Chapter One: EML 4551C

1.1 Project Scope

1.1.1 Project Description.

The objective of this project is to create an improved rapid prototyping system that allows for installation in small spaces such as offices, garages, or homes.

1.1.2 Key Goals.

This project aims to develop a functioning prototype that embodies the capabilities of a RP CNC device. Team 520 will explore the market that best fits what our device is capable of and will decide the target audience that will best benefit from our product. Team 520 will undergo extensive research before the developing stage begins to ensure that we are headed in the correct path. We will use the information gained during the researching stage to create an initial prototype of our device that will then be refined and improved.

The project will research and define the necessary systems to construct this project based on existing models. These will be used as a basis of the industry standards. Related and conflicting patents will be searched and documented during this phase.

After the systems are defined, the project will be developed into a functional prototype. This goal will be to create a system that performs the essential functions and can act as an MVP, performing all functions that are defined in the concept selection phase.

As an entrepreneurship project, a large amount of focus must be put into creating a feasible business model around the project. This will include the market segments to be sold to, the value propositions that the system offers, the channels of delivery, advertising, core features and components, potential revenue streams, and key activities towards delivery. These features are outside of the scope of the development and engineering of the product, but are an essential part to the senior design project. The following paragraphs explain in detail key goals to be reached in order to develop the business model.

Section 1.1.3 goes into detail of different market segments that are believed to benefit from the outcome of this senior design project. Over its course, Team 520 will conduct research through customer discovery interviews, observation of process, and market data analysis from aggregate reports of the state of the market provided by IBISWorld and similar services. This will be used to optimize the business model and pivot as needed to be successful as an entrepreneurial pursuit.

In addition to targeting the correct market segments, Team 520 will conduct research and analysis on the most important value propositions that the developed system will need to be successful. This includes "decision-making" aspects such as the price, scale, and delivery methods, as well as functionality measures such as tool-changers, optimized pilot programs, and accuracy to tolerances upon delivery.

After these are developed and the business model is studied and tested, Team 520 will compete in the FSU-JMC's InNOLEvation Challenge in March of 2022. Key deadlines on the development of the system and the business model will need to be completed in anticipation of this competition in order to increase the probability of winning a prize from the competition.

To summarize, a brief list of the key goals are included below:

- Research and define the systems associated with existing systems

- Develop a functional prototype

- Generate and validate a business model

- Compete as a team in the FSU-JMC InNOLEvation competition.

1.1.3 Markets.

The market segments that have been identified and will be targeted through this project are industrial designers, mechanical engineers at small and large businesses, machinists, teachers and instructors, and high-level hobbyists. Further details on customer profiles and their needs are located in Appendix B of this document.

Because of the state of the RP market being at a high level of innovation and offering numerous applications, the focus of this project will be to collect and analyze market data pertaining to the primary markets that see the best probability of success with the entrance into the industry. Incorporating market data and interviews collected over the course of the FAU regional NSF I-Corps program has been used to determine which markets are to be defined as the primary market segments. These primary market segments are small mechanical-engineering-focused businesses in the robotics, automotive, and manufacturing industries, industrial designers that work with complex shapes and materials, and high-level hobbyists who create personal projects focused on robotics, automotives, and sculpted pieces. Details on the data collected from the NSF I-Corps program is listed in Appendix E. The remaining secondary market segments are teachers and instructors, large mechanical-engineering-based businesses, and machinists that could also utilize the system.

1.1.4 Assumptions.

Senior Design Team 520 will operate with the following assumptions during the design and construction process throughout the fall and spring semester. These assumptions are as follows:

- Used to create a variety of prototypes that work on existing systems

- Placed in a temperature-maintained environment between 18° C~30° C

- Placed on a level surface

- A space of 1 cubic meter (1m x 1m x 1m) is open for the machine to occupy, and the air around is well-ventilated and has low levels of pollution or particles that could enter the system

- Maximum material strength to be cut using subtractive means is aluminum

- Materials used with additive measures are available, standard filament reels (e.g. PLA)

- Standard 120V power is provided (15 – 20-amp breaker)

- The machine will incorporate existing equipment and parts for several components (e.g. motors, pumps, spindles, extruders)

- The machine will take in information from a slicer program that reads CAD files, instead of requiring manual programming in G

- 120 psi compressed air is provided

1.1.5 Stakeholders.

Stakeholders are parties considered to be invested, interested, or have control in the outcome of the project, this includes all team members, the advisor, and the sponsor. As an entrepreneurial project, there is no industry sponsor for this project. Dr. Michael Devine is the

business model mentor, and Dr. Shayne McConomy is the faculty advisor to the program. The LCRDA provides laboratory space and office space for use throughout the project. The Jim Moran College of Entrepreneurship offers additional workspace and its associated investors in the InNOLEvation challenge provide business knowledge and mentorship throughout the program. Another potential stakeholder that will arise later in the production process will be the customer and consumer of the machine.