



BEP PROJECT PROPOSAL

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1. Introduction

In this chapter, some information about the company will be given. Besides this, an overview of the logistic process at Wasserij de Blinde will be presented.

1.1 Wasserij de Blinde

Wasserij de Blinde is a laundry that is servicing the catering industry. They are a part of Rentex Floron, which is a laundry that is servicing the hospitality branch. Wasserij de Blinde is one of the biggest laundries in their industry.

Before 2010 Wasserij de Blinde was servicing not only the catering industry but also areas like healthcare. However, due to the takeover by Rentex Floron in 2010 it has been decided to target the catering industry. Rentex Floron is servicing the healthcare sector.

Wasserij de Blinde is specialized in cleaning bedding, bath linen, kitchen linen and table linen. However, also service is provided for the cleaning of different types of clothing like work wear and cook's clothing. Besides cleaning, Wasserij de Blinde is also renting linen to their customers. Customers of the laundry can choose to rent the linen, so they do not have to invest in their own linen.

At the moment Wasserij de Blinde is making 12-13 million revenue per year. Besides, the catering industry is growing every year and so does the laundry.

1.2 Business process of the laundry

1.2.1 Inbound logistics

Two times a day, in the morning and in the afternoon, up to ten trucks are bringing in dirty laundry. The dirty laundry all comes in packed onto trollies. Every trolley is labeled with a sticker on which the customer number is printed. On a screen in the inbound hall the truck driver can choose from which particular customer(s) he has brought in the textile. After this the trollies are put on a scale to weigh the dirty laundry. This is done to get a picture of the number of dirty laundry kilo's that comes in. After the weighing, the trolley is put in a specific row in the inbound hall. These rows are separated from each other with lines painted onto the ground. When the trollies are put into their corresponding row, one can see in a glance how many trollies there have to be washed for a certain customer.

1.2.2 Intern process

After the trollies have been placed into their corresponding rows an employee picks up the trollies and drives it to a conveyer belt. This belt transports it to another employee who is going to sort the dirty laundry of the particular customer. The sorted laundry is put in containers of either pillowcases, terry cloth, sheets or duvet covers. Those containers can carry 50 kilograms of dirty laundry each. When the weight of a container reaches 50 kilograms it empties its load automatically into a laundry

bag. When the laundry has been deposited into a laundry bag the second weighing moment is taking place.

After everything has been sorted into bags the actual cleaning process can start. The dirty linen is transported by rails to the one of the six washing tubes which clean the linen in approximately 30 minutes. On a screen located in the cleaning hall can be seen in what washing tube which kind of product is getting washed. The green boxes on the screen represent the pillow cases, dark blue is duvet covers, light blue is sheets, red is roll towels and dark red is bathrobes.

When the laundry comes out of the washing tube a hydraulic press presses most of the water out of the cleaned laundry. With a conveyor belt the 'just' cleaned laundry is transported to one of the tumble dryers. The drying process is taking 16 minutes in the so called 'voldrogers'. Sheets are not dried but only shaken loose, this is been done in 4 minutes.

If an item is not properly cleaned after the whole process it will get an additional special treatment. This special treatment is assigned to a specific type of difficult to remove stains. If after that treatment the item is still dirty, it gets rejected.

When everything is cleaned and (partially) dried it gets transported to employees who sort the different product types based on their dimensions. After this, some other employees put the product types onto a mangle machine that will first mangle and flatten the products automatically. After this the mangled products are directly folded by a folding machine that is connected to the mangle machine. The folding machines can even fold the textile in such a way that the customer demands. The folding process is therefore highly customized. On average the mangle and folding machines have a throughput time of 16 seconds. After the folding of the products, the products for one customer are put onto empty trollies which will be labeled. The label shows how many of that particular item are loaded onto the container.

1.2.3 Outbound logistics

All the trollies with the cleaned products are driven to the outbound part of the company. Here the trollies will be assigned to a specific row again. At outbound the trollies will be weighted for the last time. After this the trollies with the cleaned laundry are ready to be shipped back to the customer. The cleaned laundry is then exchanged for dirty laundry and the trucks comes back with a new load of dirty laundry. Depending on the type of customer the trucks are bringing and picking up laundry 2-7 times per week. Every truck can carry up to 56 containers and all the items are invoiced per unit.

The flow chart of the whole business process as explained above can be found in **Appendix....**

2. Problem description and research goal

In this part of the report, a description of the problem will be given. Also the research questions and their corresponding sub questions will be presented.

2.1 Problem description

Over the past few years the catering industry is growing fast. Wasserij de Blinde is trying to grow with the catering industry by scaling up their productivity every year. They are doing this by working an extra day in the weekend (Saturdays). However, scaling up also means more customers that want their dirty laundry to be washed as fast as possible. A lot of these customers require their dirty laundry to be washed more times a week. Other customers are fine when the wasserij de Blinde is washing their dirty laundry to a lesser extent. The problem that arises due to these fluctuations in demand makes it difficult to predict when to assign a certain amount of resources.

The real problem for wasserij de Blinde is not about the fact they are not able to process all the dirty laundry for all their customers. In other words, wasserij de Blinde has enough capacity to make sure demand is met. They tackled this already by extending a particular working day or even by working on Sunday's. However, the latter has been said to happen rarely. The real problem for wasserij de Blinde is that they do not know good enough how much dirty laundry will arrive in a certain week. This problem could be tackled by buying better washing tubes that will wash in a more efficient way. However, these washing tubes are very expensive and thus are not replaced every year for a new one. Another way to tackle this problem is by better assigning the resources in a given week. Also, in a conversation with the CEO of wasserij de Blinde it became clear that being able to assign resources in a more useful way could decrease costs significantly. An estimation has been made by the laundry that costs could be reduced by approximately 70.000 euros per year if a better prediction could be made of how much laundry would come in at a given week. Subsequently, this would also mean that resources could be assigned in a better way.

So, after making accurate observations of the business process and the conversation with the CEO the choice was made to eventually come up with a model that could predict the demand for a few weeks in advance. Think for example of surcharges for employees that have to work overtime because the demand in that week was higher than expected. Besides this, wasserij de Blinde will be able to serve their customers even better due to the fact that they can be more responsive.

In order to tackle this problem, a demand prediction model will be developed. This demand prediction model should have a certain margin of error so that it will be usable for the laundry. To develop such a model, some information is needed. First of all, historical demand data of the volume of dirty laundry that has been processed in certain days is needed. Besides, literature research is needed to get a good understanding of which demand prediction method will fit the historical data best and thus gives the best forecast. Also, research is needed to check if there are possible exogenous variables that could be influencing the demand for cleaned textile and if those variables could be a good predictor for the demand.

Because the construction of a demand prediction model is not an easy to solve task, a structured approach is needed. This is also the main reason why this research is conducted.

2.2 Research goal

The goal of this research is to find out what forecasting model fits best to predict demand for wasserij de Blinde a few weeks in advance. Besides this, there will be given recommendations on what forecasting models would best fit to eventually make a good prediction of demand for wasserij de Blinde.

2.3 Research question

How to design a weekly demand forecasting model for wasserij de Blinde?

2.3 Sub questions

To give structure to the research, some sub questions are formulated. The sub questions will eventually make sure that the research questions is answered in clear way.

1. *What kind of data is currently available?*
2. *Are there exogenous variables that influence the demand fluctuations?*
3. *Are these variables a good predictor of demand?*
4. *How can historical data be used (in combination with other variables) to forecast demand?*

2.4 Elaboration on the sub questions

In order to develop a good conceptual model that can make an accurate demand forecast, it is important that you know what data is available. Moreover, it is important that you select the right data to use for the eventual model. This step is very crucial because if one is starting out with the wrong data the research would fail in an early stage due to a lack of right information. Also, a look will be taken at the historical data available and in what way it can be fitted into the prediction model. This is important for the final forecasting model, because the data could have outliers which are not representative for the model. In other words, pre-processing has to be done in order to have clean data and eventually use it in a model.

After all the data is gathered and pre-processed a look will be taken on exogenous variables which could possibly influence demand. In a conversation with the laundry it was discussed that there would be exogenous variables that possibly could have a very high degree of prediction for the dirty laundry that comes in at wasserij de Blinde in a certain time period. Wasserij de Blinde has different types of customers that each make up for varying amounts of dirty laundry. Sometimes there huge peaks in demand can be observed. Thus, it is very important to know which factor are influencing these volume fluctuations per customer. Besides, research will be done to come up with variables that could possibly be fitted in a model to make better predictions.

Last of all, a fitting forecasting technique should be chosen to predict the demand. Research will be done on which model can forecast demand and which of these models should be considered. This is because not every forecast technique fit to make a good forecast. Also, models that do not use exogenous variables will be taken into account to create a certain baseline. After this models in which exogenous variables are used will be compared with these models that do not use exogenous

variables and see if they perform better. Elaborations will be made on when a forecast can be seen an accurate one.

2.5 Research plan

As described in section 2.4, literature research will be done to discover which external variables could be good explanatory variables for the final demand prediction model. Explanatory variables are variables that have in some way influence on the fluctuations in demand.¹

Moreover, appropriate forecasting techniques will be discussed. For this the literature research will be done to examine which model is best to be used for this particular demand prediction model. The decision on which technique will be used will be based upon the historical data of wasserij de Blinde and the external variables found. The historical data will be analyzed using a statistical program called R. In R, different types of calculations can be performed that will help to determine if different variables fit to the model.

¹ <https://www.chegg.com/homework-help/definitions/explanatory-variable-31>