Spring 5-9-2020

Product Realization Capstone: Using Project Management to Optimize Manufacturing of Charcuterie Boards

Megan Staffieri

PRODUCT REALIZATION CAPSTONE: USING PROJECT MANAGEMENT TO OPTIMIZE MANUFACTURING OF CHARCUTERIE BOARDS

by
Megan Ann Staffieri

A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of the requirements of the Sally McDonnell Barksdale Honors College.

Oxford

May 2020

Approved by:

Advisor: Dr. Scott Kilpatrick

Reader: Mike Gill

Reader: Dr. Jack McClurg

DEDICATION

To my mother, you are my biggest fan. I owe all of my academic and personal success to you. Without you constantly pushing me to my full potential, I would not be writing a dedication for my honors thesis. You are the smartest and strongest woman I know, and I strive to be more like you each and every day.

To Gadston, thank you for being my support system throughout my college career. You have always believed in me more than I have believed in myself. I could not have made it this far without your patience, your humor, your love, and your positivity. You are the love of my life.

To my family, thank you for the love, laughs, and support.

To my roommates, I would not have wanted to be on this journey with anyone else but you guys. I love you.

ACKNOWLEDGEMENTS

To Dr. Scott Kilpatrick, thank you so much for all of your help on my thesis. It would not be what it is today without you. But what has been the most helpful was your listening ear throughout my four years at Ole Miss. I appreciated your patience during my rant sessions about classes and projects, I appreciated your support while I searched for employment, and I appreciated you harmonizing with me while we sing like Jean-Ralphio and Mona Lisa. YOU are Grandma's secret Mac and Cheese.

ABSTRACT

MEGAN ANN STAFFIERI: USING PROJECT MANAGEMENT TO OPTIMIZE MANUFACTURING OF CHARCUTERIE BOARDS
(Under the direction of Dr. Scott Kilpatrick)

The purpose of this project was to successfully create 36 charcuterie boards with varying designs during a two-week production period using principles of project management and manufacturing. In the initiation phase, the needs and requirements were assessed according to the project definition. During the planning phase, a work breakdown structure was created, material was researched, a budget was developed, and an initial risk assessment was performed. During the executing phase, the initial designs were prototyped before production began. The controlling phase was done in conjunction with the executing phase. The controlling phase monitored the project management plan and recorded the lessons learned. The project ended with the closing phase, which included a final report and presentation. These phases were all performed using the principles of project management and lean manufacturing. All of these used in conjunction resulted in a successful project and 36 charcuterie boards.

TABLE OF CONTENTS

LIST OF FIGURES ix

LIST OF TABLES xi

1. INTRODUCTION 1

1.1 CAPSTONE OVERVIEW 1

1.2 PROJECT MANAGEMENT 2

1.3 MANUFACTURING PRINCIPLES 4

2. INITIATION 7

2.1 PITCHING THE PROJECT 8

2.2 PROJECT CHARTER 8

2.2.1 OVERVIEW 8

2.2.2 GOALS 9

2.2.3 SCOPE 9

2.2.4 MILESTONES 9

3. PLANNING 10

3.1 ROLES AND RESPONSIBILITIES OF TEAM MEMBERS 10

3.2 PROJECT DEFINITION 11

3.3 SPECIFIC SCOPE OF WORK 12

3.4 MATERIAL RESEARCH INFORMATION 12

3.5 PROJECT SCHEDULE 13

3.5.1 INITIATING 13

3.5.2 PLANNING 13

3.5.3 EXECUTING.. 13

3.5.4 CONTROLLING 14

3.5.5 CLOSING 14

3.6 WORK BREAKDOWN STRUCTURE 14

3.6.1 INITIATION.. 15

3.6.2 PLANNING 16

3.6.3 EXECUTION.. 17

3.6.4 CONTROLLING 18

3.6.5 CLOSING 19

3.7 INITIAL DESIGN 20

3.8 ANTICIPATED CHALLENGES AND RISK ANALYSIS 21

3.9 INDUSTRY REQUIREMENTS AND STANDARDS.. 21

3.10 INITIAL BUDGET.. 22

3.11 SPECIFIC TIMELINE FOR TASKS 22

3.12 ASSUMPTIONS.. 23

4. EXECUTION.. 25

4.1 DEFINE USER REQUIREMENTS 25

4.2 DEFINE DESIGNS 26

4.3 MATERIALS.. 26

4.4 PROTOTYPE 27

4.4.1 PINE PROTOTYPE 27
4.4.2 WALNUT PROTOTYPE 28
4.5 FLOOR LAYOUT 30
4.6 PRODUCTION 30
5. CONTROLLING 39
5.1 PROJECT MANAGEMENT 39
5.1.1 PROJECT COMPLETION REPORT 39
5.1.2 PROJECT SCHEDULE 39
5.2 CHANGE LOG 40
5.3 RISK MANAGEMENT 41
6. CLOSING 42
6.1 LESSONS LEARNED 42
7. CONCLUSION 44
REFERENCES 45
APPENDIX 47

LIST OF FIGURES

Figure 1: Iron Triangle ... 3

Figure 2: 5S Diagram ... 5

Figure 3: Breakdown of Process Group ... 7

Figure 4: Work Distribution ... 10

Figure 5: Mississippi Outline Model ... 20

Figure 6: Mississippi River Model ... 20

Figure 7: Magnolia Flower Model ... 20

Figure 8: CME Model ... 26

Figure 9: Pine Prototype ... 28

Figure 10: Black Walnut Prototype ... 29

Figure 11: CME Prototype ... 30

Figure 12: Initial Floor Layout ... 30

Figure 13: Actual Production Floor Model ... 31

Figure 14: Production Floor ... 31

Figure 15: Station 2 Labeling Scheme ... 33

Figure 16: Station 1 ... 34

Figure 17: Station 2 ... 34

Figure 18: Station 3 ... 34

Figure 19: Station 4 ... 35

Figure 20: Station 5 ... 35

Figure 21: Station 6 & 10 35

Figure 22: Station 7.......... 35

Figure 23: Station 8.......... 36

Figure 24: Station 9.......... 36

Figure 25: Station 11.......... 36

Figure 26: Station 12.......... 37

Figure 27: CME Charcuterie Boards 37

Figure 28: Flower Design 38

Figure 29: River Design.......... 38

LIST OF TABLES

Table 1: Initiation Work Breakdown 15

Table 2: Planning Work Breakdown... 16

Table 3: Execution Work Breakdown... 17

Table 4: Controlling Work Breakdown 18

Table 5: Closing Work Breakdown 19

Table 6: Budget after Prototyping.. 22

Table 7: Timeline for Milestones... 23

Table 8: Assumptions Log 24

Table 9: Production Steps 32

Table 10: Log of Changes throughout Project 40

Table 11: Lessons Learned Log 43

1. INTRODUCTION

The Haley Barbour Center for Manufacturing Excellence (CME) was founded for the purpose of teaching college students, in Mississippi, manufacturing principles that are pivotal in most industries. The need for this program was introduced when Toyota established a new manufacturing facility in Blue Springs, Mississippi. A 47,000 square foot facility on The University of Mississippi's campus has been serving this purpose since 2010. Since its founding, the CME consists of approximately 200 students from the Schools of Engineering, Accountancy, and Business to teach the principles of manufacturing within one facility. Throughout their college years, CME students take many interdisciplinary courses to learn popular manufacturing principles, such as lean and six sigma. The CME also conducts experiential learning classes where students go into industries to apply these learned principles. During the CME students' senior year, they are formed into teams where they apply their four years of knowledge into one final project called Capstone.

1.1 CAPSTONE OVERVIEW

At the beginning of senior year, all 50 CME students from a single class "pitched" a new product to their fellow classmates and professors. After carefully reviewing each product, the capstone professor chose nine products to develop before the close of the year. The students voted on their top five products and were assigned teams. During the first semester, students became acquainted with their team members, formed a project plan, began prototyping, and presented a presentation of their progress to the CME faculty and staff. During the second semester, students began mass manufacturing their product on the CME factory floor. Students were trained to use equipment during labs under the supervision of the lab technicians. They created a plant layout, recorded takt time (time each process took), made improvements, and presented their manufacturing process to the CME faculty and staff. This was a large and time-consuming project, so the need for an effective organization and management system was imperative.

1.2 PROJECT MANAGEMENT

Project Management is a methodology used by project managers to organize projects to ensure the scope of work, the delivery date, and the budget of the project are met. The Project Management Institute (PMI) is the standard for project management [1]. The Global Accreditation Center accredits the PMI for project management offered within accredited institutions worldwide [2]. In addition, the PMI certification for project management allows work in any industry anywhere in the world. [3]. They define a project as a temporary endeavor undertaken to create a unique product, service, or result [1]. Even though the project is temporary, the effects of the project can last for decades. Throughout a project's life cycle, the scope, schedule, and cost must be met to have a successful project. The scope of the project is all of the processes required to ensure the project includes all the work required, and only the work required, to complete the project successfully [1]. The schedule of a project includes the processes required to manage the timely completion of the project [1]. The cost of a project includes the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so the project can be completed within the approved budget [1]. These three principles make the points of the iron triangle with quality in the center seen in Figure 1.

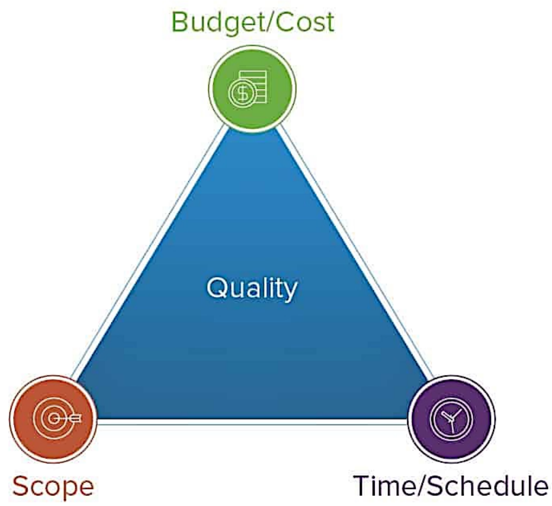


Figure 1: Iron Triangle [4]

The theory behind the iron triangle is that one of the points cannot be affected without affecting the other two [1]. For example, a farmer is building a large walk-in cooler to store his produce before delivery. He gets a quote from a contractor stating the work to be done (scope), the amount of money needed (cost), and the amount of time it will take (schedule). Once the project is underway, the contractor realizes the loading door in the cooler only locks from the inside, so he will have to cut out a regular door for entry and exit. The scope of the project is increasing; therefore, the cost and the schedule are affected. This unforeseen circumstance will either cause the farmer to pay more money or to wait longer for his cooler to be finished. The role of a project manager is to juggle these three principles successfully. The balance of scope, cost, and schedule is called quality [1]. Better balancing these principles will result in higher quality. The Project Management Body of Knowledge (PMBOK) has laid out five process groups for projects: initiating, planning, executing, controlling, and closing, which make up the project's lifecycle. Each stage contains multiple steps which add up to 49 total processes to complete before the next stage begins, with the exception of executing and controlling, which are performed simultaneously. PMBOK also lays out ten knowledge areas of a project: integration management, scope management, schedule management, cost management, quality management, resource management, communications management, risk management, procurement management, and stakeholder management [1]. Each of these have a variety of inputs and outputs that all contribute to a successful project.

1.3 MANUFACTURING PRINCIPLES

Another way to ensure a successful project is to incorporate manufacturing principles, especially if the project leads to the creation of a product. The first real push for modern manufacturing was by Henry Ford in 1913 with the model T. He introduced flow production or one-piece flow, which led to the traditional assembly line [5]. The downside of this style of manufacturing was the inability to customize the product. Taiichi Ohno learned from Ford during the 1930s and revisited the assembly line approach [5]. It was with his improvements that the Toyota Production System (TPS) was born. This allowed process flow in addition to a variety of products. The TPS system is widely used today and set the standard for lean manufacturing. Lean manufacturing simply means cutting waste from a process [5]. Waste is anything that does not add value to the product. For example, workers walking to the trash to throw away garbage does not contribute to the making of the product, but it still takes time and therefore money. A way to reduce that waste is to move the trash can closer to the worker.

The TPS system also introduced a new manufacturing method – 5S. This started in the mid-20th century. 5S is another lean methodology to reduce waste. The name comes from five Japanese words: seiri, seiton, seiso, seiketsu, and shitsuke [6]. When the words are translated, they become: Sort, Set in Order, Shine, Standardize, and Sustain as seen in Figure 2.

Figure 2: 5S Diagram [6]

Sort involves going through the workstation and determining the value of the items there. It might involve removing items not being used or take up space. Set in Order involves creating an arrangement for the remaining items in the workstation. The items there should be put in a logical order taking into consideration the frequency of use and the order of task. Shine involves keeping all workstations clean and free of debris. The 5S principles involve everyone taking responsibility for their workstation including keeping it neat and tidy. Standardize involves maintaining the new layout and principles put into place. It is easy to revert to what is comfortable. This makes it one of the most vital parts of 5S. Sustain is the last “S” and involves keeping the system running smoothly. This is an ongoing process that never finishes. Once 5S is in place, companies begin to see real results [6]. When all of these Lean principles are applied, waste reduces, which fulfills the purpose.

Another manufacturing principle is Six Sigma, the goal is to reduce the number of defects. Motorola Corporation was the first company to coin the term Six Sigma in the 1980s. Their Six Sigma goal was to reduce the defect rate to 3.4 defects per million products [7]. This was the first time a preventative measure was introduced to try and avoid problems at the end of the product’s lifecycle by preparing and controlling the processes at the beginning of the product’s lifecycle. The mathematics behind Six Sigma were founded in 1809 by Carl Frederich Gauss [7]. The “bell curve” was a graph that plotted the samples versus the measured values. The standard deviation is measuring the shape of the bell curve. Some defects, however, do not have an assignable cause and should not try to be corrected [7]. Without a cause of the defect, there is no use in trying to fix it.

2. INITIATION

All of the manufacturing principles, in addition to the principles from project management, were tools used to ensure the success of the project. Each heading corresponds to an item of the Work Breakdown Structure created for this project. The charcuterie board project was broken down into the five project management process groups, starting with initiation. The initiation phase made up 2.1% of the total project, which was the smallest percentage. Closeout is the next lowest with 5.8% followed by planning that made up 23.9% of the total project. Executing and controlling are tied for the highest percentage of 34.2%. These percentages fall closely within typical standards – the exception being planning, which is generally the most time-consuming process group followed by executing and controlling.

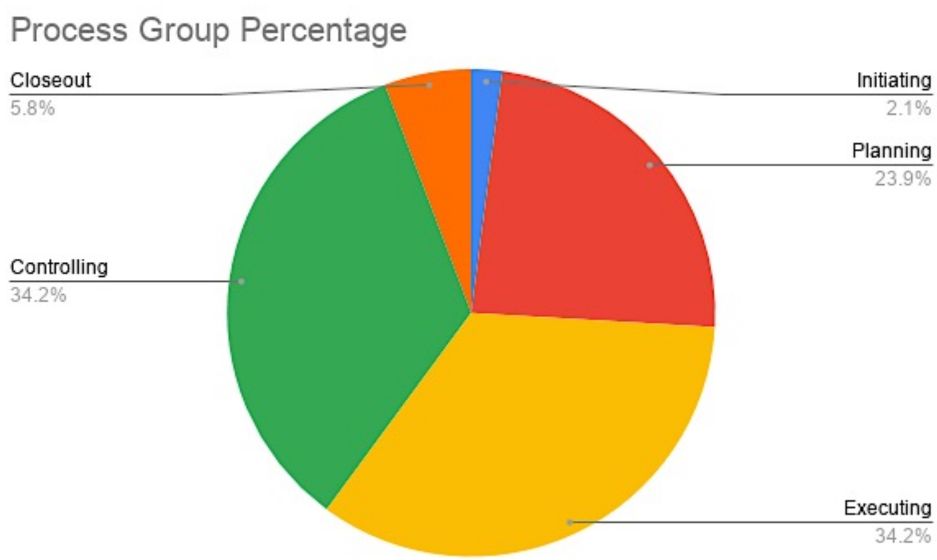


Figure 3: Breakdown of Process Group

The initiation phase involved pitching the project and creating the project charter. This phase also involved creating the project team, which was assigned at the beginning of the project; however, this is normally done during the planning phase of the project. Also included in the initiating phase was assessing the needs and requirements of the project after the charter was approved.

2.1 PITCHING THE PROJECT

The project was pitched the first week of classes in Fall 2019. The project focus was to create a charcuterie board of no specific size with a resin inlay that was no more than 1/8” deep. The proposal then went to a panel of professors that chose the best nine pitches. Then, the selected projects were ranked by students in the order of interest. Once the teams were assigned, the formation of the capstone was initiated.

2.2 PROJECT CHARTER

The project charter [Appendix A] established four sections of the project: overview, goals, scope, and milestones. These sections were clearly defined before the project charter was submitted for approval.

2.2.1 OVERVIEW

Draft a project management plan, create a work breakdown structure, clearly define scope, manage the timeline, stay within the allocated budget, accomplish the common goals, and successfully deliver the project to the consumer were the main points of the project.

2.2.2 GOALS

The goals of the project were also listed: staying within scope and budget while delivering the project in the desired timeline and working together as a team to accomplish the entirety of the project within the timeline.

2.2.3 SCOPE

The scope of the project was clearly defined to alleviate the threat of scope creep. 15 charcuterie boards were produced. There were three featured designs: the Mississippi River, a magnolia flower, and the state outline of Mississippi. The designs were featured in resin, and the boards were prototyped prior to mass production. A plan for the project was developed to stay on schedule and budget, and the product was delivered to the intended party by the end of the spring semester.

2.2.4 MILESTONES

During the fall semester, a project management plan and work breakdown structure were created; an initial budget was formed, as well as, a risk assessment, initial designs, a project schedule, and two prototypes. A project was presented at the close of the semester. During the spring semester, the project was monitored and controlled while in the production phase. A CME prototype was created, any changes made were documented as they occurred, a final report was submitted, and a final presentation was given before the close of the semester.

3. PLANNING

After the project charter was clearly defined, the planning proceeded into greater detail. A work breakdown structure was created that scaffolded every step needed to be taken to complete the project. The number of hours each task would take was estimated to determine the percentage of each project phase.

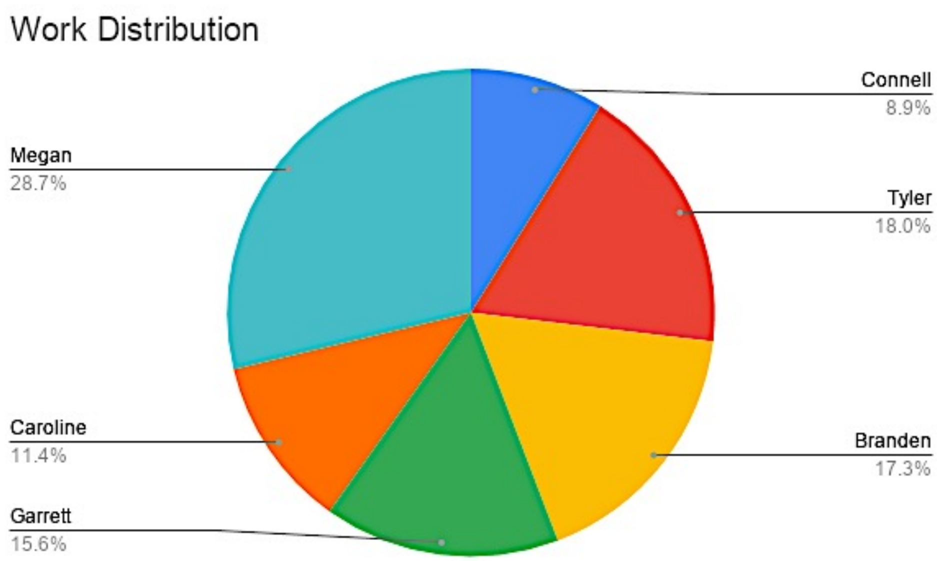


Figure 4: Work Distribution

3.1 ROLES AND RESPONSIBILITIES OF TEAM MEMBERS

A role was assumed by each member during the project, so each item in the work breakdown structure had a person responsible. Connell Boyle was the Risk Manager. He was responsible for identifying and creating a mitigation strategy for every risk our project was susceptible. Tyler Edwards was the Lead of Research and Development. He was responsible for research, planning, and overseeing project development. Branden Livingston was the Lead Engineer. He was responsible for designing the product to be manufacturable and troubleshooting any problems that arose. Garrett Reed was the Production Engineer. He was responsible for determining and developing the most efficient manufacturing process for the product. Caroline Rose was the Financial Consultant. She was responsible for accomplishing the financial objectives, developing financial strategies and plans, and monitoring changes in financial status. I was the Project Manager. I was responsible for managing the scope and timeline of the project, as well as drafting and updating the project management plan.

3.2 PROJECT DEFINITION

Charcuterie boards with colorful resin inlays were designed and manufactured. The manufacturing took place on the Center for Manufacturing Excellence's factor floor. The initiating and planning took place during team meetings and individual work hours. All accounting and financial information were included in a report at the end of the project, as well as documentation of lessons learned during the execution phase. By the end of the fall semester, three prototypes in addition to all financial and accounting information were developed. By the end of the spring semester, full production took place and continuous improvements were made to the manufacturing process. At the close of the project, 15 charcuterie boards were created, a final presentation was presented, and a complete report was finished.

3.3 SPECIFIC SCOPE OF WORK

15 charcuterie boards were manufactured. The three designs were: the Mississippi River, a Magnolia flower, and the state outline of Mississippi. The designs contained a two-part epoxy resin and were coated with wax and oil. The designs were prototyped prior to production. A project plan was developed to stay on schedule and budget, and the boards were delivered by the end of the semester.

3.4 MATERIAL RESEARCH INFORMATION

For this project, sufficient information was gathered regarding wood type, board size, sealant, and resin. Black walnut was selected for its luxurious appearance. Other potential wood types considered, included bamboo and maple. Each charcuterie board was 12” wide, a standard board width. This size allowed for the option to order one solid board or two 6” wide boards that could be laminated together to attain the desired width. This also allowed for different lengths of boards to be purchased depending on readily available materials. After being cut to length, each board was sanded to a smooth finish and treated with mineral oil and wax to seal the board, ensuring its food safety compliance. This process also protected the wood from minor scratches and cracking. A non-toxic resin was used. This manufacturer was chosen due to the convenience of combining the epoxy and hardener. The amount of epoxy and hardener needed was predetermined by the included dispensers. They measured out the correct ratio of each part, so the mixture contained one pump of each. The resin would act as a base for the pigment. Powder and liquid pigment were both ordered to determine which would create the desired look.

3.5 PROJECT SCHEDULE

After clearly defining the project definition, scope, and materials, a general project schedule was drafted to have clear goals for each process phase in the process and project management plan.

3.5.1 INITIATING

Team members worked together to assess needs and requirements per project definition. An initial financial analysis and stakeholder analysis was prepared. Lab technician and capstone advisor were consulted to ensure project definition was being met and goals were achievable. A project charter was drafted and submitted for approval.

3.5.2 PLANNING

Meetings were scheduled to ensure the project milestones were being met. A scope statement encompassing all the work to be done was developed. The number of prototypes and final products produced by the close of the project were identified. A work breakdown structure was created. Initial wood, resin, and finish quantities for testing were estimated. A project schedule was developed, and a budget and risk analysis were formed. Project plan approval was gained at the end of the phase.

3.5.3 EXECUTING

Meetings were scheduled and attended to ensure the project milestones were being met. Proper allocation for the execution of the project in the budget was ensured. Distribution of workload was coordinated and managed. Initial prototypes and final materials for production were chosen. A preliminary production plan was used as a baseline for initial trials and was updated based on trial results. Production of final product design began.

3.5.4 CONTROLLING

Project variables were monitored against the Project Management Plan. The budget was monitored to ensure it was on track. Problems within the project process were identified, as well as corrective actions. Corrective actions were recorded as lessons learned. Any changes to the Project Management Plan were documented.

3.5.5 CLOSING

The final product was approved using a presentation and a final report. Documents associated with the project were archived, and lessons learned were recorded.

3.6 WORK BREAKDOWN STRUCTURE

After the project schedule was drafted, a work breakdown structure was created to monitor inputs and outputs of each process, as well as provide a way to measure progress. The number of hours each task would take was estimated to ensure the milestones were being met in the allotted time, seen in Tables 1 through 5. This was the most helpful tool during the process because the next task was laid out and organized.

3.6.1 INITIATION

Table 1: Initiation Work Breakdown

Process	**Description**	**Time (hrs)**
Evaluation and Recommendation	Assigned at the beginning of the Fall	1
Develop Project Charter	An overview of the project, determined goals, and baselined product scope	1
Submit Project Charter	Submitted on September 24th, 2019	1
Project Sponsor Reviews Project Charter	Reviewed on September 24th, 2019	1
Milestone: Project Charter Approved	Approved on September 24th, 2019	1

3.6.2 PLANNING

Table 2: Planning Work Breakdown

Process	**Description**	**Time (hrs)**
Determine Project Team	Connell, Tyler, Branden, Garrett, Caroline, and Megan	1
Project Team Kickoff Meetings	September 20th and 25th, October 2nd, 9th, and 16th of 2019	5
Create Preliminary Project Definition	Worked as a team to encompassing the steps and goal of the team in order to manage stakeholder expectations	1
Develop Preliminary Scope of Work	Fully defined the baseline of the project and what the team wanted to deliver to the customer	1
Material Research	Researched materials and methods to determine the optimal design	3
Project Schedule	Worked as a team to determine the best schedule	2
Initial Design	Discussed wood selection, milling processes, and resin designs to create CAD models	3
Anticipated Challenges/Risk Analysis	Discussed with team to identify potential risks and develop a mitigation strategy	10
Industry Requirements/Standards	Researched industry standards to identify guidelines for prototyping and execution	3
Initial Budget/Anticipated Expenditures	Produced a budget for potential costs for the project	5
Specific Timeline for Tasks	Used the project schedule to create a specific date for completion of each task	2
Develop Project Management Plan	Worked with team members to develop a detailed plan to ensure a successful project	20
Submit Project Plan	Submitted to Mike Gill on October 7th, 2019	1
Milestone: Project Plan Approval	Approved by Mike Gill on October 7th, 2019	1

3.6.3 EXECUTION

Table 3: Execution Work Breakdown

Process	**Description**	**Time (hrs)**
Project Team Kickoff Meeting	October 23rd and 30th, November 6th, 13th, and 20th, and December 4th of 2019	12
Define User Requirements	Performed market research to determine what the user desires out of a charcuterie board	2
Obtain Funds	Obtained proper funding to begin planning and producing prototypes, while executing the Project Management Plan	1
Define Designs	Completed the transfer of three initial resin designs from custom design to CAD	2
Order Material	Placed an order for materials necessary to begin producing prototypes	2
Prototype	Completed three prototypes with the selected wood and resin for each of the three designs	20
Adjustments	Tested the prototypes and make any changes necessary	4
Production	Produced 15 total boards according to the production plan	40

3.6.4 CONTROLLING

Table 4: Controlling Work Breakdown

Process	Description	Time (hrs)
Project Status Meetings	October 23rd and 30th, November 6th, 13th, and 20th, and December 4th of 2019	12
Project Management	Ensured the scope baseline was being met, there was no scope creep, and team members were meeting the timeline	30
Change Requests	Updated the Project Management Plan to reflect any changes made throughout the project	10
Risk Management	Monitored ongoing processes and reevaluated potential risk moving forward with the remainder of the project	5
Budget Check-in	Compared initial budget to costs incurred throughout the lifecycle of the project	5
Production Check-in	Verified the team was operating on schedule and there was enough time allocated for final production	1
Update Project Management Plan	Document progress and changes throughout the project	20

3.6.5 CLOSING

Table 5: Closing Work Breakdown

Process	**Description**	**Time (hrs)**
Document Lessons Learned	Assembled all changes and assessed team to document any opinions on how the project could have run smoother	5
Update Files/Records	Change the Project Management Plan to reflect all changes and incorporate lessons learned	5
Gain Formal Acceptance	Submit the project and all the associated documents for approval	1
Archive Files and Documents	Assemble all associated documents for reflection and research	3

3.7 INITIAL DESIGN

The initial design of the charcuterie board consisted of a 12” x 18” x 1.75” piece of wood with three different designs milled out of the center. The three designs can be seen in Figures 5, 6, and 7. Each design was custom drawn to avoid any intellectual property issues.

Figure 5: Mississippi Outline Model

Figure 6: Mississippi River Model

Figure 7: Magnolia Flower Model

3.8 ANTICIPATED CHALLENGES AND RISK ANALYSIS

One of the largest challenges anticipated was working with materials largely unfamiliar to the team. The reaction of the epoxy and hardener and interaction with the chosen wood was unknown and could have had large repercussions in both design and cost. There was proper allocation of the budget to allow for trial and error in selecting compatible materials. Execution of machining could have also posed several risks as the designs ranged in level of complexity. The resins were a risk, in terms of safety, as potential fumes could have been given off. To diminish the risk, proper personal protection equipment was worn at appropriate times.

3.9 INDUSTRY REQUIREMENTS AND STANDARDS

Although there were no industry requirements or standards associated with charcuterie boards, extensive research was done to ensure the safety of the consumers. The USDA recommended using a nonporous surface for cutting boards [8]. Although cutting boards were not being manufactured, this was a comparable substitution for research. Therefore, a hard wood that also had aesthetic look was chosen. Black walnut has a dark chocolate color, a high density, and tight grain when compared to other woods [9]. For finish, the USDA also recommended cleaning all wooden boards with hot soapy water after use and using mineral oil to retain moisture [8]. In compliance, a mineral oil finish was chosen for the boards.

3.10 INITIAL BUDGET

The CME allotted $1000 for each capstone team. This shaped the initial budget for prototyping and production. Because production ran for at least an hour, this determined the amount of boards needed to be made. Ultimately, 20 boards were produced within the budget. Five were prototyped, and 15 were produced. Table 6 shows the budget projection after prototyping. Most of the material for prototyping was more than was needed for five boards, so the left-over material was used during full production. The budget, after prototyping, was determined to be conducive for full production.

Table 6: Budget after Prototyping

Materials	Unit	Quantity	Use	Price	Price Per Board
Black Walnut	1 Board (8')	1	5	$138	$27.60
Epoxy Resin	Gallon	1	10	$70	$7.00
Epoxy Pigment	Pack of 9	1	100	$8	$0.08
Wax & Oil	Kit	1	20	$20	$1.00
Syringes	Pack	1	12	$9	$0.75
Consumables	Varies		20	$32	$1.60
Price per Board					$38.00
Boards Able to be Produced				**20**	
Total Costs				**$297**	
Budget Remaining				**$703**	

3.11 SPECIFIC TIMELINE FOR TASKS

After the general schedule was determined and the work breakdown structure was created, the project milestones were determined. These milestones are in Table 7. These milestones were monitored closely because if the dates slipped from the schedule, the project was at risk of falling behind. At the beginning of the project, the due dates were underestimated. Even though the project fell behind at the beginning, there was enough time to ensure the project was not in danger of getting behind schedule.

Table 7: Timeline for Milestones

	Team Member	Due Date	Done Date
Initial Material Selection	Tyler	10/02/2019	10/01/2019
Work Breakdown Structure	All Members	10/27/2019	10/04/2019
Initial Design	Branden	10/24/2019	10/04/2019
Initial Budget	Connell/Caroline	10/02/2019	10/04/2019
Initial Risk Analysis	Connell/Caroline	10/02/2019	10/04/2019
Project Management Plan	Megan	10/07/2019	10/05/2019
Initial Prototyping	Tyler/Branden/Megan	11/08/2019	11/01/2019
Final Material Selection	Tyler	11/13/2019	11/15/2019
Final Prototyping	Tyler/Branden	11/20/2019	12/05/2019
Presentation	All Members	12/06/2019	12/06/2019
Production	All Members	02/21/2020	02/21/2020
Project Report	All Members	05/01/2020	05/01/2020

3.12 ASSUMPTIONS

Before starting prototyping, assumptions made at the beginning of the project were clearly defined, seen in Table 8. Each team member stated assumptions related to their area of the project. Then, at the close of the project those were analyzed for accuracy.

Table 8: Assumptions Log

Area	**Person**	**Assumption**
Financials	Connell	The price of materials will remain the same throughout the process
Production	Branden	Boards will arrive ripped and planed from supplier.
Materials	Tyler	We would receive one 12” wide board rather than two 6” boards.
Prototyping	Branden	Resin will react the same with pine as with black walnut
Materials	Branden	The forces on the board are smaller than the strength of the glue
Prototyping	Branden	The blow torch will remove all large bubbles from resin
Production	Tyler	The mineral oil and wax will prevent the pigment from seeping into the wood grain.
Project	Megan	Outputs of Work Breakdown Structure will be turned in on time
Risk	Connell	All machines will be fully operational throughout the process
Risk	Connell	Proper PPE will be worn at all times
Research	Connell	Market Research is accurate
Financials	Connell	Employee wage and factory overhead will remain constant

4. EXECUTION

Execution began during the first semester of the CME senior capstone course when specific steps were taken to actually complete the project. During the execution stage the Executive Director of the Center for Manufacturing Excellence (CME) presented a new opportunity. Each year at the close of the second semester, representatives of companies around Mississippi come to the CME to give input to the course curriculum; this annual event is called the Advisory Board Meeting. The CME Executive Director wanted to give the charcuterie boards as gifts for the Advisory Board Members for this year. This meant an additional design featuring the CME logo was created, and more than twice as many boards as originally planned, were produced.

4.1 DEFINE USER REQUIREMENTS

In order to determine desired aspects of the project, a survey was created to aid in developing design, pricing, and scope. 287 responses were received with the two largest demographics being "Married Adult with Children" (109) and "College Student" at (91). When potential consumers were asked what important factors were present when selecting a charcuterie board, appearance received the largest number of votes (204) followed by cost (168), size (164), and maintenance (81). When participants determined daily use of a charcuterie board, on a scale of one to five, two received the largest number of votes. One was described as no use and five was daily use. When asked about pricing, 161 participants indicated a $40-$60 price zone with $60-$80 being selected 63 times as the runner up. The flower design was chosen the most often as favorite design with the state outline being a close second. The data suggested that a product focusing on appearance, in the $40-$60 price zone, with the flower design would sell the best on a large scale.

4.2 DEFINE DESIGNS

After the positive feedback from the survey, the team moved forward with the original designs presented, as well as the new design for the Advisory Board. These designs were prototyped before mass production to ensure production ran as smoothly as possible.

Figure 8: CME Model

4.3 MATERIALS

Because black walnut was an expensive material, pine, a cheaper material, was ordered to do initial prototyping to stay within the budget. Pine was used to test the routing of the design as well as the resin. Because resin and wood had not been worked with before, three prototypes were created with the pine.

4.4 PROTOTYPE

Prototyping began with three pine boards (flower, river, and state outline) and concluded with four black walnut prototypes (flower, river, state outline, and CME logo). The prototyping process was extremely beneficial because many adjustments had to be made before running full production. The three pine prototypes and three of the black walnut prototypes were accomplished before the end of the fall semester. The CME prototype was finished shortly after the beginning of the spring semester. All of the designs were thoroughly tested before full production began.

4.4.1 PINE PROTOTYPE

The pine raw material came in as one solid board with dimensions 12” x 1.5” x 120”. The board was cut into 18” pieces before being routed with the CNC router. Each design was then cut into the top. The resin came in two parts (epoxy and hardener). These had to be thoroughly mixed together before adding the pigment. A liquid blue dye was used to mix into the resin. Syringes worked the best to fill the channels and avoid messes. Almost immediately after the resin was poured, the blue pigment seeped into the wood grain, noted in Figure 9.

Figure 9: Pine Prototype

This was not a desirable characteristic of the charcuterie boards. Because pine was a porous wood, the resin seeped in easier than it would with a black walnut board, which was one of the densest woods. After the resin dried, the top of the board was planed. This left a frosted look on the resin, which was an undesirable characteristic. To solve this, an alternate powder dye was used instead. This had a shimmer and was still shiny after being planed.

4.4.2 WALNUT PROTOTYPE

The black walnut wood was ordered to begin the prototyping process. A solid piece of black walnut with the dimensions 12" x 2" x 72" was expected to arrive. However, the material arrived in two 6" pieces instead of one 12” board. The supplier explained that 12” black walnut was rare and nearly impossible to find in a large enough quantity for full production. The process was changed. The sides of each board were cut off and two pieces were laminated to reach the desired width. After completing the three black walnut prototypes, seen in Figure 10, it was decided that the designs needed to be enhanced.

Figure 10: Black Walnut Prototypes

The state outline was not centered in the middle of the board, the flower looked better at a landscape orientation, and the river needed to be thinner and longer. These changes were made before going into full production. The CME prototype had to be approved by the Executive Director before full production began. Multiple red and navy pigments were tested to find the best hue. The approved prototype can be seen in Figure 11.

Figure 11: CME Prototype

4.5 FLOOR LAYOUT

Before the production equipment was repositioned on the factory floor, time was spent downstairs measuring the production equipment needed to create a computer model before making the floor layout.

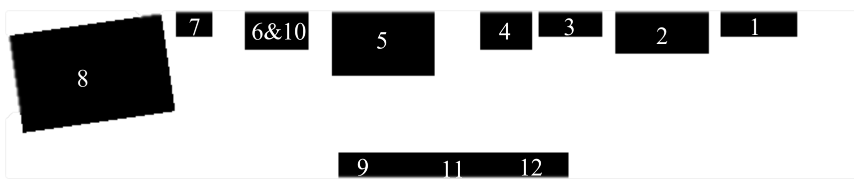


Figure 12: Initial Floor Layout

4.6 PRODUCTION

The production time was scheduled for February 10^{th} through the 14^{th} and February 17^{th} through the 21^{st}. The black walnut that was ordered for full production was scheduled to come in February 14^{th}. This was an issue because there was twice as much work to do with the addition of the CME Advisory

Board charcuterie boards, but the time was cut in half. The first week was spent moving equipment, running through the process mentally, and making identifiable process improvements. Figure 13 shows the computer model of the factory floor layout, and Figure 14 shows the actual CME production floor during the process.

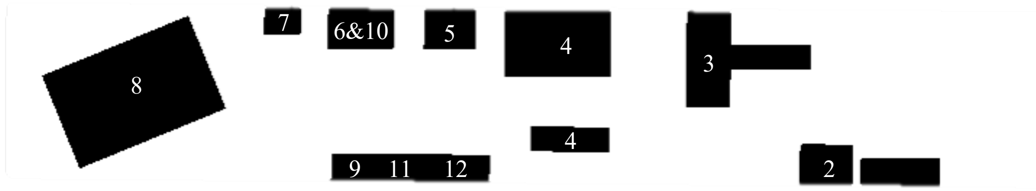


Figure 13: Actual Production Floor Model

Figure 14: Production Floor

Each station was broken down and a standardized work procedure [Appendix B1-B13] was created, as well as a daily check sheet [Appendix C1-C12] to incorporate lean manufacturing practices into the process. Table 9 shows the steps that would be taken if running full production on a long-term basis.

Table 9: Production Steps

Station	Description	Work to be Done	Machines & Support Equipment
1	Receiving Material	Inspect material and ensure there are no defects	N/A
2	Cutting to Length	Cut the boards to 18" pieces	Chop Saw, Tape Measure
3	Ripping Sides	Rip each piece to 6"	Saw Stop Table Saw, Tape Measure
4	Gluing Boards	Glue both sides of board and place into the panel press with shims in between boards	Panel Press, Table, Glue, Roller, Paint Pan, Shims
5	Trimming the Sides	Shave one side of the board and place the other side against the stop to cut to 17.5"	Radial Arm Saw, Tape Measure, Rolling Cart
6	Planing	Plane both sides of the board until smooth and mark the top	Planar, Push Stick, and marker
7	Routing Chamfers	Rout chamfer on each side of the top surface	Table Router and shelf
8	Routing Design	Place board onto sheet router against the pegs, turn the vacuum on, check daily quantity, and start machine	Sheet Router and cart
9	Pouring Resin	Check design map for appropriate design, pump corresponding amount for the design and add pigment, stir for one minute, and syringe into channels	Table, Epoxy, Hardener, Pigment, Gloves, Cups, Wooden Sticks, Syringes, Rolling Cart, and Blowtorch
10	Planing	After resin has cured for 8 hours, plane the top until uniform	Planar, Rolling Cart
11	Sanding	Start with 60 grit and sand the entire board increasing until reaching 320 grit	Palm Sander, Table, Rolling Vacuum, Sandpaper, and mask
12	Oil & Wax	Clean dust off board with rag, oil board with clean rag, and leave to dry for 4 hours	Table, Oil, Wax, Rags, and Rolling Cart
13	Final Inspection & Packaging	Ensure all features are present, check daily order sheet, and package appropriate designs into the shipping boxes	Boxes

The only difference in the production run and the following table was Station 3. Raw material was paired up based on the width of each long board to reach 11.5”. Originally, a 12” board was desired, but it was not possible with the raw material received. At Station 2, each cut piece had to be labeled with the corresponding long board number and then lettered to make matching the pieces easier.

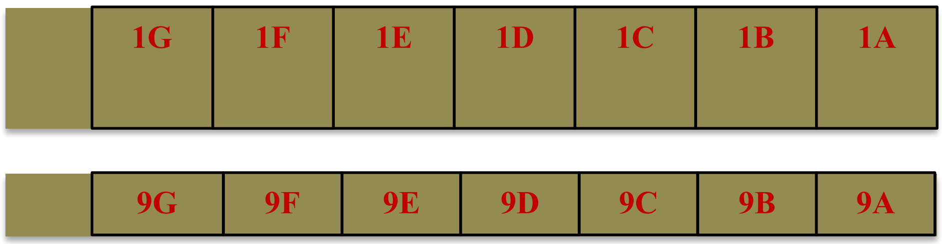


Figure 15: Station 2 Labeling Scheme

Because each board was not square, piece 1A might go best with 9F. This was a time-consuming and unforeseeable part of the process, which would not occur in an actual production setting. Figures 16 through 26 show each station in the production run. Each station had a standardized work and daily check sheet.

Figure 16: Station 1

Figure 17: Station 2

Figure 18: Station 3

Figure 19: Station 4

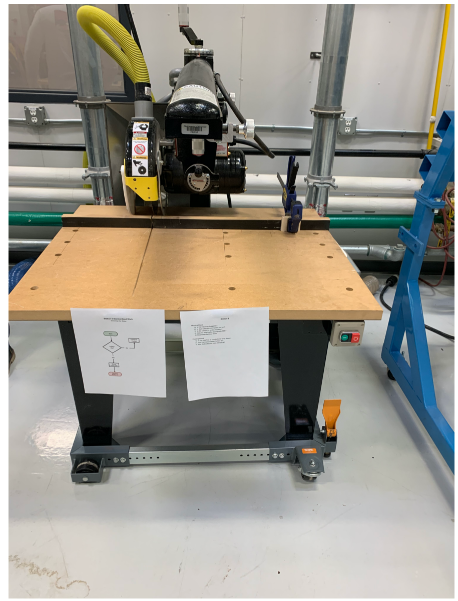


Figure 20: Station 5

Figure 21: Station 6 & 10

Figure 22: Station 7

Figure 23: Station 8

Figure 24: Station 9

Figure 25: Station 11

Figure 26: Station 12

At the end of production, we had successfully created 22 CME charcuterie boards, seen in Figure 27.

Figure 27: CME Charcuterie Boards

Figure 28 shows the updated flower and Figure 29 shows the updated river design.

Figure 28: Flower Design

Figure 29: River Design

5. CONTROLLING

One of the most challenging parts of this project was keeping track of all the changes made and incorporating those changes into the Project Management Plan. One of the tools used by project managers is Microsoft Project. This software was not beneficial in this case because Microsoft Project assumes people work 40-hour weeks, and as students, 40 hours a week was not spent on this project. However, an alternate way to keep track of scheduling and progress was created using Microsoft Excel. This allowed for customized tracking of the progress.

5.1 PROJECT MANAGEMENT

Using Microsoft Excel, two different spreadsheets were created: a project schedule and a project completion report.

5.1.1 PROJECT COMPLETION REPORT

The project completion report [Appendix D1] corresponded to the work breakdown structure. This sheet contained estimated hours and calculated the percentage of the project that each line item accounted for. Then, as each task was completed, the project completion percentage increased.

5.1.2 PROJECT SCHEDULE

The project schedule [Appendix D2] took a similar approach. It too corresponded to the work breakdown structure. Each task was assigned a start and end date. As the task ended, the box was checked. Each task was color coded to keep track of the responsible person. These two spreadsheets were extremely useful in keeping track of the progress made and the progress left.

5.2 CHANGE LOG

In order to successfully track changes throughout the project, Table 10 was created to log changes. Most of the changes were made during production to increase efficiency and have standardization among the boards.

Table 10: Log of Changes throughout Project

Process	Original Plan	New Plan	Reason	Result
Material	Use one single piece of wood	Laminate pieces together	12” wide black walnut was not readily available	Shorter lead time on material
Production	Dimension boards to 12” width	Dimension boards to 11.5”	Material ordered would not support 12” width	Greater use of material
Production	Dimension boards to 18” long	Dimension boards to 17.5”	Uniformity among boards after gluing	Standardization
Production	Ripping sides before cutting to length	Cut to length first	Ripping an entire board would be strenuous on operators	Increased production
Production	Plane all boards to the same thickness	Set Sheet Router to thinnest board	Resetting Sheet Router between every board was time consuming	Increased Production and Lowered Costs
Production	Fill each board with resin after being routed	Batch fill boards with the same design	Extra resin was be used to fill other boards	Resin was saved and cost was reduced
Production	Oil each channel before pouring resin	Pour resin without oil	Black walnut was dense enough to not absorb color	4 hours of time was saved

5.3 RISK MANAGEMENT

Managing and ultimately eliminating risks was an essential goal of the project management plan. The plan starts with addressing prevention of risks. The first risk addressed was personal protection risks, where proper protection equipment (PPE) was required at all times on the factory floor. The next risk discovered was using the epoxy which was unfamiliar to all team members. Research and testing were performed on how the resin would react with different samples of wood. This minimized the portion of the budget that would be used during the process if problems were discovered during actual production. A cost-benefit analysis was performed on the different materials, such as oil and resins to determine which combination would be best suited for production. In addition, food safety was a major consideration in selecting materials and processes as well. In the end, each material chosen was determined safe for consumers.

6. CLOSING

The closing phase includes recording lessons learned, creating a final report, and a providing a final presentation. Lessons learned were recorded throughout the process to maintain accuracy. After the close of full production, a continuation of the report and presentation done during the fall semester was completed to finish the project requirements.

If this project were to scale to mass production, some adjustments would be made. First, the raw material would have to be one board that is cut to size instead of laminating pieces together. If this were not attainable with the material that was chosen, then an alternate material would have to be used. However, an alternate gluing process to speed up the dry time would also be an option, such as a rotating clamp carrier. The state outline design would be offered in all 50 states to broaden the market, and the river design would be eliminated because it was the least popular. In addition, the resin would be measured by weight for repeatability, and methods to reduce drying time would be researched. These are the major adjustments that would greatly improve the process when pushed to a large scale.

6.1 LESSONS LEARNED

One of the most important aspects of the project management was recording lessons learned. This serves as a good reference for similar projects. Learning from past mistakes is essential to continuous improvement, reducing costs, and successful projects. The lessons learned, for this project, were recorded in Table 11 throughout the execution phase to maintain accuracy of all changes made.

Table 11: Lessons Learned Log

Name of Member	**Process**	**Lesson Learned**	**Suggested Fix**
Megan	Prototyping	Liquid pigment seeped into the pine board	Coat pine board first and see if it happens with Walnut
Megan	Prototyping	Material will not come in the correct size	Glue boards together to reach desired width
Tyler	Prototyping	Oiling the boards with blue shop rags leaves fuzz on the board.	Switch oil rag to a cloth material.
Tyler	Prototyping	Dust sticks to oiled boards	Sand the entire board (including bottom) before oiling the board.

7. CONCLUSION

The purpose of the capstone project was to use all the manufacturing principles learned throughout the program to successfully create a product. 36 charcuterie boards with four different designs were created during a two-week production period. In the initiation phase, the project definition was stated, and needs and requirements were assessed. During the planning phase, an initial risk assessment was performed, material was researched, a work breakdown structure was created, and a budget was developed. During the executing phase, the designs created were prototyped before production began. The controlling phase was accomplished in conjunction with the executing phase. The controlling phase recorded the lessons learned and monitored the project management plan. The project ended with the closing phase, which included a final presentation and report. These phases were performed using project management and lean manufacturing tools that were learned throughout the CME program. All of these principles resulted in a successful project and 36 charcuterie boards.

REFERENCES

[1] *A guide to the project management body of knowledge: (PMBOK guide)*. Newtown Square, PA: Project Management Institute, 2017.

[2] "University of Maryland Project Management," *Project Management Center for Excellence*. [Online]. Available: https://pm.umd.edu/partner/global-accreditation-center-gac/. [Accessed: 04-Apr-2020].

[3] "PMI Certification Digital Badge Program," *Project Management Institute*. [Online]. Available: https://www.pmi.org/certifications. [Accessed: 04-Apr-2020].

[4] K. Eby, "The Triple Constraint: The Project Management Triangle of Scope, Time, and Cost," *Smartsheet*. [Online]. Available: https://www.smartsheet.com/triple-constraint-triangle-theory. [Accessed: 07-Feb-2020].

[5] "A Brief History of Lean," *What's Lean*. [Online]. Available: https://www.lean.org/WhatsLean/History.cfm. [Accessed: 07-Feb-2020].

[6] "What is 5S," *5S Today*. [Online]. Available: https://www.5stoday.com/what-is-5s/. [Accessed: 07-Feb-2020].

[7] "World Class Manufacturing," *History of Six Sigma*. [Online]. Available: https://world-class-manufacturing.com/Sigma/history.html. [Accessed: 07-Feb-2020].

[8] "Cutting Boards and Food Safety," *Cutting Boards and Food Safety*, 02-Aug-2013. [Online]. Available: https://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-

education/get-answers/food-safety-fact-sheets/safe-food-handling/cutting-boards-and-food-safety/ct_index. [Accessed: 14-Mar-2020].

[9] Vermont Woods Studios, “Walnut Wood,” *Walnut Wood: Color, Grain & Characteristics - Vermont Woods Studios*. [Online]. Available: https://vermontwoodsstudios.com/content/walnut-wood. [Accessed: 14-Mar-2020].

APPENDICIES

A

Charcuterie Board Project Charter

OVERVIEW

The Project Team will accomplish the CME Capstone project by successfully managing the project and successfully working together to accomplish the common goal. They will do this by drafting a Project Management Plan and Work Breakdown Structure. They will clearly define the scope and manage the timeline and budget in order to successfully deliver the project to the end user.

GOALS

1. Staying within scope and budget while delivering the project in the desired timeline.
2. Working together as a team to accomplish this project.

SCOPE

The Project Team shall produce 15 Charcuterie Boards. There shall be three designs: Mississippi River, Magnolia Flower, and State Outline of Mississippi. The designs shall contain resin. The design shall be prototyped prior to production. The Project Team shall develop a plan for the project to stay on schedule and budget. The boards shall be delivered to the intended party by the end of the spring semester.

MILESTONES

End of Fall Semester

By the end of the fall semester, the Project Team will have completed the Project Management Plan and Work Breakdown Structure. They will also accomplish initial budget, risk assessment, initial design, project schedule, and 2 prototypes per design. They will also present the stage of the project December 12th, 2019.

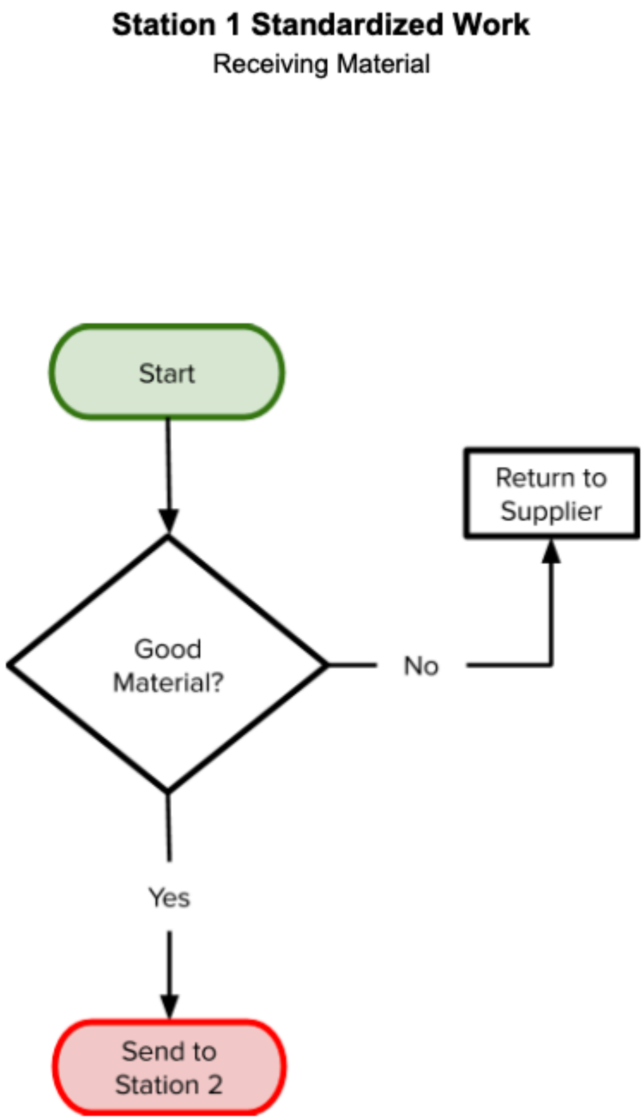
End of Spring Semester

By the end of the spring semester, the Project Team will have updated and managed the Project Management Plan. They will also monitor and control the project while it is in the production phase, as well as document the changes that occur. At the close of the project, they will present it to the intended party on the agreed upon date.

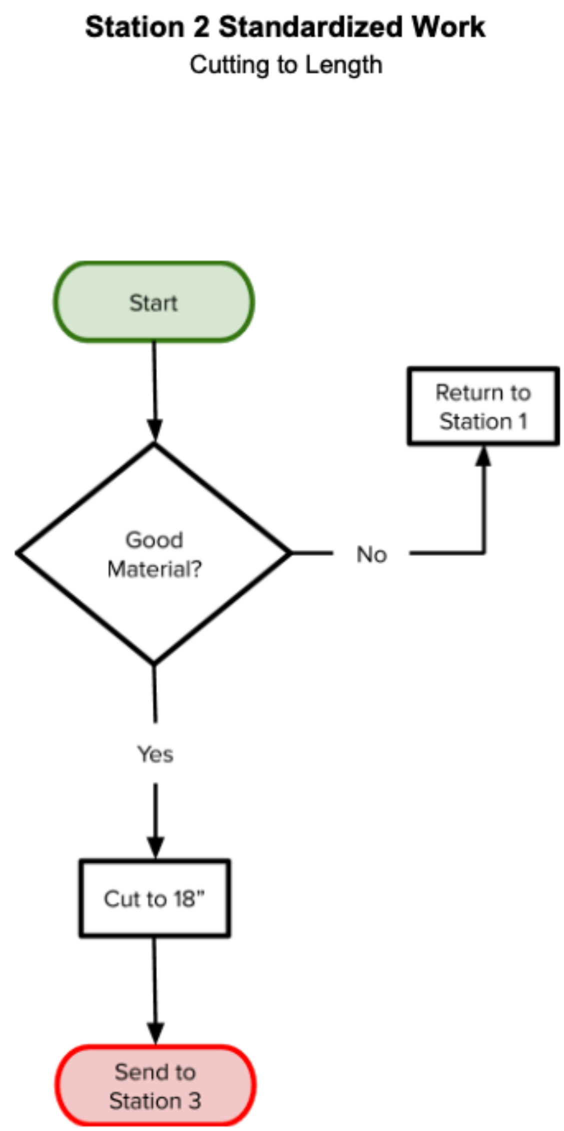
Approved By: Mike Gill

Approved On: September 24th, 2019

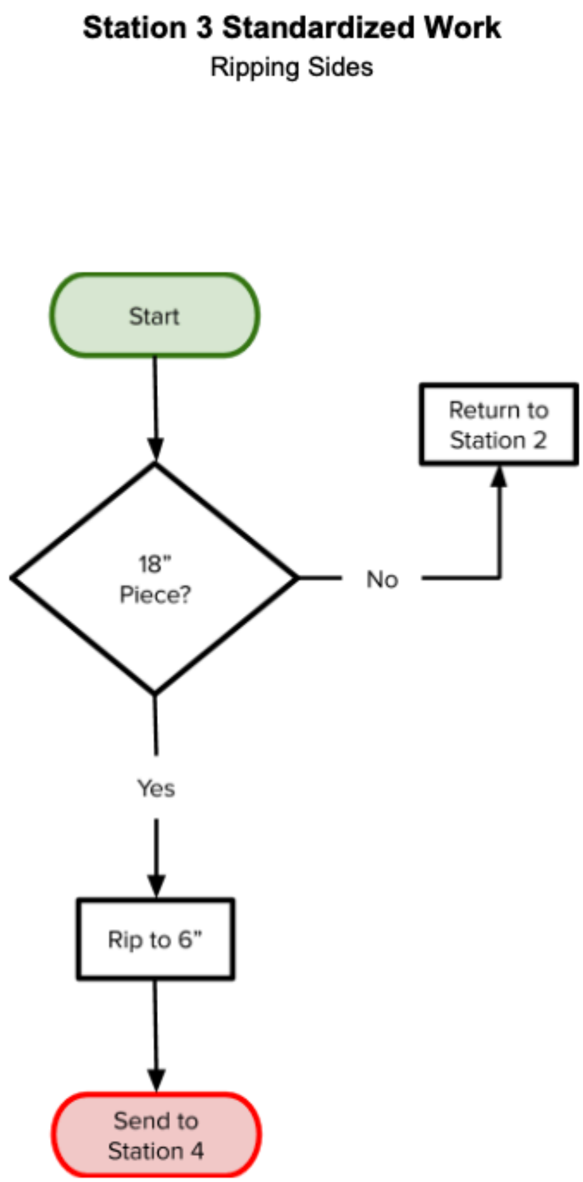
B1


Station 1 Standardized Work
Receiving Material
Start
Good Material?
No
Return to Supplier
Yes
Send to Station 2

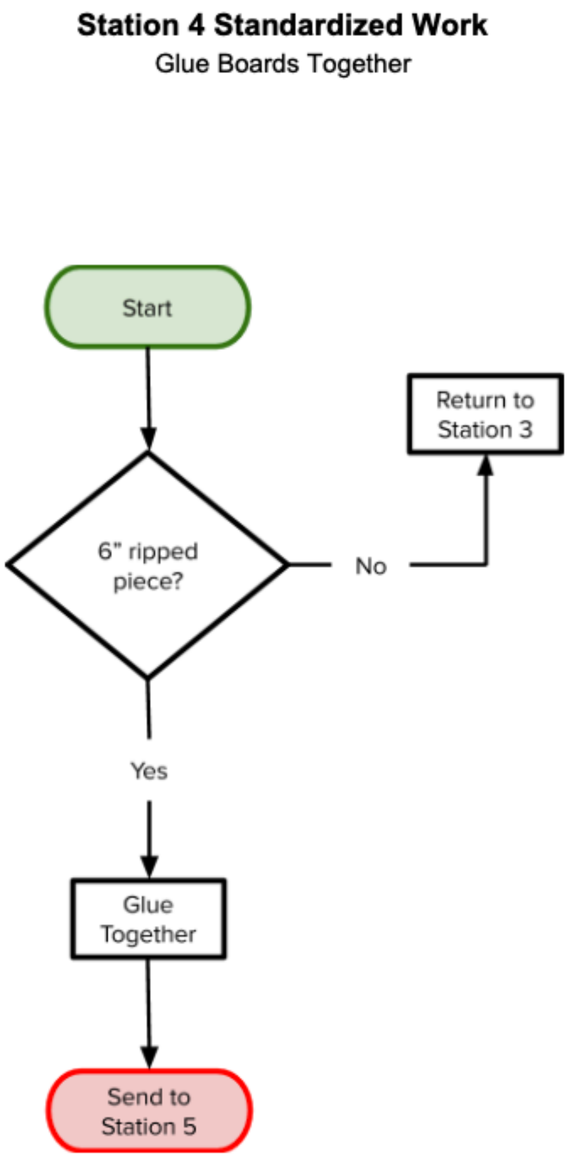
B2


Station 2 Standardized Work
Cutting to Length
Start
Good Material?
No
Return to Station 1
Yes
Cut to 18"
Send to Station 3

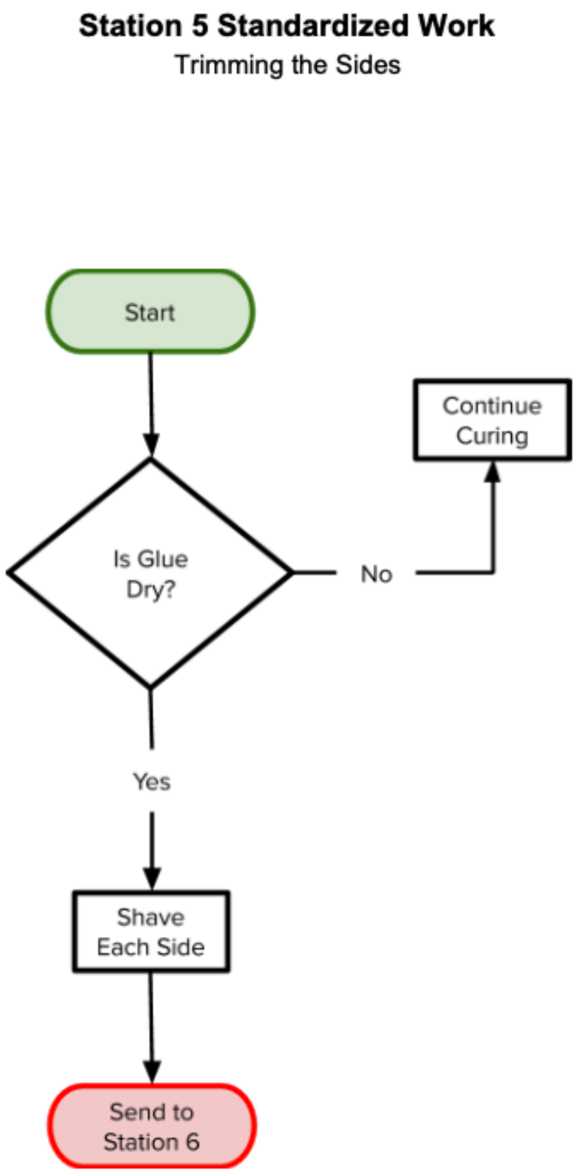
B3


Station 3 Standardized Work
Ripping Sides
Start
18"
Piece?
No
Return to
Station 2
Yes
Rip to 6"
Send to
Station 4

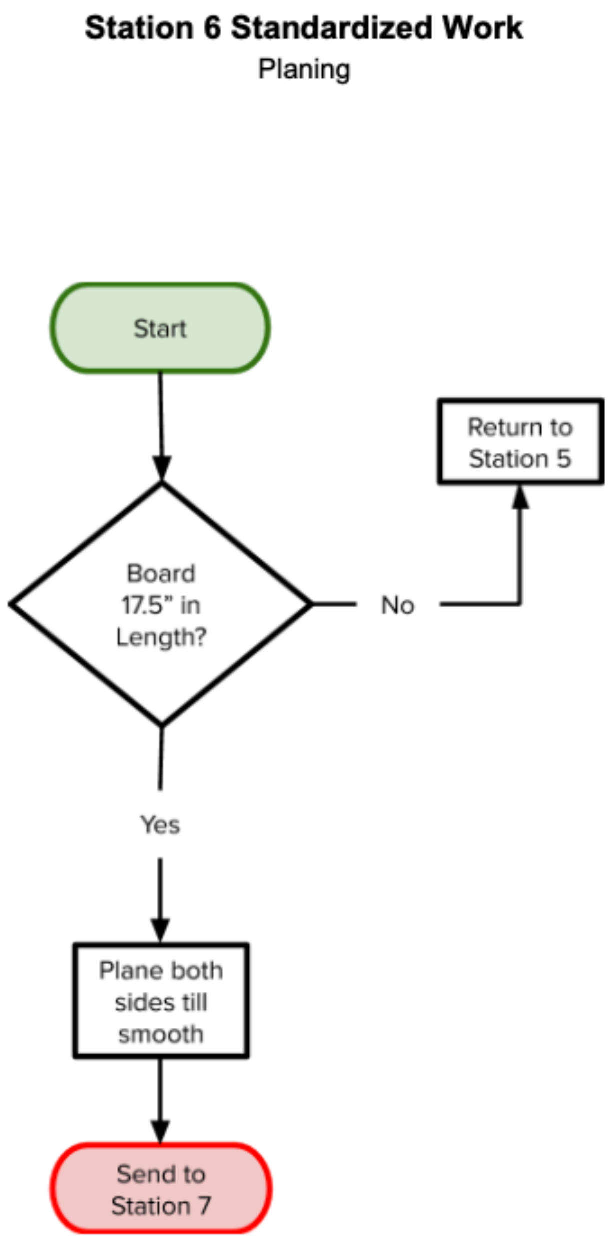
B4


Station 4 Standardized Work
Glue Boards Together
Start
6” ripped piece?
No
Return to Station 3
Yes
Glue Together
Send to Station 5

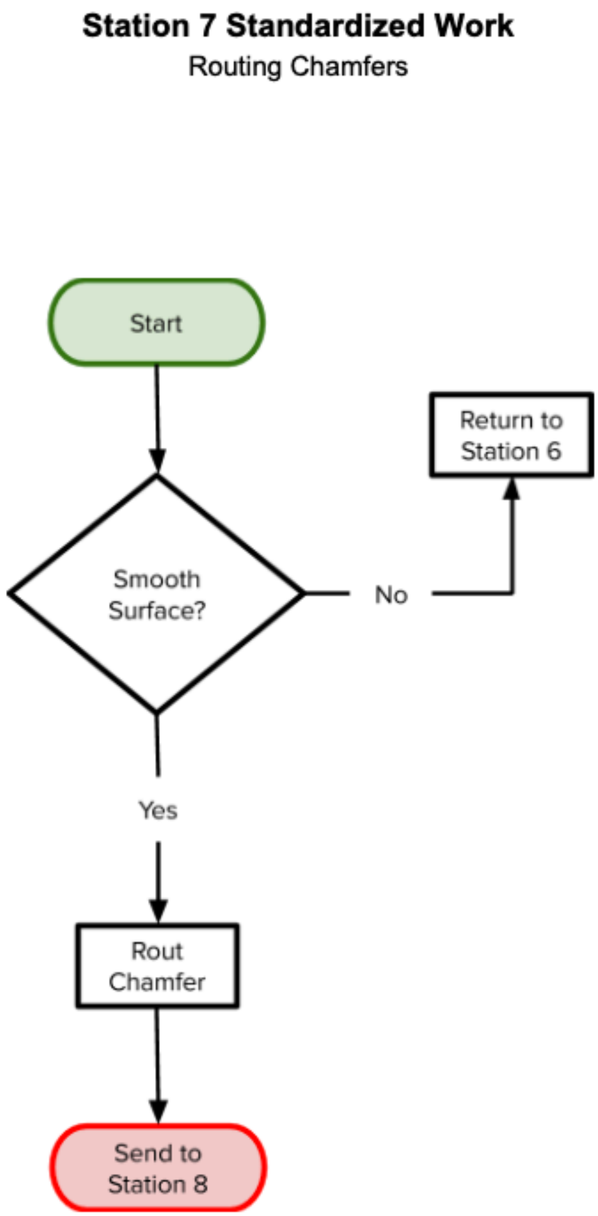
B5


Station 5 Standardized Work
Trimming the Sides
Start
Is Glue Dry?
No
Continue Curing
Yes
Shave Each Side
Send to Station 6

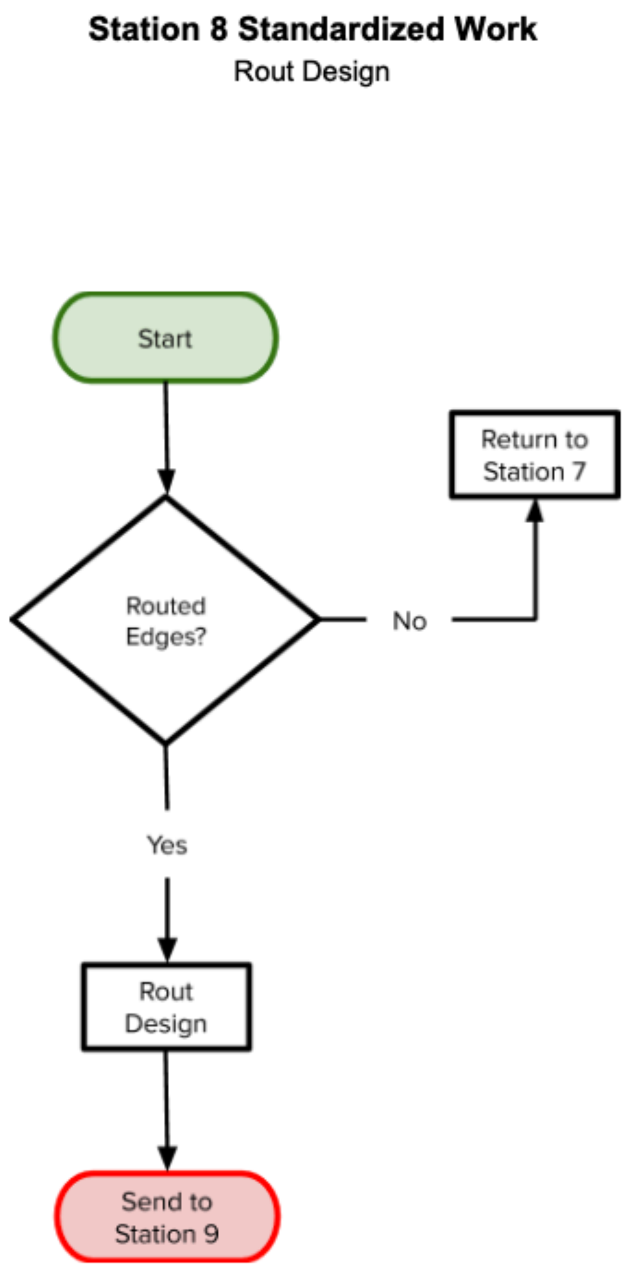
B6


Station 6 Standardized Work
Planing
Start
Board
17.5" in
Length?
No
Return to
Station 5
Yes
Plane both
sides till
smooth
Send to
Station 7

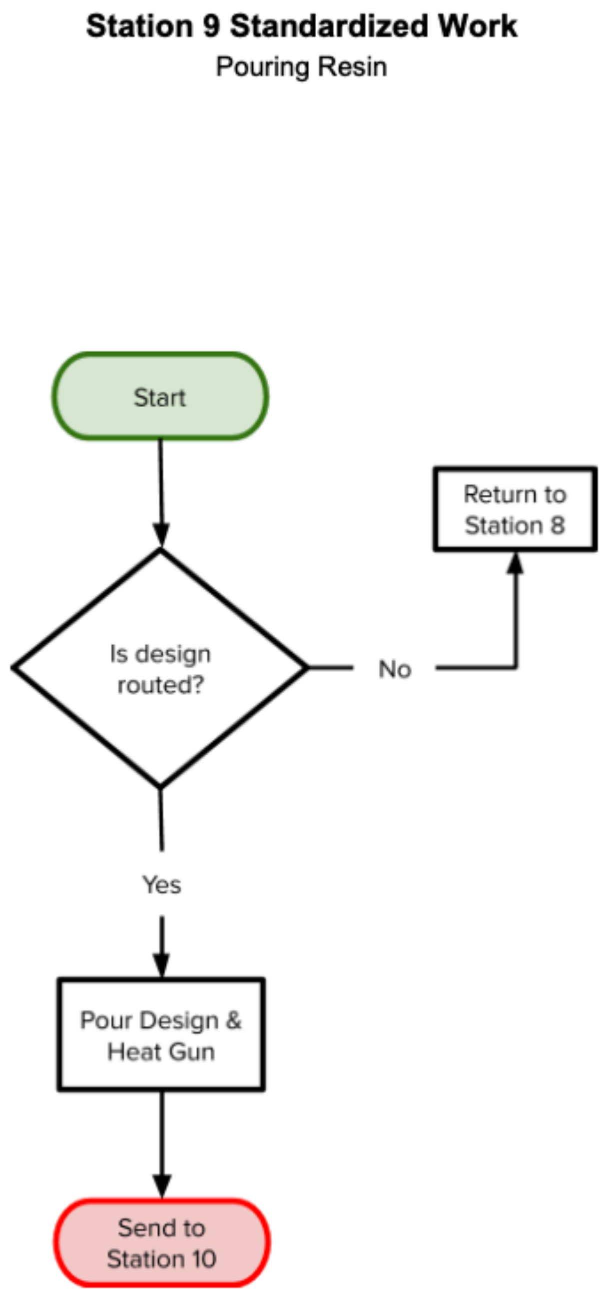
B7


Station 7 Standardized Work
Routing Chamfers
Start
Smooth
Surface?
No
Return to
Station 6
Yes
Rout
Chamfer
Send to
Station 8

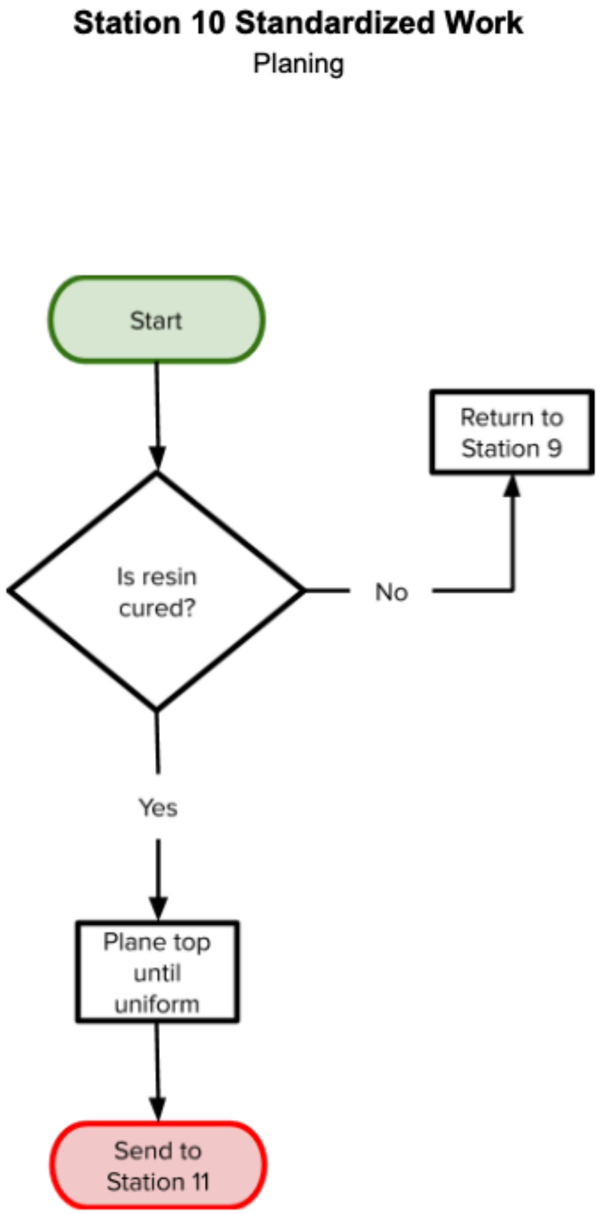
B8


Station 8 Standardized Work
Rout Design
Start
Routed
Edges?
No
Return to
Station 7
Yes
Rout
Design
Send to
Station 9

B9

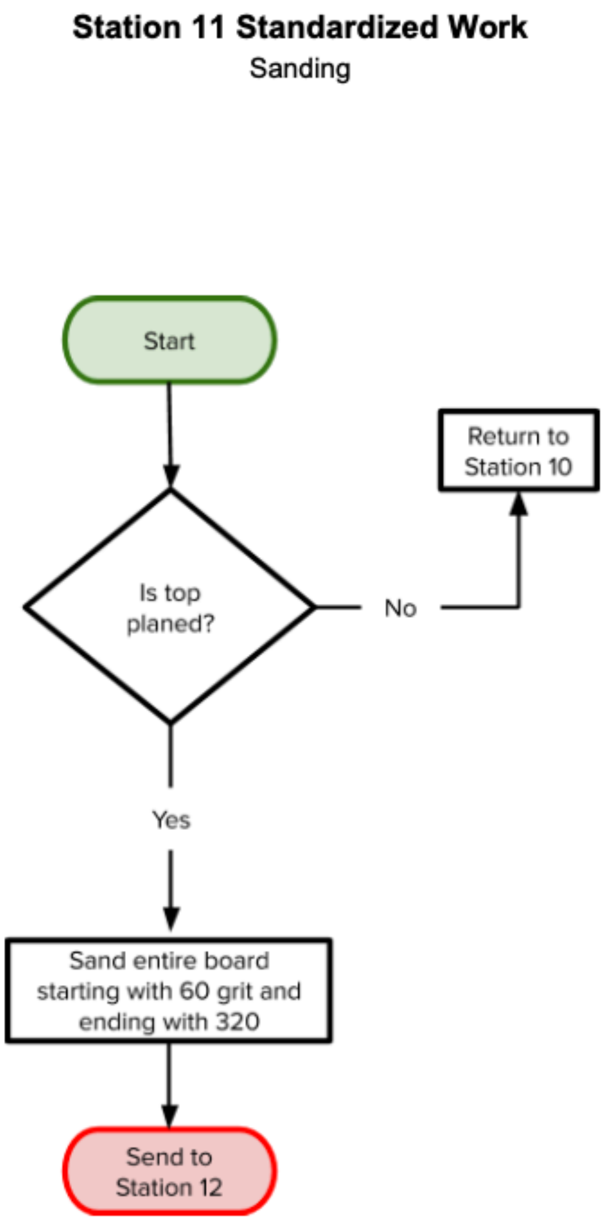

Station 9 Standardized Work
Pouring Resin
Start
Is design routed?
No
Return to Station 8
Yes
Pour Design & Heat Gun
Send to Station 10

B10



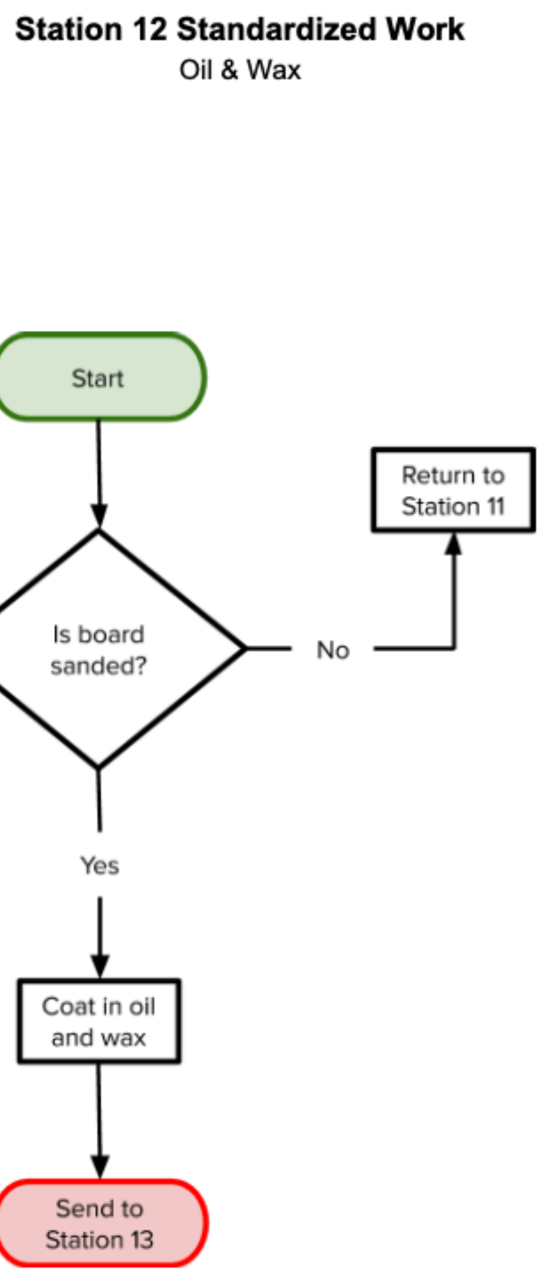
Station 10 Standardized Work
Planing
Start
Is resin cured?
No
Return to Station 9
Yes
Plane top until uniform
Send to Station 11

B11



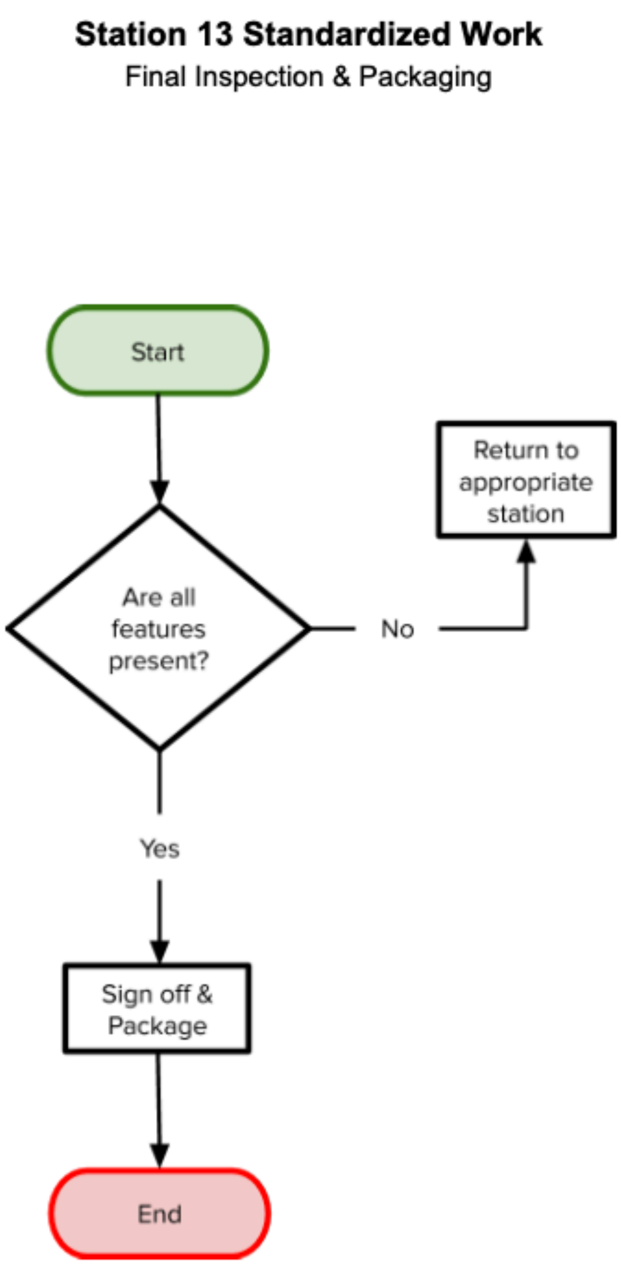
Station 11 Standardized Work
Sanding
Start
Is top planed?
No
Return to Station 10
Yes
Sand entire board starting with 60 grit and ending with 320
Send to Station 12

B12



Station 12 Standardized Work
Oil & Wax
Start
Is board sanded?
No
Return to Station 11
Yes
Coat in oil and wax
Send to Station 13

B13


Station 13 Standardized Work
Final Inspection & Packaging
Start
Are all features present?
No
Return to appropriate station
Yes
Sign off & Package
End

C1

Station 1

Morning Check

1) Are you wearing the appropriate PPE?
2) Is the station free of sawdust and other debris?
3) Is the station free of tripping hazards?
4) Begin Standardized Work

Evening Check

1) Is the area free of sawdust and other debris?
2) Is the station organized and all tripping hazards placed in a safe location?

C2

Station 2

Morning Check

1) Are you wearing the appropriate PPE?
2) Is the machine plugged in?
3) Is dust collection connected and on?
4) Is the correct blade on the machine?
5) Is the stop in the correct position?
6) Begin Standardized Work

Evening Check

1) Is the area free of sawdust and other debris?
2) Has the machine been turned off?
3) Has dust collection been turned off?

C3

Station 3

Morning Check

1) Are you wearing the appropriate PPE?
2) Is the machine plugged in?
3) Is dust collection connected and on?
4) Is the correct blade on the machine?
5) Is the stop in the correct position?
6) Is the safety equipment covering the blade?
7) Begin Standardized Work

Evening Check

1) Is the area free of sawdust and other debris?
2) Has the machine been turned off?
3) Has dust collection been turned off?

C4

Station 4

Morning Check

1) Are you wearing the appropriate PPE?
2) Is the workstation clear of contaminant?
3) Does the station have enough wood shims for the days work?
4) Does the panel glueing rack contain the appropriate amount of arms for the days work?
5) Is there enough glue at the station?
6) Is the glue roller clean of all debris?
7) Begin Standardized Work

Evening Check

1) Is the area free of sawdust and other debris?
2) Has all dried glue been cleaned from the station?
3) Are all glue containers properly sealed?

C5

Station 5

Morning Check

1) Are you wearing the appropriate PPE?
2) Is the machine plugged in?
3) Is dust collection connected and on?
4) Is the correct blade on the machine?
5) Begin Standardized Work

Evening Check

1) Is the area free of sawdust and other debris?
2) Has the machine been turned off?
3) Has dust collection been turned off?

C6

Station 6

Morning Check

1) Are you wearing the appropriate PPE?
2) Is the machine plugged in?
3) Is dust collection connected and on?
4) Is all supporting equipment located at the workstation?
5) Begin Standardized Work

Evening Check

1) Is the area free of sawdust and other debris?
2) Has the machine been turned off?
3) Has dust collection been turned off?

C7

Station 7

Morning Check

1) Is the machine plugged in?
2) Is dust collection connected and on?
3) Is the correct bit on the machine?
4) Are you wearing the appropriate PPE?
5) Begin Standardized Work

Evening Check

1) Is the area free of sawdust and other debris?
2) Has the machine been turned off?
3) Has dust collection been turned off?

C8

Station 8

Morning Check

1) Is the machine plugged in and warmed up?
2) Is dust collection on?
3) Is there a list of quantity of each design for the day?
4) Are you wearing the appropriate PPE?
5) Begin Standardized Work

Evening Check

1) Is the area free of sawdust and other debris?
2) Has the machine been turned off?
3) Has dust collection been turned off?

C9

Station 9

Morning Check

1) Are you wearing the appropriate PPE?
2) Is everything in place on the shadow board?
3) Is the area free of dust?
4) Begin Standardized Work

Evening Check

1) Is the area free of dust and trash?
2) Has everything been returned to the shadow board?
3) Have the boards been placed on a level rack?

C10

Station 10

Morning Check

1) Are you wearing the appropriate PPE?
2) Is the machine plugged in?
3) Is dust collection connected and on?
4) Is all supporting equipment located at the workstation?
5) Begin Standardized Work

Evening Check

1) Is the area free of sawdust and other debris?
2) Has the machine been turned off?
3) Has dust collection been turned off?

C11

Station 11

Morning Check

1) Are you wearing the appropriate PPE?
2) Is the sander plugged in?
3) Is dust collection on?
4) Is everything in place on the shadow board?
5) Begin Standardized Work

Evening Check

1) Is the area free of sawdust and trash?
2) Has the sander been turned off?
3) Has dust collection been turned off?
4) Has everything been returned to the shadow board?

C12

Station 12

Morning Check

1) Are you wearing the appropriate PPE?
2) Is the area free of dust?
3) Is everything in place on the shadow board?
4) Begin Standardized Work

Evening Check

1) Is the area free of dust and trash?
2) Has everything been returned to the shadow board?

D1

Work Breakdown Structure								
Phase	**Item**	**Responsible Party**	**Estimated Hours**	**Completed**	**Percentage of Work**	**Member**	**Hours**	**Work Distribution**
Initiation	Evaluation and Recomendation	Mike Gill	1	✓	0.41%	**Connell's Total Hours**	53	21.81%
	Develop Project Charter	Megan Staffieri	1	✓	0.41%	**Tyler's Total Hours**	107	44.03%
	Submit Project Charter	Megan Staffieri	1	✓	0.41%	**Branden's Total Hours**	103	42.39%
	Review Project Charter	Mike Gill	1	✓	0.41%	**Garrett Total Hours**	93	38.27%
	Project Charter Approved	Mike Gill	1	✓	0.41%	**Caroline's Total Hours**	68	27.98%
Planning	Determine Project Team	Mike Gill	1	✓	0.41%	**Megan's Total Hours**	171	70.37%
	Project Team Kickoff Meeting	All Members	5	✓	2.06%	**Mike's Total Hours**	45	18.52%
	Preliminary Project Definition	Branden Livingston	1	✓	0.41%	**Total Project Hours**	**243**	
	Preliminary Scope of Work	Megan Staffieri	1	✓	0.41%			
	Gathering Info, Materials, and Data	Tyler Edwards	3	✓	1.23%	**Percentage Complete**	**100.00%**	
	Project Schedule	Megan/Tyler/Branden	2	✓	0.82%	**Initiation Percent Complete**	100.00%	2.06%
	Initial Design	Branden Livingston	3	✓	1.23%	**Planning Percent Complete**	100.00%	23.87%
	Anticipated Challenges/Risk Analysis	Connell / Caroline	10	✓	4.12%	**Executing Percent Complete**	100.00%	34.16%
	Industry Requirements/Standards	Tyler Edwards	3	✓	1.23%	**Controlling Percent Complete**	100.00%	34.16%
	Initial Budget/Anticipated Expenditures	Connell / Caroline	5	✓	2.06%	**Closeout Percent Complete**	100.00%	5.76%
	Specific Timeline for Tasks	Megan/Tyler/Branden	2	✓	0.82%			
	Develop Project Management Plan	Megan Staffieri	20	✓	8.23%			
	Submit Project Plan	Megan Staffieri	1	✓	0.41%			
	Project Plan Approval	Mike Gill	1	✓	0.41%			
Executing	Project Team Kickoff Meeting	All Members	12	✓	4.94%			
	Define User Requirements	Tyler Edwards	2	✓	0.82%			
	Obtain Funds	Connell / Caroline	1	✓	0.41%			
	Define Designs	Branden Livingston	2	✓	0.82%			
	Order Material	Connell / Caroline	2	✓	0.82%			
	Prototype	Tyler/Branden/Garrett	20	✓	8.23%			
	Adjustments	Tyler/Branden/Garrett	4	✓	1.65%			
	Production	Tyler/Branden/Megan/Garrett	40	✓	16.46%			
Controlling	Project Status Meetings	All Members	12	✓	4.94%			
	Project Managment	Megan Staffieri	30	✓	12.35%			
	Change Requests	All Members	10	✓	4.12%			
	Risk Managment	Caroline Rose	5	✓	2.06%			
	Budget Check-in	Connell / Caroline	5	✓	2.06%			
	Production Check-in	Tyler/Branden/Garrett	1	✓	0.41%			
	Update Project Managment Plan	Megan Staffieri	20	✓	8.23%			
Closeout	Document Lessons Learned	Megan Staffieri	5	✓	2.06%			
	Update Files/Records	Megan Staffieri	5	✓	2.06%			
	Gain Formal Acceptance	All Members	1	✓	0.41%			
	Archive Files/Documents	Megan Staffieri	3	✓	1.23%			

D2

Projected Project Schedule

Phase	Item	Completed
Initiation	Evaluation and Recomendation	☑
	Develop Project Charter	☑
	Submit Project Charter	☑
	Review Project Charter	☑
	Project Charter Approved	☑
Planning	Determine Project Team	☑
	Project Team Kickoff Meeting	☑
	Preliminary Project Definition	☑
	Preliminary Scope of Work	☑
	Plan for Gathering Info, Materials, and Data	☑
	Project Schedule	☑
	Initial Design	☑
	Anticipated Challenges/Risk Analysis	☑
	Industry Requirements/Standards	☑
	Initial Budget/Anticipated Expenditures	☑
	Specific Timeline for Tasks	☑
	Develop Project Management Plan	☑
	Submit Project Plan	☑
	Project Plan Approval	☑
Executing	Project Team Kickoff Meeting	☑
	Define User Requirements	☑
	Obtain Funds	☑
	Define Designs	☑
	Order Material	☑
	Prototype	☑
	Adjustments	☑
	Production	☑
Controlling	Project Status Meetings	☑
	Project Managment	☑
	Change Requests	☐
	Risk Managment	☐
	Budget Check-in	☐
	Production Check-in	☐
	Update Project Managment Plan	☐
Closeout	Document Lessons Learned	☐
	Update Files/Records	☐
	Gain Formal Acceptance	☐
	Archive Files/Documents	☐