

March 31th, 2022

Dr. Mike Hegedus
School of Engineering Science
Simon Fraser University
Burnaby BC, V5A 1S6



Re: ENSC 405W Final proposal for UpDawg

Dear Dr. Hegedus,

This document describes the final proposal for *Doggolicious*, which is an automatic hot dog condiment dispenser targeted for employees working at an office who would like to grab a quick lunch. Our goals are to develop a product that is easy to use and to provide a convenient and mess-free solution to putting condiments on a hot dog.

This document will outline the final proposal of *Doggolicious*. It will consist of the following major sections: project scope, risks & benefits, market & competition rationale, company details, project planning, and cost considerations.

UpDawg is a company that is made up of six engineers: Linhan Pei, Mingqi Tian, Jerry Mazurek, Weilong Sun, Tsz Wing (Nicole) Choi, and Chi Hong (Happy) Yip. Each team member is well-equipped with different sets of skills gained from previous experiences, which will allow us to succeed in our roles.

Thank you so much for reviewing our design specification. If you have any suggestions or questions, please contact our designated CCO, Jerry Mazurek, at jmazurek@sfu.ca.

Sincerely,

Linhan Pei

Linhan Pei,
CEO
UpDawg



Final Proposal:

Doggolicious

Company Members: Linhan Pei - CEO
Weilong Sun - CTO
Tsz Wing (Nicole) Choi - CTO
Chi Hong (Happy) Yip - CFO
Mingqi Tian - CIO
Jerry Mazurek - CCO

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Submitted To: Dr. Mike Hegedus - ENSC 405W
Dr. Andrew Rawicz - ENSC 440
School of Engineering Science
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Abstract

Living in a fast-paced world, people are continuously looking for convenient and time-saving alternatives to assist with their everyday lives. As a result, the team at UpDawg came up with the idea of an automatic hot dog condiment dispenser, *Doggolicious*, that will make the job of placing condiments on a hot dog faster and simpler. The intended use of this product will be employees working at an office looking to have a quick lunch. Doggolicious will also allow drawing of condiment patterns.

This document describes the final proposal of the product, *Doggolicious*. It will outline the scope, the potential risks and benefits in terms of society and business, the market and competition, the project planning, and the cost consideration of *Doggolicious*. This document will also talk about the details of UpDawg and the team members. The purpose of this document is to provide potential investors with information about the whole project and the company's setup.

Table of Contents

Abstract	2
List of Figures	4
List of Tables	4
Glossary	5
1 Introduction and Background	6
2 Scope	6
2.1 Initial and Current Scopes	6
2.2 Future Scope	6
3 Risks and Benefits	7
3.1 Society	7
3.1.1 Risks	7
3.1.2 Benefits	7
3.2 Business	7
3.2.1 Risks	7
3.2.2 Benefits	8
4 Market & Competition Rationale	8
4.1 Local Market	8
4.2 Canadian Market	9
4.3 Foreign Market	9
4.4 Competition	10
5 Company Details	11
5.1 The Team	11
6 Project Planning	12
6.1 Gantt Chart	12
7 Cost Considerations	14
7.1 Cost Analysis	14
7.2 Potential Funding Sources	16
7.2.1 Wighton Development Fund	16
7.2.2 Engineering Science Student Endowment Fund	16
7.2.3 Personal Fund	16
8 Conclusion	16
9 References	18

List of Figures

Figure	Caption	Page No.
4.4.1	Auto ketchup dispenser	10
4.4.2	Wunder-Bar food dispenser	11
6.1.1	Gantt Chart for Project Scheduling With ENSC405W Plan	13
6.1.2	Gantt Chart for Project Scheduling With Predicted ENSC440 Plan	14

List of Tables

Table	Caption	Page No.
4.2.1	Canadian Business Counts, with employees, June 2021	9
4.3.1	The Number of US Firms and Establishments by Enterprise Employment Size, 2019	9
7.1.1	Current budget of our project	14

Glossary

CNC	Computer numerical control
LCD	Liquid Crystal Display
OLED	Organic Light-Emitting Diode
kcal	kilogram calorie

1 Introduction and Background

This project name is *Doggolicious*, which is a machine that allows users to add several sauces to their foods. UpDawg aims to provide more sauce combinations for users through the machine without adding the sauces manually. At the beginning of this project, the team at UpDawg wanted to create a machine that can provide users with a complete hot dog including simple processing of food resources and hot dog assembly. However, after discussing with the instructor, UpDawg's members reduced the scope to one component of the proposed system, the automatic condiment dispenser, in order to ensure the success of the project.

2 Scope

2.1 Initial and Current Scopes

Initially, UpDawg attempted to build an automatic hot dog machine. This machine would assemble fresh hot dogs on demand by cooking and combining the sausages with bread and condiments. After having discussions with the instructor and TAs, UpDawg's members have narrowed the scope to making the condiment dispenser first. The machine will work as follows, the user will be able to place their hot dog on a tray. They will then select what types of condiments they would like on their hot dog. After confirming, the machine will handle applying the chosen toppings to the hot dog. In the current scope, UpDawg is focused on constructing a system that is able to draw patterns of sauces on the hot dog with condiments such as ketchup, mustard, and onions.

2.2 Future Scope

Future iterations of the product, *Doggolicious*, may include a hot dog cooker as in the initial scope, however expanding on the utility of the condiment dispenser may be a more realistic goal. Currently, *Doggolicious* can only apply condiments to hot dogs. The types of applicable toppings are also limited. As such, UpDawg is considering expanding the scope to allow other food items, such as hamburgers, fries, or pizza slices, to receive the perfect amount of condiments, while also expanding the types of toppings the machine can dispense. The user experience will also be expanded upon, with a built-in touchscreen and payment options so selling condiments to customers will become feasible.

3 Risks and Benefits

In the development procedure of *Doggolicious*, *Updawg*'s engineers analyzed a few potential safety hazards and multiple benefits. This section will introduce the risks and benefits in both society and business aspects.

3.1 Society

3.1.1 Risks

Social Health Problem

As *Doggolicious* will provide high-calorie condiments, if the machine is promoted and used frequently by a large number of users, the frequent intake of high-calorie food by the users will lead to health problems. By comparing the calories of ketchup and one of the traditional healthy condiments, vinegar, ketchup has 117 kcal per 100g [1], while vinegar only has 18 kcal per 100g [2]. Therefore, actively promoting the moderate enjoyment of high-calorie foods would be a good entry point.

3.1.2 Benefits

Pollution Reduction

In most fast-food restaurants or rec-rooms, condiments such as ketchup or soy sauce are packaged in both plastic and metallic foil, which are difficult to be recycled, as the package layers are hard to separate. [3] *Doggolicious* will only utilize recyclable containers in order to reduce waste.

3.2 Business

3.2.1 Risks

Competition and Reliance on Early Adopters

Since this project is aimed at office workers who would like to grab a quick lunch, this product is competing with condiment packages and bottles; the traditional way to add sauces to one's food. Modifying the users' daily behaviors will not be easy. Furthermore, condiments can be added manually to a variety of foods, while *Doggolicious* in its present state can only apply them to hot dogs. This could reduce demand for the product due to its specialization.

High Research and Development Costs

In the early-stage product development, *UpDawg*'s engineers must test multiple structures to hold all the systems (User operating system, condiments dispenser system, and CNC machine system.) The load capacity and overall structure must be considered. In this case, the cost of

customizing structure components (e.g. cut metal board) will be expensive, as engineers shall design multiple different structure plans.

3.2.2 Benefits

Cost Reduction

According to UpDawg members' research and observation, the traditional way to contain sauces is to use bags and bottles [4]. Supplying condiments to an office break room in this way may cost the supplier more money in the long run. Employees could grab more sauce bags than they need at the time in order to use the provided condiments elsewhere or more conveniently next time. By using *Doggolicious* to dispense the condiments, the supplier can reduce the costs of wasted condiments and better ration the provided sauces.

Stimulate Sales

If *Doggolicious* exists in the market, it could have a positive tendency that can stimulate other related products and goods, such as hot dogs. According to Microeconomics, the market has many needs for hot dogs, then it would need sauces that can be paired with hot dogs [5].

Research and Innovation

Since *Doggolicious* is used to provide various sauces that include solid and liquid, it will provide sauces mechanically without manual operation. Although this idea may not be the newest one, *Doggolicious* can provide more than one type of sauce for users, which could enrich the combinations between sauces and sauce-providing machines in the market.

4 Market & Competition Rationale

This section outlines the potential target market and existing competition that the team at UpDawg has identified for the product. The product offers a convenient alternative to applying condiments manually, that is also efficient and safe for use in a public setting. As such, the target market includes office break rooms as well as the possibility of future expansion to the fast-food industry.

4.1 Local Market

Originally, it was assumed that a company wishing to outfit their break room with an espresso machine or microwave would likely invest in the *Doggolicious*. However, companies often outsource food services such as coffee, as it ends up costing less per employee than to outfit and maintain their own coffee machines [6]. Such food service companies could be a viable target for the proposed condiment dispenser, either as a standalone product or a commission

from packages including the technology. The Van Houtte company provides such services in the Greater Vancouver area and should be a good entry point into the local market.

4.2 Canadian Market

The following data from Statistics Canada shows the size of our target market.

Business Size	Count
Total, with employees	1,291,424
1 to 4 employees	748,387
5 to 9 employees	233,347
10 to 19 employees	152,655
20 to 49 employees	99,732
50 to 99 employees	32,889
100 to 199 employees	14,492
200 to 499 employees	7,119
500 plus employees	2,803

Table 4.2.1 - Canadian Business Counts, with employees, June 2021 [7]

We can get a good estimate of the size of our target market from the number of businesses with more than 50 employees. Statistics Canada counts each registered location as a business even if several locations are part of the same company. This is useful since we can expect locations with a sizable number of employees to have one or more break rooms to house our product. This results in an estimate of 57,000 workplaces across Canada.

4.3 Foreign Market

Similar statistics were gathered by the US Census. The following is an excerpt from Statistics of U.S. Businesses (SUSB) data.

Enterprise Size	Firms	Establishments
01: Total	6,102,412	7,959,103
02: <5 employees	3,777,085	3,783,930
03: 5-9 employees	1,013,629	1,026,898

04: 10-19 employees	640,827	674,135
05: <20 employees	5,431,541	5,484,963
06: 20-99 employees	555,046	728,140
07: 100-499 employees	94,957	375,232
08: <500 employees	6,081,544	6,588,335
09: 500+ employees	20,868	1,370,768

Table 4.3.1 - The Number of US Firms and Establishments by Enterprise Employment Size, 2019 [8]

The above data is harder to interpret. While “Establishments” refers to any location that conducts business under the enterprise [9], each individual location does not necessarily have more than 500 employees. Using a conservative metric of “Firms” with more than 100 employees results in an estimate of about 114,000 workplaces as a suitable target.

4.4 Competition

Current solutions for dispensing condiments in public settings include hand pumps, shared condiment stations, and condiment packets.

Kraft Heinz



Figure 4.4.1: Auto ketchup dispenser [10]

In Nov. 2020, Kraft Heinz announced their solution for a touchless condiment dispenser [11] as a response to the pandemic. The goal was to facilitate the safe distribution of condiments in a public setting to help reduce the spread of pathogens. While Kraft Heinz is a big company within the food-service industry, their solution doesn’t provide much more utility than just dispensing a predetermined amount of condiments and is missing the ability to dispense solid toppings such as onions, a key feature of our proposed solution.

Wunder-bar Food Dispensing Systems



Figure 4.4.2: Wunder-Bar food dispenser [12]

The company Wunder-Bar currently offers an automatic pizza saucer and manual condiment dispenser [12]. This dispenser is able to serve ketchup and mustard at the same time. While our product offers to automate the latter of the two systems, the existence of the pizza saucer suggests the company may soon expand to more automated food-service products.

5 Company Details

Founded in 2022 Spring with six like-minded engineers, UpDawg is a start-up food service company. UpDawg aims to enhance the dining experience of customers with a half-automatic condiments adder, the *Doggolicious*. Users will only place their desired condiment order, then *Doggolicious* will add the ordered condiments with exquisite patterns onto the food.



5.1 The Team

Linhan Pei - Chief Executive Officer

As a fifth-year computer engineering student at Simon Fraser University, Linhan has widely interested in software development and user interface design. He has a full-year period of co-op experience with the website development and social media production. Outside of academic progress, Linhan is also working as a video creator on multiple platforms.

Mingqi Tian - Chief Information Officer

Mingqi is a fifth-year Computer Engineering student with a strong interest in digital circuits and machine learning. Mingqi has experience in Arduino applications and OOP programming. He has completed an 8-month Co-op in NETGEAR where he gained knowledge of wireless communication technologies and built software packages for

multi-site teams. Mingqi will apply his knowledge of electronics and software design to ensure that key subsystems of the product function as intended.

Weilong Sun - Chief Technical Officer

Weilong is a fifth-year Computer Engineering student. He has learned some knowledge from the previous courses, which include machine learning, user interface, computer graphics and vision, and so on. He applied the skills of the user interface to design the screen display of the project.

Tsz Wing Choi - Chief Technical Officer

Tsz Wing (Nicole) Choi is a Computer Engineering student in her final year of pursuing an Applied Sciences (BASC) degree at Simon Fraser University. By successfully completing school projects and participating in engineering events, she has developed a strong interest in software programming and data science.

Chi Hong Yip - Chief Financial Officer

Chi Hong is a fifth-year System Engineering student. Chi Hong has completed a 4-month co-op learning robot control and another 4-month co-op for traffic light system testing. Chi Hong gained valuable skills in problem-solving and documentation from 2 co-op terms and has some background in systems construction. Chi Hong is also cautious with details, such as reading datasheets, understanding schematic diagrams, and document proofreading.

Jerry Mazurek - Chief Communications Officer

Jerry is a fifth-year Computer Engineering student with a combined 12 months of co-op experience in both software (Counterpath Technologies) and semiconductor (Microchip) industries. The knowledge and experience gained in the industry gave him valuable insight into corporate life as well as the technical skills needed to develop the product.

6 Project Planning

6.1 Gantt Chart

Figure 6.1.1 shows the Gantt chart. This chart includes the project's scheduling within ENSC 405W and milestones (yellow stars [13] and red circles [14]) for the key tasks throughout the term.

Project Proposal - Automated Condiments Dispenser

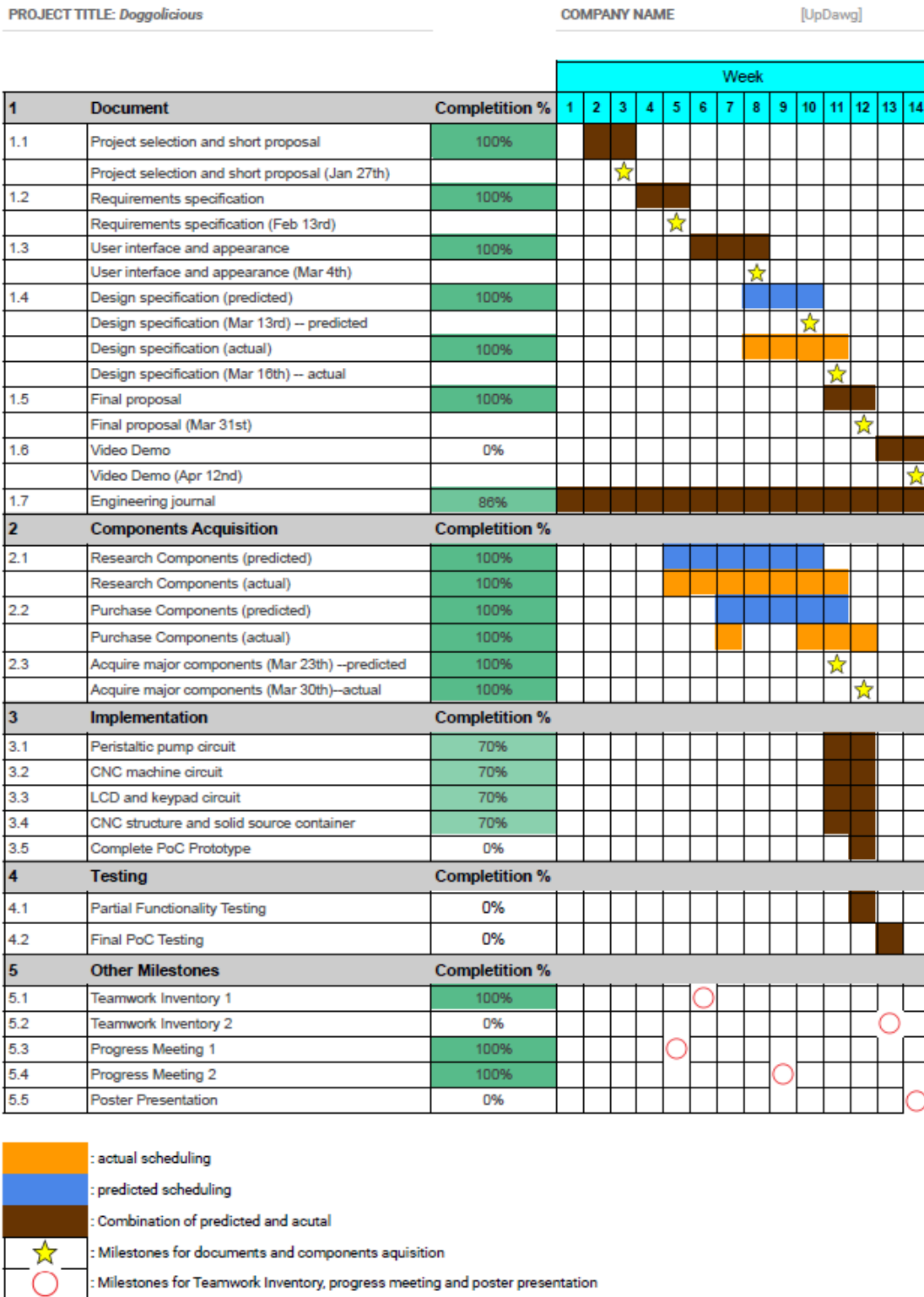


Figure 6.1.1: Gantt Chart for Project Scheduling With ENSC405W Plan

From figure 6.1.1, brown blocks represent that the predicted and actual are the same on one milestone. Assume the predicted and actual schedules have some differences, blue and orange blocks represent the predicted and actual duration of any milestones, respectively. For example, UpDawg predicted to finish the design specification by Mar 13th but the actual

finished date is Mar 16th. Thus, the milestone predicted to finish for design specification is at week 10, and the actual milestone finished is at week 11. Also, the predicted and actual Components Acquisition have some differences. Besides, yellow stars represent the milestones of the most and main documents of *Doggolicious*. The red circles represent the milestones related to the team, which include teamwork inventory, progress meetings, and poster presentation. During progress meeting 2, UpDawg’s members decided to adopt the idea they got from the instructor, which is to narrow down the scope of the project and they apply this idea to the documents after, including design specifications. This scope change also has delayed achieving the milestone for the design specification.

The following figure shows the predicted plan for ENSC 440. The predicted plan will be rescheduled based on the PoC presentation feedback.

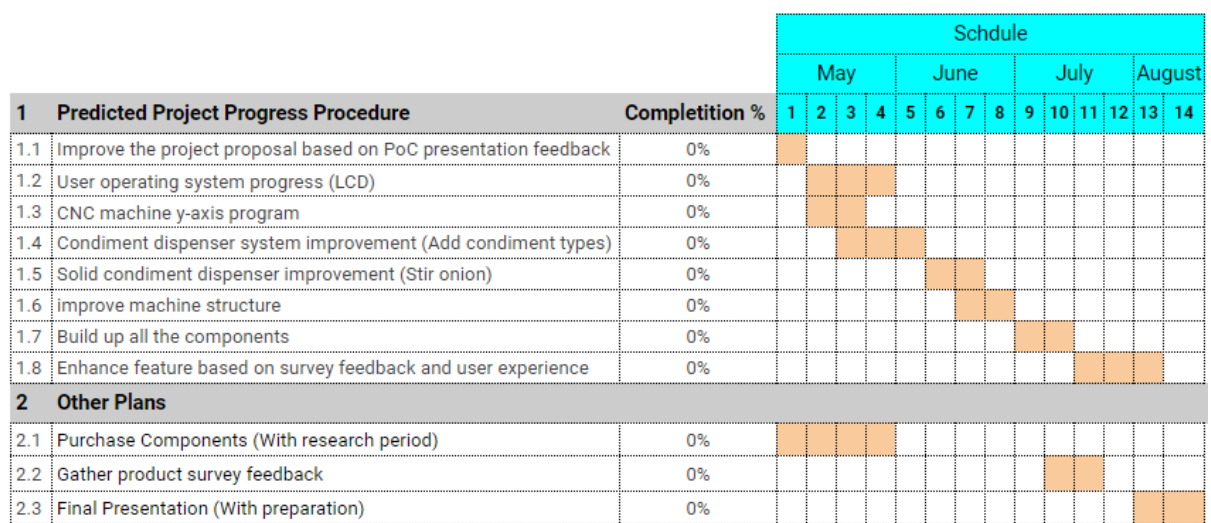


Figure 6.1.2: Gantt Chart for Project Scheduling With Predicted ENSC440 Plan

7 Cost Considerations

7.1 Cost Analysis

Until now, UpDawg’s members have purchased several items, and one of them has been returned. The table below shows the components purchased and the current budget UpDawg has spent.

Purchased product name	Marked Cost (CAD)	Actual Cost (CAD)	Note
UNO kit set	45.99	53.94	
Coca-Cola hot dog roller	85.99	112.32 - 77.54 = 34.78	Returned, hence the marked price is not calculated. Instead,

			the shipping fees have been paid
Linear Sliding Gide (300 mm)	34.57	200.44	
Arduino kit with stepper motor	90.99		
Timing belt, pulley, tension spring & mount block	23.99		
ELEGOO MEGA board	29.95		
4*4 keypad	9.68		
Linear Sliding Gide (250 mm)	30.94	83.58	
Power supply adapter	19.99		
Peristaltic pump	16.98		
Silicone tube	12.99		
H2O Slimline beverage dispenser	12.47	13.96	
Printer cable (1m)	7.59	7.97	
Hilitchi screws and nuts assortment kit	19.99	25.52	
Gorilla super glue	4.98		
Total	361.1	420.19	

Table 7.1.1: Current budget of our project

Since UpDawg’s engineers are focusing on the sauce dispenser in the current scope of the project, the engineers don’t need the Coca-Cola hot dog roller for now. It has now been returned, but the project may need it back in the future scope. Except that, engineers expect to buy some other components, such as a bigger OLED touch screen, a metal board, etc. Since the cost of each component may vary from CAD \$10 to \$100, from table 7.1.1 the average of each component is CAD \$25 to \$30, and about 8 to 10 components may be purchased in the future, the predicted budget will be around CAD \$650.

7.2 Potential Funding Sources

In order to start the project, UpDawg needs some funds to buy components to build the project prototype. If the prototype works successfully it can then be commercialized for the public market. The team will need to seek external funding sources in order to increase the budget for commercializing. The sections below show the primitive financial support UpDawg currently has access to.

7.2.1 Wighton Development Fund

Wighton Development Fund is administered by Andrew Rawicz, and its purpose is to support students' group projects for general expenses, such as buying components. Updawg's members are planning to finish a proposal and look for the approval of the fund's committee, then the company will apply for this fund between this semester and next semester.

7.2.2 Engineering Science Student Endowment Fund

Engineering Science Student Society (ESSS) supports the Engineering Science Student Endowment Fund, and SFU students can apply this fund to cover the expenses of their projects. Due to the practical usage of the project, it fits into the fund's "Category B (Entrepreneurial)."

7.2.3 Personal Fund

Currently, each team member has provided \$100 to the team for buying the components needed for the project. Besides, the fund provided by each team member will also cover the remaining fees where the above funding sources cannot cover the remaining costs of the project. If \$100 for each team member is still not enough to cover the budget for this project, further personal funds may be required.

8 Conclusion

In the past, people often used spoons to bring the sauce from the containers or squeezed the sauces from sauce bags on their food. This traditional way could be suitable for the former people. However, this way could not be beneficial for people who live in the mechanization era since people would prefer using machines [15]. Not only can the machines provide convenience for people, but also improves satisfaction when people use the goods provided by machines.

Since the goal of UpDawg is to enhance the user experience of the users, they create *Doggolicious* to provide convenience for people in order to let people have much more satisfaction in having their meals.

The team at UpDawg enjoys creating every procedure for this Capstone project. Although the market's competition is serious every day, UpDawg's members are still insisting their project could draw more attention from the people, which the method of the project for adding sauce without manual operations could bring convenience to the mechanization era for people.

UpDawg's members appreciate the knowledge acquired from the courses of Dr. Mike Hegedus and the useful suggestions from TAs. Then, they also wish to keep a positive performance on this project under the support and encouragement of Dr. Andrew Rawicz to go through the term of ENSC 440.

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