

DELIVERABLE III: PROJECT PLANNING/PRODUCT SPECIFICATIONS

EML4550C – Senior Design Fall 2015
TEAM 17 - “DOG GROOMING TOOL”



Sponsors - Bill Bilbow, Todd Hopwood

Team Advisor – Dr. Simone Hruda

Course Advisor – Dr. Nikhil Gupta, Dr. Shih

Submission Date: 10-09-2015

Submitted To: Dr. Nikhil Gupta

Authors: Justin Proctor (*Team Leader*)

Jordan Chupp (*Secretary*)

Dennis Pugh (*Treasurer*)

Roy Mason (*Web Designer*)

Table of Contents

Abstract	iii
1. Introduction	1
2. Project Definition	1
2.1. <i>Needs Statement</i>	1
2.2. <i>Goal Statement and Objectives</i>	1
2.3. <i>Constraints</i>	2
2.4. <i>Methodology</i>	2
2.5. <i>House of Quality</i>	3
3. Project Planning	4
3.1. <i>Work Breakdown Structure</i>	4
3.2. <i>Gantt Chart</i>	5
3.3. <i>Critical Path Method</i>	8
3.4. <i>Project Task List</i>	11
4. Product Specifications	11
4.1. <i>Design Specifications</i>	11
4.2. <i>Performance Specifications</i>	12
5. Conclusion	13
6. References	14

Table of Figures

Figure 1: House of Quality.....	3
Figure 2: Work Breakdown Structure	4
Figure 3: Gantt Chart: Part 1	6
Figure 4: Gantt Chart: Part 2	7
Figure 5: Critical Path Method: Part 1.....	9
Figure 6: Critical Path Method: Part 2.....	10

Abstract

This is the design report deliverable for the project planning and the product specifications of the Dog Grooming Tool project. In this report Team 17 restates the project definition through the reiterations of the need statement, the goal and objective statement, and any front-end constraints imposing this project. As a part of the project definition, this report also includes a QFD diagram, which reflects upon the analysis conducted in obtaining the voice of the customer as well as the characteristics of competitor products. Planning phase of this project is represented in this report through the work breakdown structure, which is presented in the form of a Gantt chart and a Critical Path Method diagram. Lastly, this report includes the specifications of the product being designed, with the concentration given to the desired specifications design and performance of the dog grooming tool.

1. Introduction

Team 17 has been selected to provide a solution for the unpleasant grooming experiences of dogs and their caregivers, through the design and construction of a tool, which will allow a dog's coat hairs to be detangled and ordered using a process that is non-stressing for the groomer, and pleasant for the dog.

So far in the initially stages of this design project, Team 17 knows and understands that the current brushes that are being used to detangle and de-mat dog coats aren't getting the job done. Team 17 also understands that while there is a market for their desired product, a detailed planning process is essential for a successful design process. Team 17 has implemented several methods as ways to appropriately plan for the project ahead. These methods include Gantt charts, and critical path methods, in order to stay on top of progress of current tasks and to prepare for upcoming ones. A task list was formed to delegate the work among members so that all team members are involved, and so that everyone is held accountable for the outcome of the project. A work breakdown structure, by way of a tree diagram showed the critical tasks that need to be accomplished to achieve the project goals and the order in which they must be approached.

This planning and specification design phase is the foundation for the success of the design project, because it allows everything that needs to be done to be laid out and it allows the team to recognize what qualitative and quantitative features need to be included in the overall product. By laying out the tasks and specifications in the initial stages of the design process, Team 17 is placed in a position to be optimally prepared for the challenges, expected and unexpected, that lie ahead.

2. Project Definition

2.1. Needs Statement

For this project we have two sponsors, Todd Hopwood and William M. Billbow. The problem presented to Team 17 is that dogs of all hair qualities, textures, and lengths, experience matting and tangling in their coats. This matting makes it tough to groom the dog when trying to complete small tasks, such as brushing a dog's hair. This problem is seen in many different types of dogs with different hair lengths.

“De-matting a dog's hair can be an unpleasant experience for both the dog and the groomer, especially if the matting has advanced and is deep in the hair or fur. To de-matt or de-tangle, it can be very time consuming and uncomfortable, if not painful.”

2.2. Goal Statement and Objectives

“Design and develop a grooming tool that untangles matted hair.”

The objectives of this project are:

- Design a hand held dog grooming tool for use by consumers, groomers, and dog rescues.
- Successfully untangle hair without harming animal
- Develop a hand-held rotary pet groomer that provides for a stress-free experience for both the dog (or other animal) and the groomer

2.3. Constraints

The constraints of this project are:

- The tool must be hand-held and ergonomically friendly
- The tool must have a low RPM to keep quiet
- The tool must be easy to clean and sterilize
- The battery should last 2 hours at 50% duty cycle
- The total weight must be at 1 pound or under

2.4. Methodology

Throughout the upcoming year, Team 17 plans to take this design project from its initial concept all the way to prototype and production phases. The design team plans to accomplish this by following a well-defined set of objectives and timetables as closely as possible, and adapting to any setbacks that may arise. The first steps in this process involve gaining an insight into the wants and needs of potential customers and determining if there is a market for our desired product, and what the risks are. Surveys will be performed on potential customers with questions that will help the team understand what engineering characteristics to focus on when the design begins. By obtaining the ‘voice of the consumer’, the team will better understand what features and characteristics are important to potential buyers. A risk assessment and failure analysis will also be conducted in order to determine what road blocks may lie ahead for this project and if it is an endeavor with a large enough profit to make it worth pursuing. After determining what engineering characteristics will be included in the product and conducting the risk analysis, the design phase will begin as the team begins to draft the chosen concept based on the information found from consumers. The tentative goal is to have a final prototype by the end of the fall semester.

2.5. House of Quality

(+) – Positive Correlation
 (-) – Negative Correlation

◊ - Strong Interrelationship
 ◻ - Medium Interrelationship
 ○ - Weak Interrelationship

Rankings are on a scale of 5 to 1 with 5 being the most important

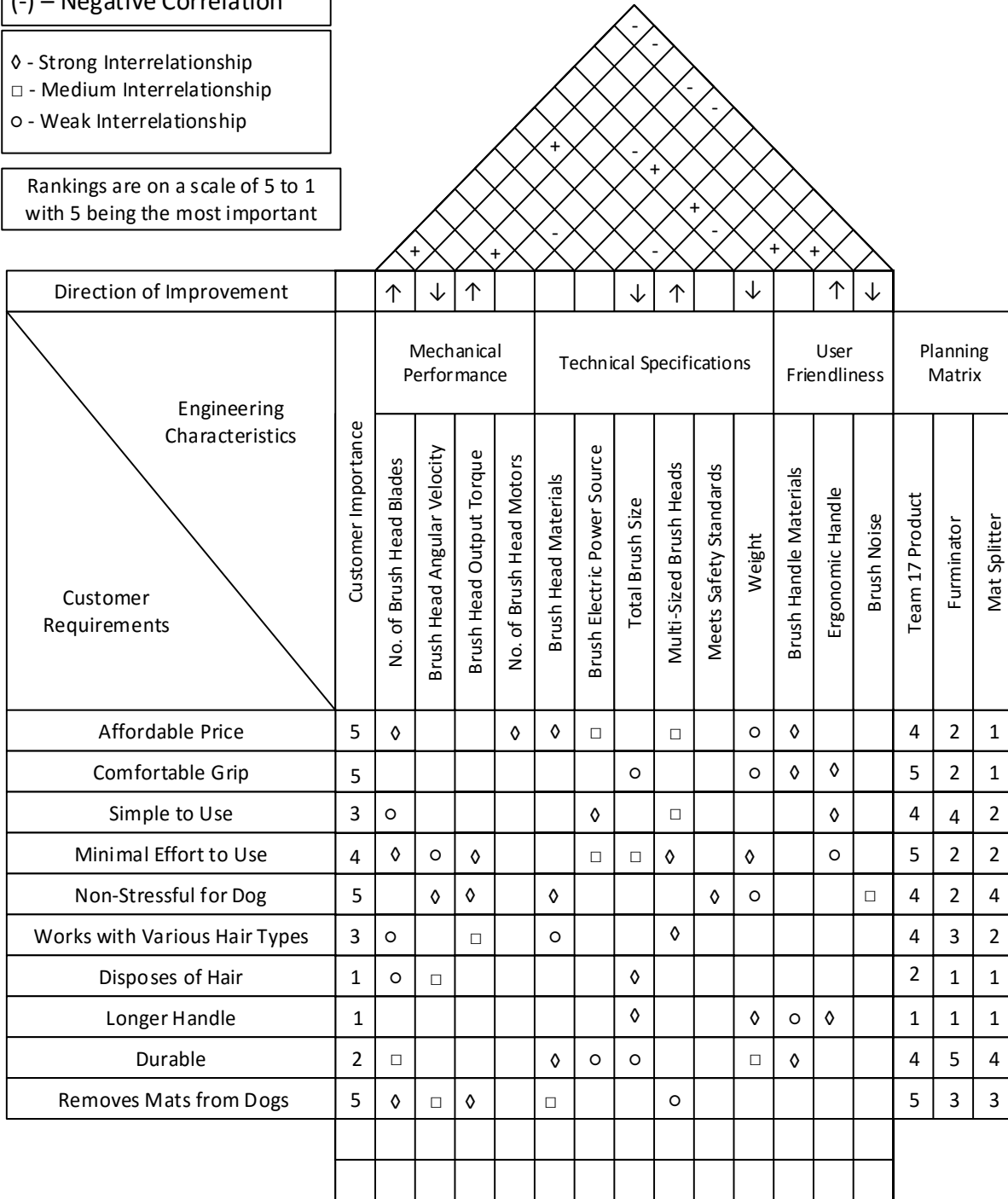


Figure 1: House of Quality

Figure 2 shown above is the House of Quality for Team 17. This diagram was constructed based on results from surveys and questionnaires that were conducted in order to define the voice of the customer. The house of quality was used to form relationships between the desires of the target market and engineering characteristics of the dog grooming tool. The engineering characteristics are grouped under the categories of the tool's mechanical performance, technical specifications, and the user friendliness. All the categories except for the user friendliness are quantitative categories, which require the application of mathematical calculations and engineering principles. The user friendliness is a qualitative measurement and will be in direct relation to the voice of the customer. The roof matrix interrelates the engineering characteristics with each other define those that have strong, medium, and weak correlations. Finally the customer importance ranks the customer requirements on a 1-5 scale, with 5 being most important and 1 being the least. The planning matrix is similar to the customer importance as it likewise ranks the importance of the same customer requirements for team 17 and the designs of the leading competing devices

3. Project Planning

3.1. Work Breakdown Structure

To help meet the deadlines set by the project sponsor as well as the team, it is important to keep track of deadlines for project deliverables. By creating a work breakdown structure as well as a Gantt chart, it becomes much easier to see what deadlines are coming up and stay ahead of them. Figure 2 below shows a basic work breakdown structure that lists the tasks that are critical to the completion of the project, and the progressive step by step process with which they must be accomplished.

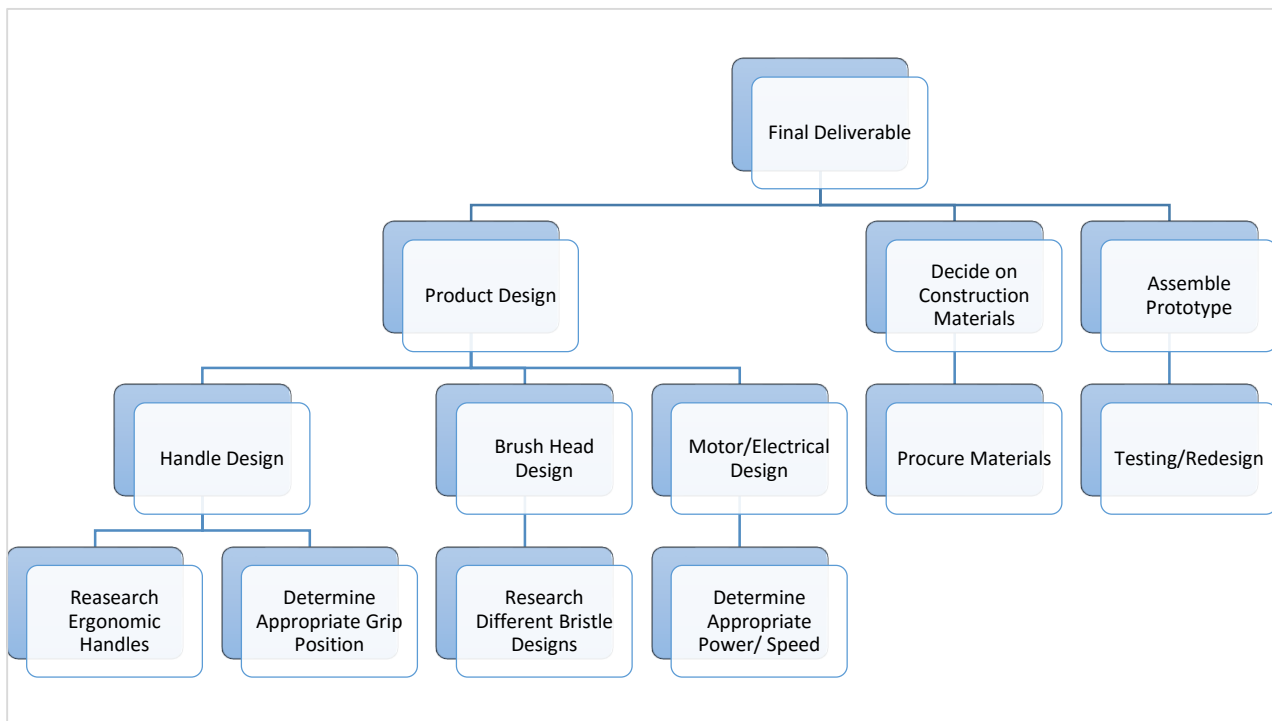


Figure 2: Work Breakdown Structure

3.2. Gantt Chart

Figure 3 and Figure 4, shown below, are the initial Gantt chart diagrams for the design project. In the left matrix, the Gantt charts display a list schedule of all the tasks that are to be completed during the 2015 fall semester of the design process. These tasks include meetings between Team 17 and the sponsors and various advisors, deliverable reports to be constructed, presentations, as well as the detailed steps of the design process that are necessary to achieve the end goals.

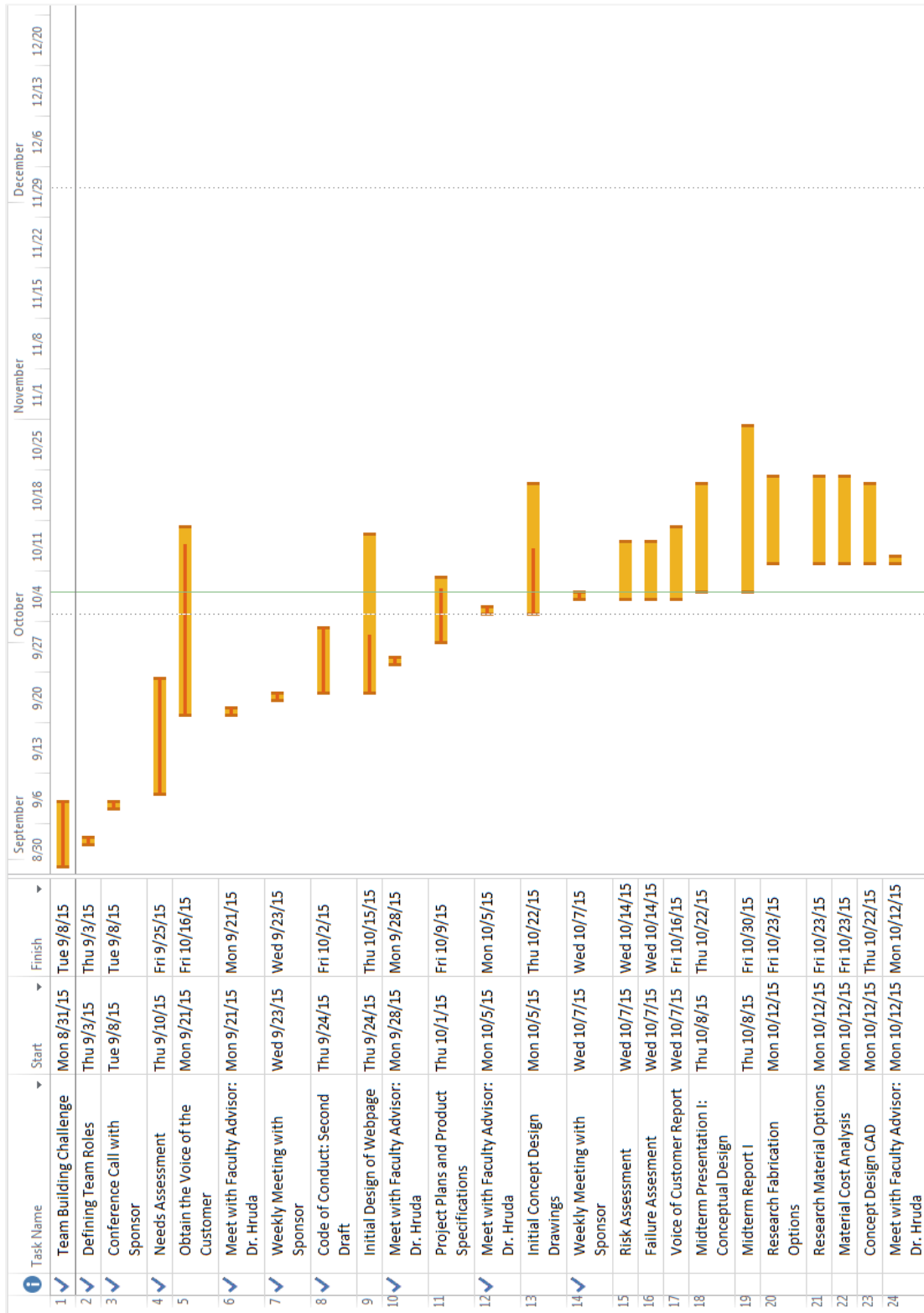


Figure 3: Gantt Chart: Part 1

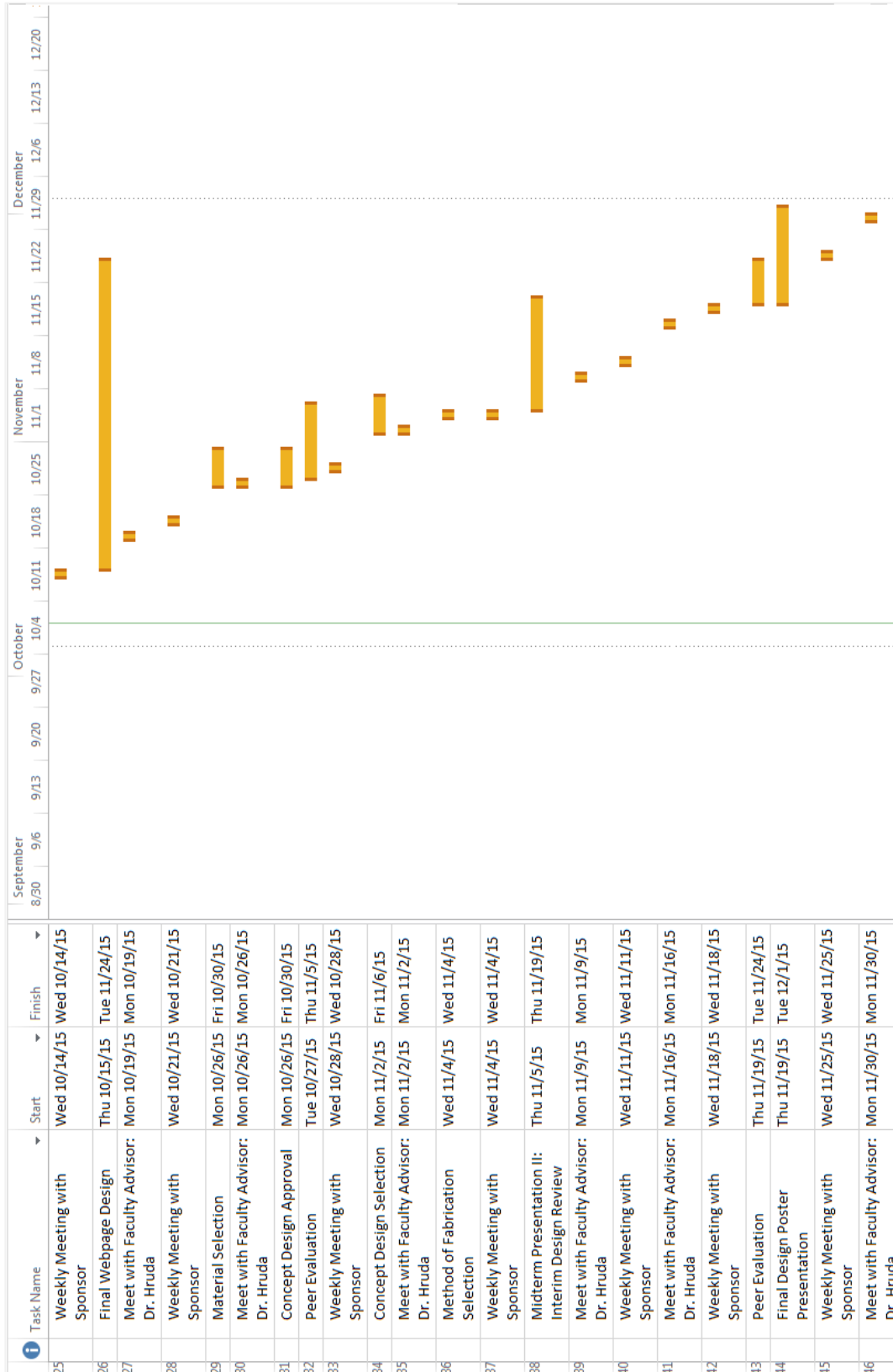


Figure 4: Gantt Chart: Part 2

3.3. *Critical Path Method*

The critical path method, below in figures 5 and 6, illustrates the given tasks to be accomplished in order to have a success for project. The critical path method provides a timeline for the tasks to be done, and shows what tasks are dependent and independent of completion of preceding tasks. This allows there to be no stoppage in working as the team will know which things can be done while other tasks are pending.

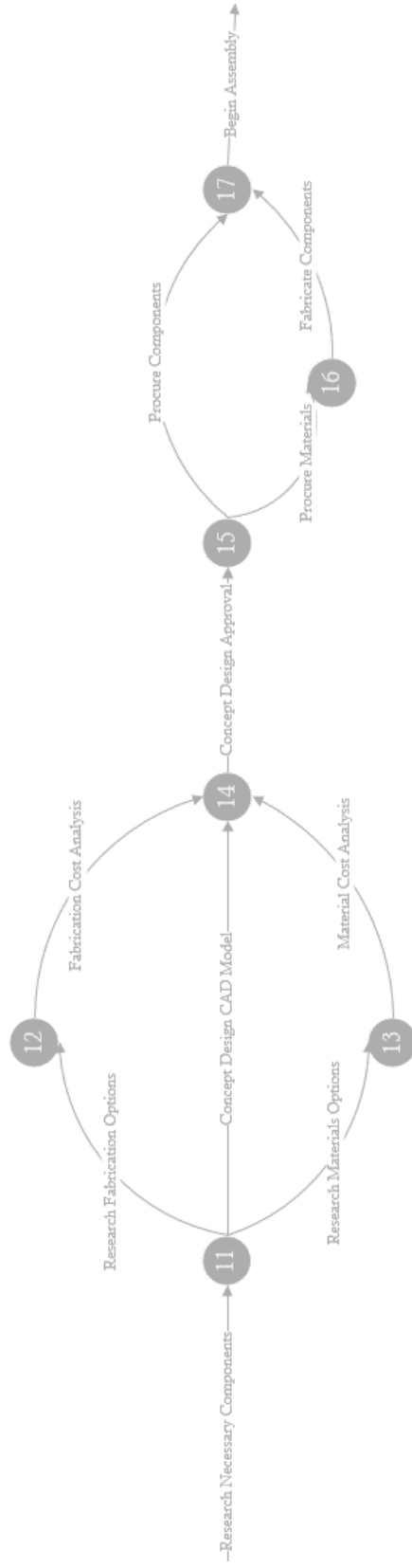


Figure 6: Critical Path Method: Part 2

3.4. Project Task List

Table 1: Project Task Table

<i>Task</i>	<i>Leader</i>
<i>Managing Records and All Documentations</i>	Jordan Chupp
<i>Liaison for Sponsors</i>	Justin Proctor
<i>Manage Scheduling</i>	Roy Mason
<i>Cost Analysis of Materials and Components</i>	Dennis Pugh
<i>Research Ergonomic Handles</i>	Jordan Chupp
<i>Determine Appropriate Grip Position</i>	Dennis Pugh
<i>Research Different Bristle Designs</i>	Roy Mason
<i>Determine Appropriate Power/Speed</i>	Team 17
<i>Procure Materials</i>	Justin Proctor
<i>Testing/Redesign</i>	Team 17

Table 1 above shows the upcoming tasks for Team 17 and which team member or members will be taking the lead on them.

4. Product Specifications

4.1. Design Specifications

In order to design a tool that will meet the specified goals, various specifications are required. Table 1.1 below lists the design specifications, but they are broken down here with descriptions starting with the overall design. The whole tool must be lightweight, which will require it to be one pound or less. Obviously the design will need to be appealing in order to get customers to buy the product when it hits the market. The design of the tool itself can be broken down into three major components which are the handle, the internal electronics such as the motor, and the rotary head.

Starting with the handle, it must be hand held and ergonomic, meaning the device must be comfortable to the customer's hand and not much force be needed to operate the device. The idea is to take away as much stress as possible and by providing a customer friendly tool, much stress will be levitated.

Moving to the inside of the tool, the battery will need to have a 2 hour duty with an 8 hour standby. Along with these specifications, the battery must be designed to be replaced quickly. The more stressful it is to replace a battery the less likely someone is to buy the product.

Also, the power must have 120V of ac alternate. These specifications are early on and are subject to change if needed.

Finally, there are some rotary head specifications. These include removable, single speed, bi-directional, low speed, small diameter, and bristles. The removable idea is key, because if one head is ruined, instead of replacing the whole tool, one could just replace the head. Also, taking the head off the tool provides a much easier availability to clean the head. The device must be single speed so that a careful low speed near 60 revolutions per second would not harm the animal. The bi-directional does not mean go both directions in this case, it refers to the head being able to be put on in the opposite direction so that no matter which hand is dominant the customer has the same experience. Lastly, the head specifications include being around 1.5 inches in diameter, as to not be too bulky, and to have bristles of some kind that are not corrosive and easily breakable. These bristles are not required to be of a certain material. Many different types will be thought of and the type that is most successful when dealing with efficiency and harmless to the animal will be chosen.

Table 2: Design Specifications

Item	Specification
Mobility	Hand-held, ergonomic
Power Source	<ol style="list-style-type: none"> 1. Battery, 2 hr duty, 8 hr standby, with quick replacement 2. 120V ac alternate
Weight (max)	1 lb
Rotary head	<ul style="list-style-type: none"> • Removable / replaceable • Single speed • Bi-directional • 40-100 rpm (Final speed determined experimentally) • Diameter: ~1.5" • Detangling elements/bristles: Stainless spring steel or similar (not subject to breakage, corrosion or harm to pet)

4.2. Performance Specifications

When designing this dog-grooming brush there are many performance specs that have to be taken into account. The performance specifications will define the desired functionality of the product when being used. With the understanding that dog groomers, dog rescue workers, and personal dog owners will be using this product, it is essential that the performance of this dog-grooming brush meet the needs and expectations of every consumer.

Some of the main performance specifications that this product must meet are that it must be able to detangle and de-mat any type texture or length of dog. From talking with many dog groomers, rescuers and dog owners, it is very apparent that detangling a dog's matted hair is very frustrating. It is said that using a conventional dog grooming brush is very time consuming, which is why we are creating a rotary style grooming tool. The brush must be electric powered device that does the de-matting and detangling work for the user. The brush must reduce the time it takes to de-mat a dogs coat significantly enough to make the use of Team 17's product worthwhile to customers.

Dog groomers and owners claim that using a conventional dog grooming tools create a lot of stress on the hands and arms of the groomer. The electric functioning of the brush must perform in a manner that reduces the wear and tear on the user, and eliminates the stress that dogs experience when the groomed manually. Team 17 has to make the tool more ergonomic to appeal to the comfort of the person using the brush. By creating an enjoyable experience with a simple task of grooming for the dog and its groomer, Team 17 can build brand trust and healthy consumer producer relationship.

The brush design must perform as quietly as possible, and output enough work to be effective in its grooming task while not harming any dog during the process.

5. Conclusion

Grooming a severely matted animal can be a long, stressful, and tiring process. This goal of this project is to make the grooming process much more enjoyable for both the pet and groomer. The team plans to examine the current methods used for grooming in order to develop an ideal product for future use. Potential groomers will continued to be questioned to determine what further characteristics make up the ideal pet-grooming tool.

Team 17 understands that a strong planning stage sets the strong foundation for the rest of the design process. By developing a clear and concise schedule and delegating tasks to which each team member will be held accountable, Team 17 is putting itself in position to accomplish the goals and meet the needs and desires of the customers and sponsors.

Future plans include website development, project risk assessment, failure analysis, continuation of the webpage development, as well as the research of material options and concept design drawings.

6. References

- ⁱ *Furminator Deshedding Tool for Medium Dogs*. n.d. September 2015. <<http://www.petco.com/product/112965/FURminator-deShedding-Tool-for-Medium-Dogs.aspx>>.
- ⁱⁱ <http://www.furminator.com/>. 2015.
- ⁱⁱⁱ *Infiniti Conair Spin Styler* . September 2015. <http://www.amazon.com/Infiniti-Conair-Spin-Styler-2-Inch/dp/B004INUWX0/ref=zg_bs_11058221_1>.