GE 401

PRODUCT SPECIFICATION DOCUMENT

GROUP 7

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1 Introduction

1.1 Purpose

The purpose of this document is to specify the requirements of the product in the engineering format. The engineers can easily design the product by following the measurable statements of the product's requirements in this document.

1.2 About this Document and its Readers

The Product Specification Document describes what the project is to do in terms of measurable constraints. There are 3 fundamental roles of this document:

1) It is an input for the developer company's engineering department since it contains the project requirements with measurable specifications.

2) At the end, this document will be used to check the product, to see if it does everything that it should be as written in this document.

3) It helps the engineers to divide the problem into pieces.

2 System Requirements and Constraints

2.1 Electrical Characteristics

- The product would work with 220V AC power supply which is the industry standard in Turkey.
- The current drawn by product would be at most 250mA under maximum load (while the dispenser is rolling down a bag), and at most 20mA in standby condition.
- If the product requires DC voltage, the user still should not be forced to use DC power supply. It will be done by product either by regulating the AC voltage to DC in the product, or out of the product by adapter.
- In supermarkets, the system should support up to 30 dispensers.

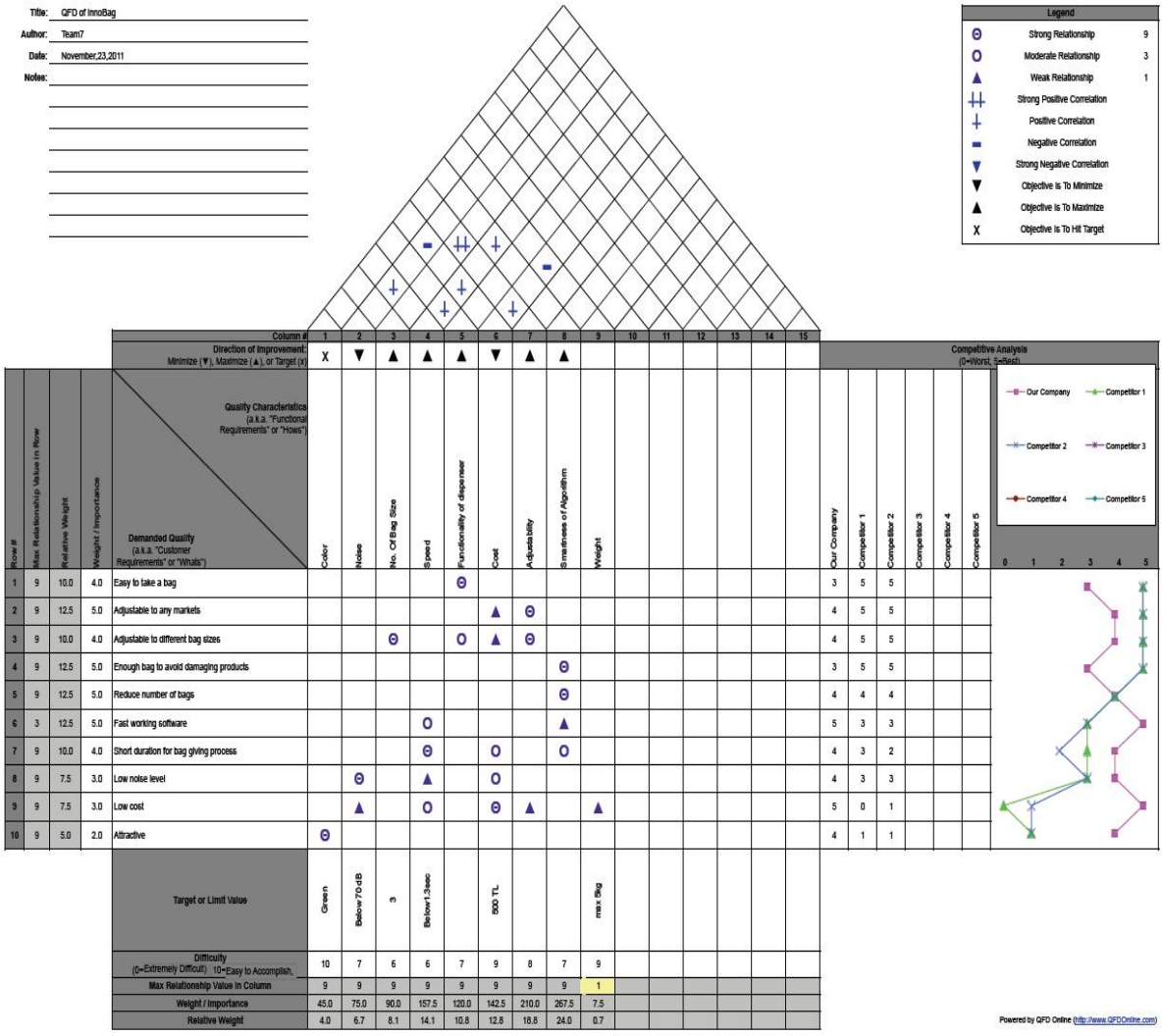
2.2 Mechanical characteristics:

- Weight: 5kg
- Volume: 35cm x 25cm x 20cm

- The dispenser will use rolled bags. The dimensions for big rolled bags are 30x55 cm. The machine will be designed for bags that have 30 cm width. There are also other sizes of bags are available in the markets. The dispenser would be compatible with those sizes, which are: 25x46 cm, 22x40 cm.
- The bag dispenser should be capable of rolling-down 1 full bag at most in 1.3 seconds. The dispenser should be 1 meter above the ground so that customers can easily take the bags.
- The color of the dispenser would be green because the product should seem as nature-friendly.
- There should be some messages written on the dispenser such that the customer will ashamed of demanding one more bag from cashier. One of the examples to those messages can be: “Save Earth! We have nowhere else to go!”
- The noise level of the product would be less than 70dB.
- The response time of the product is at most 500ms. (By response time, we mean the time from starting the calculation to starting to roll down the bag)

3 QFD

The House of Quality Matrix is as follows:



Color: There is a strong relationship between color and attractiveness. We want the customer to feel that they save the world by using InnoBag. By considering this, we choose the color to be green because we think green color is related with being nature friendly. The difficulty of this specification is rated as 10 where difficulty ranges from extremely difficult(0) and easy to accomplish(10).

Noise: There is a strong relationship between noise and low noise level, and a weak relationship between noise and low cost. Customer wants to have low noise level but at the same time they wanted it to be cheap. Since the relationship between low cost and noise level is weak, without thinking so much about cost (since it will not effects

much), we decided the product should have noise level below 70 dB. This level is chosen considering the cashier and the customers of supermarkets so that they wouldn't be disturbed. The difficulty of this specification is rated as 7.

Number of bag size: There is a strong relationship between number of bag size that the machine will support and adjustability to different bag sizes demand. The product should be designed to support different sizes of bags, as it's demanded by customer. The research that we made showed that there are three sizes of bags that are widely used in supermarkets. Those sizes are: 30x55 cm, 25x46 cm, 22x40 cm. The product will support those three sizes of bags. The difficulty of the specification is rated as 6.

Speed: Engineering speed constraint is related with 4 of customer demands: fast working software, short duration for bag giving process, low noise level and low cost. There are strong relationships between speed and both fast working software and low cost. There is a moderate relationship between speed and short duration for bag giving process. And finally there is a weak relationship between speed and low noise level. Without increasing the cost, the product should be work as fast as possible. Considering those demands, we choose that the machine should give the bag in less than 1.3 seconds. This will not require the fastest motors and microcontrollers in the world so it will not increase the cost, also it will not increase the noise level a lot. And to do this, we will have to create fast working software which is good because it is another demand of customer. The difficulty of this specification is rated as 6.

Functionality of dispenser: There is a strong relationship between functionality of dispenser and easy to take a bag demand of customer, and there is a moderate relationship between functionality of dispenser and adjustability to different bag sizes. The dispenser would be 1 meter above ground so that the customer will take a bag in a very comfortable way. We decided to let the customer take the bag himself, the product will not have a bag-cutting feature because the machine have to be adjustable to different sizes of bags, the cutting feature could be difficult to work correctly when the company changes the bag sizes that they use. The difficulty of this specification is rated as 7.

Cost: Cost is related with 5 of customer demands: adjustable to any markets, adjustable to different bag sizes, short duration for bag giving process, low noise level, low cost. There is a strong relationship between cost and low cost. There is a moderate relationship between cost and both short duration for bag giving process and low noise level. And finally there is a weak relationship between the cost and both adjustable to any markets and adjustable to different bag sizes. The company wanted to earn the money back that they spent on this product, in approximately 1 year. Our research showed that according to company demands, the price of this product have to be approximately 500 TL. The design should be made considering this price. The difficulty of this specification is rated as 9.

Adjustability: There is a strong relationship between adjustability and both adjustable to any markets and adjustable to different bag sizes. There is a weak relationship between adjustability and low cost. The product should be designed considering industry standards so that that, any company will buy and easily plug in it into their markets. Also it supports three different sizes of bags, and those bags are also industry standards. The power supply will also be chosen such that, without need of anything, customers should plug into standard 220V power supply and use the product. By doing those, the low cost demand of the customer wouldn't be forgotten. The difficulty of this specification is rated as 8.

Smartness of Algorithm: Smartness of algorithm is related with 4 of customer demands: enough bags to avoid damaging the products, reduce the number of bags, fast working software and short duration for bag giving process. There is a strong relationship between smartness of algorithm and both enough bag to avoid damaging products and reduce number of bags. There is a moderate relationship between smartness of algorithm and short duration for bag giving process and there is a weak relationship between smartness of algorithm and fast working software. The algorithm that will be used to calculate the required number of bags should be designed such a way that the number of bags used should decrease. On the other hand, it should not give less than enough bags, otherwise the products would be damaged. It should really know the consumer's packing behavior and give bags according to those behaviors (for example no one would pack hygiene products with foods). The calculation

process shouldn't be too long, because we do not want the consumers to wait too long near the bag dispenser to take a bag. The difficulty of this specification is rated as 7.

Weight: There is only one demand for this requirement which is low cost. The weight of the product would be in a way that will decrease the product's price. This somehow means, none of the engineers should try to decrease the weight of the product by using some better materials that would have less weight but more expensive. No, this shouldn't be done! The weight is not so important for companies that will buy the dispenser; there is only an upper limit which is not a low value, 5kg. Its weight should be anything below 5 kg, whatever minimizes the production cost. The difficulty of this specification is rated as 9.

The correlation between the engineering requirements is as follows:

- Number of bag size and adjustability have strong positive correlation because different number of bag size should be used to increase the adjustability of the product.
- Noise and speed have positive correlation since increasing the speed of the product can cause high noise levels.
- Speed and cost have positive correlation because speed increment requires powerful engine and it increases the cost.
- Cost and adjustability have positive correlation since making the product adjustable to many different conditions increases the cost.
- Speed and smartness of the algorithm have positive correlation. The algorithm can increase the speed of the product by working efficiently.
- Noise and cost have negative correlation. Trying to decrease the noise level can cause high cost levels.
- Cost and weight have negative correlation since decreasing the weight of the product increases the cost.

4 Conclusion

Consequently, the main aim of this document is to specify the requirements of the product in an engineering format. The product can be easily designed by engineers who use the measurable specifications in this document. The document specifies the electrical and mechanical characteristics of the product in more detail with specific values and it also specifies other requirements which are noise level, color and cost of product, adjustability and so on with measurable statements.

5 References:

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