. The purchaser must inform the warehouse manager when an order is placed and inform him about the quantities of products and the delivery date forecasted. Purchaser must track the delivery and inform the warehouse manager in case of delay or if the delivery is advanced. If the purchaser can keep the initial delivery date by leaving the goods some days in the carrier dock it could be beneficial for the warehouse. The planning of goods' reception will be made according to the initial date. Getting goods earlier than forecasted can be challenging for the warehouse activities, especially during the peak. It can turn out that the warehouse does not have enough storage immediately.

If the stock is too consequent during the peak, a part of the storage can be externalized. Externalized storage can be used, for example, for the safety stock. Safety stock is not a stock that must be used in emergency. Safety stock can be used when the main warehouse will run out of the article. It is easy to identify a product about to be sold out. Just before running out of that product in the warehouse a delivery can be ordered and the good will be delivered quickly. Outsourcing the stock can also help when a big quantity of the same item is received.

Lately, collaboration must be carried out with all the product managers. It is necessary to avoid individualism in the company. The company has only one warehouse to manage its logistics. In this unique warehouse all customers must be served no matter what they demand. The brand manager must think globally

about the company, and not only about their brands and products. The collaboration can be set up to share fairly the occupancy of the warehouse.

6.3 Reliability of the study

Credibility

Having a long working experience related to the topic helped to have the knowledge and skills, and to understand the topic more concretely. Besides this experience, the previous studies helped to have theoretical knowledge concerning the topic, but also the business world in general. Knowing the functions of the business world help to know the aim of a research and the importance of the supply chain management.

The data collection represents most of the work in the thesis. The primary and secondary data have been collected with different methods. The theoretical part brought a lot of data that has been completed by the practical part. The practical part analyzed secondary data from the company and generated the primary data, which was also analyzed. Interviews brought different information and opinions. Data are numerous and coming from many different sources. To draw conclusions in this thesis, this data were used. Conclusions are drawn exclusively with the data present either in the theoretical part or in the research part.

Transferability

Other researches were also made concerning seasonality. Many different articles relate with the peak period before Christmas. Research speaks also about the seasonality and the peak period, but in a different context and a different market. Moreover, the peak happening at Rivolier presents an additional issue than just high activities. Rivolier must face the summer leaves at the same time with the peak. This research had a focus on the operational activities, and there is no similar research.

The articles related with the seasonality in general present similarities concerning the results. Considering the human resource management and anticipating the hiring is one of the common results concerning such research.

Dependability

The research has been made of a theoretical part with theoretical information related with the topic. School books, newspapers, internet documents, and other documents were used to carry out this research. To understand analyses and interpret these data, additional data must be gathered. The secondary data from the commissioning party were collected and analyzed. Besides that, external data was collected during interviews with external actors. Several employees working in similar companies than the commissioning party answered some questions related to the topic.

Thanks to this data collection and according to the situation of the company, some conclusions and recommendations are presented. Without the multitudes of data and sources, the conclusions would have been inaccurate.

Confirmability

To be able to set up the interpretation and conclusion, sources must be accurate. When an element is found several times, in several data, and even several sources its reliability is high. To draw the conclusion most of the elements were found several times. During the interview, most of the aspects mentioned were brought up by every person, like the importance to forecast and to set up a scheduling for instance. During the analysis of the secondary data given by the commissioning party, figure has been used and explained. Under every figure an explanation of the data is given considering the context of the topic.

About the personal notices and observations, every aspect is explained clearly, and in the context, divided by four main logical subparts.

7 CONCLUDING REMARKS

Conducting such a research was interesting. This process has been long, required to focus and to follow each point meticulously. Every stage of the research taught different aspects related to supply chain management and business management.

The theoretical research was a long but interesting process. Using documents of other researchers or professionals were precious. Learning from other experiences was really motivating. Some knowledge from lectures were used, but the theoretical documents have been really rewarding for me. Finding documents has been a tough phase, especially for this topic. Finding books related with the seasonality was really challenging compared for example with forecast of even warehouse management. The warehouse management is one of the main topics in logistics, and forecasting and scheduling are used in most businesses. For the workforce management part, it was also difficult to find documents with a focus on warehouse management.

After collecting the documents and writing the theory about the topic, an introduction about the commissioning party was made. The issues the company is face every year has also been presented. Having work experience in the commissioning party helped a lot to be involved in the research, especially concerning the “practical” part. Knowing how the company operates helped to understand the subject, especially concerning the recommendations. The seasonal demand of the company was shown and explained through figures.

To get additional information about the topic, different interviews have been administered. One with a manager of the commissioning party and with three different employees of other international companies. The interview made in Rivolier was interesting to understand the current action led in the warehouse. The interview was also interesting to collect secondary data from the company. To understand what other companies are doing to face seasonality. These interviews were really exciting. Being in contact with other professionals helped to get information. Due to my location it has been made via Skype®, but it could be even

more interesting to do it face-to-face in the company of the worker to know and understand the working environment.

The analysis of the secondary data given by the manager of the commissioning party was different than interviewing the persons, but it was also relevant for the research. Showing the seasonality, the peak period, and analyzing the trends was adequate for the results and recommendations. Calculating the forecast of the sales required precision.

Analyzing what I had noticed during my working period was the most interesting part. Using notes written during the working time to propose recommendations was motivating. The most important notes have been described, and then analyzed to give the recommendations.

The commissioning party could use the notes and recommendations to improve the warehousing process. Some examples of the projects that could be set up in the warehouse were described. The operational part is an important feature for the warehouse. The operations and the flows are passing through the warehouse, therefore they must be managed in the most efficient way. To manage the operations more efficiently, a global collaboration with all the company employees must be set up. Getting information from other companies is interesting. Other companies use techniques and know their reliability. It could be interesting to apply a technique which is working in a similar company.

When conducting such research, it is important to follow a strict plan and schedule. Methodology is the main thing.

Would it be interesting to face seasonality using commercial actions if operational aspects are not deeply impacted by seasonality?

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APPENDIX 1

Figure 1. Rivolier's turnover over the last 4 years with the trend line of the sales

Figure 2. Figure 2. Rivolier's sales from 2014 to 2017 Figure 3.

Rivolier's sales from 2014, and the forecast of 2018.

Figure 4. Rivolier's sales forecast for 2018.

Figure 5. Sales forecast for 2018 and the sales monthly average

Figure 6. Sales forecast for 2018 organized by month

APPENDIX 2

Table 1. Historical data from the previous years.

La prévision des ventes et les variations saisonnières. 2017. Available at:
<http://lescoursdevente.fr/>

Table 2. Least square method for the company X

La prévision des ventes et les variations saisonnières. 2017. Available at:
<http://lescoursdevente.fr/>

Table 3. Calculation of the seasonal coefficient compared to the previous year.

La prévision des ventes et les variations saisonnières. 2017. Available at:
<http://lescoursdevente.fr/>

Table 4. Calculation of seasonal coefficients compared to the average of several years.

La prévision des ventes et les variations saisonnières. 2017. Available at:
<http://lescoursdevente.fr/>

APPENDIX 3

Example of semi directed interview with a supply chain coordinator

- 1- Can you first introduce you company? (Its name, activities, the number of employees, who are the customers and suppliers (B2B or B2C), is it an international company...)
- 2- How is the supply chain organized?
- 3- What is your company doing to face seasonality and its issues?
- 4- What are the main problems occurring during a peak period of activities?
How do you face problems?

- 5- What are you doing during slack period? (Which task do you give to employees, what changes in the company during that moment...?)
- 6- Does forecast help your company to face seasonality? How and why? (is there a person in charge of the forecast?)
- 7- How planning can help you company and especially the warehousing? How in planning organized?
- 8- How do your company choose temporary workers?
- 9- What do you do to make temporary workers quickly efficient?
- 10- Have you something else to tell us? Interesting fact or experience related with warehouse management?