Livrable de projet B - Besoins, énoncé de problème, métriques, étalonnage et spécifications cibles

Travail présenté à

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Table of Contents

Introduction	3
List of declarations of client	3
List of needs	4
Statement of Problem	4
The metrics	5
Calibration	5
Evaluation of Products	6
Target Specifications	7
Justification	7
Reflection of client meeting	8
Conclusion	8
Bibliography	9

List of Tables

Table 1: Classifying the tools requirements by level of importance where 1 isn't very critical and	d
5 is a critical requirement	4
Table 2:Metrics list and their units based on their needs	5
Table 3:Characteristic comparison and evaluation of 4 products factored by the needs, metrics	
and importance	5
Table 4:Assigning marginal and ideal values to the metrics	7

Introduction

Following the interview with our client, we were able to identify and understand our client's wants and desires. The interview not only helped us clarify the problem but helped us answer the questions presented to us in the problem refinement loop found in the iterative engineering design process. The tool requested to be made is that of an avocado cutter, depitter and scooper. Due to limited actions making our client unable to hold down the avocado, scooping has been proven to be a challenge. Given, our ultimate avocado tool is focusing mostly on the scooper while satisfying the other requests. Other requests consist of being dish-washer friendly, made of food safe materials, not much larger than the avocado itself and can not pass the budget of 100\$. Our job is to make it as user friendly and safe as possible, while meeting these requirements.

List of declarations of client

- The avocado tool is dishwasher safe
- The avocado tool is lightweight
- The avocado tool is storable
- The avocado tool is simplistic and easy to use
- The avocado tool is secure and stable
- The avocado tool cuts the avocado
- The avocado tool de-pits the avocado
- The avocado tool scoops the avocado
- The avocado tool can be used with one hand
- The avocado tool has a safety feature for cutting the avocado
- The avocado tool is not much bigger than the avocado

List of needs

Table 1: Classifying the tools requirements by level of importance where 1 isn't very critical and 5 is a critical requirement

Number of need	The Needs	Level of Importence
1	The avocado tool is dishwasher Safe	2
2	The avocado tool is simple to use	3
3	The avocado tool is stable	5
4	The avocado tool cuts the avocado	4
5	The avocado tool de-pits the avocado	4
6	The avocado tool scoops the avocado	5
7	The avocado tool is not much bigger than the avocado	3
8	The avocado tool requires only one hand to use	5
9	The avocado tool has a reasonable price	4

Legend:

- 5 Necessary
- 4 very desirable
- 3 desirable
- 2 Not important
- 1 Undesirable

Statement of Problem

The preparation of certain fruit, notably avocadoes, poses an important challenge for people who have suffered amputation of their fingers or similar loss of limb. In order to allow for these people to gain more independence, a tool must be designed to help them prepare and enjoy the fruit

The metrics

Table 2:Metrics list and their units based on their needs

N _o of metric	N ₀ of need	Metric	Importance Level	Unit
1	1,3	Weight of object	3	g
2	3	Rigidity of object	4	mm/N
3	1,7	Dimension of the base	4	m
4	1,4	Dimension of blades	3	cm
5	1	Dimension of holder	5	cm
6	4	Force of blades cutting	5	N
7	5	Force of holder	4	N
8	9	Cost	4	\$
9	6	Force of Scooper	3	N

Calibration

Table 3:Characteristic comparison and evaluation of 4 products factored by the needs, metrics and importance

Nº of metrics	Nº of needs	Metrics	Importance factors	Unit	Product 1 [1]	Product 2 [2]	Product 3 [3]	Product 4 [4]
1	1,3	Weight of object	0.07	g	-1	+1	-1	0
2	3	Rigidity of object	0.11	mm/N	0	+1	-1	-1
3	1,7	Dimension of the base	0.11	m	-1	+1	0	-1

4	1,4	length of blades	0.07	cm	+1	-1	0	-1
5	1	Dimension of holder	0.15	cm	0	0	0	0
6	4	Force of blades cutting	0.07	N	+1	0	0	0
7	5	Force of holder	0.15	N	0	0	0	0
8	9	Cost	0.11	\$	0	-1	+1	0
9	6	Force of Scooper	0.15	g	0	0	0	0
	Total				-0.04	+0.11	-0.07	-0.29

Legend:

+1: Better than

0: Neutral

-1: Worst than

Evaluation of Products

To create the calibration table, a simple legend was made to compare the products. The better than categories would get +1, a neutral product would get a 0, and the worst than categories would get a -1 deduction. Depending on the importance of the category, they would be worth more points. The importances of the categories was determined and mentioned in the metrics tables. As such, a simple and efficient evaluation and comparison was done between 4 different products. To explain, an example will be offered taking the base of the object's dimensions category. Between the 4 products, the second product has the smallest dimensions. Due to this, it is awarded with a +1 because we are looking for a compact tool. On the contrary, product 1 and 4 are penalised by -1 because they have too big of a base. Furthermore, 3 is given a neutral 0 because its dimensions weren't the biggest nor the smallest. In the end, the one that accumulates the most points will theoretically be the best product. With a simple calculation of addition and subtraction, we have found that Product 2 was the best of the 4 accumulating a total of 0.11 points. The first product fell short with -0.04 points, the third with -0.07 points and finally the fourth with -0.29 points.

Target Specifications

Table 4:Assigning marginal and ideal values to the metrics

N _o metric	Metric	Unit	Marginal Value	Ideal Value
1	Weight of object	g	≤ 1360	≤ 1300
2	Rigidity of object	mm/N	≥ 5	≥ 10
3	Dimension of the base	m	\leq 0.30 x 0.20	$\leq 0.20 \text{ x } 0.15$
4	length of blades	cm	≤ 25	≤ 20
5	Dimension of holder	cm	≤ 12 x 7	≤ 10 x 5
6	Force of blades cutting	N	≥ 30	≥ 35
7	Force of holder	N	≥ 10	≥ 15
8	Cost	\$	≤ 50	≤30
9	Force of Scooper	N	≥ 15	≥ 20

Justification

- 1. The weight of the object allows it to be more accessible depending on how heavy it is. The weight also plays a big importance in the stability of the product. Thus, the prototype should have a balanced weight to offer accessibility and support making it ideally smaller than 1300 grams.
- 2. The rigidity of the object comes in as a factor as we do not want it to be flimsy and easily breakable. We do not want the object to bend and lose its shape as this would be a security concern for our client.
- 3. The dimension of the base would matter as it should accommodate for all sizes of avocados. Meaning we need a base big enough to fit the avocados and found an approximate of 0.20m 0.30m x 0.15m 0.20m as the needed size.
- 4. The length of the blade should be as long as the avocado itself, this plays an important role as it allows a full and straight cut across the fruit. The blade length would measure up to 25cm. Because the client can only use one hand this facilitates the task of cutting drastically by minimising the cut's difficulty and time to cut making it more precise.
- 5. Because the client can only use one hand, we decided to add holders on the prototype that keeps the avocado stable. This would allow them to safely operate with knives and other tools that would extract the contents of the fruit without the risks of self injury. The best dimensions possible for holding the avocado would be 10cm x 5cm allowing the client to

- do whatever they need with their avocados freely. These holders will not be the same size as the avocado itself.
- 6. The implementation of blades will be added onto the board, meaning the client will need to apply a certain force to cut or slice the avocado. As such sharp blades will be part of the product to simplify the task of readying the fruit and will require a small force of 30 or more Newtons.
- 7. As mentioned, the product will implement holders to stabilise the avocado. As such a minimal force is required to maintain the fruit in place. With this information, a deduction of 3-5 newtons per holder will suffice. The range will depend purely on the size of the avocado.
- 8. The course enforces a budget of under 100\$ and the expected cost is 50\$ to create the prototype since the final product needs to have a feasible price for the clients to purchase. As such, we will try to keep the budget even lower, ideally under 30\$ seeing as how our materials will consist of plastic, wood and low amounts of metal.
- 9. This product will include a scooping tool which will be very useful to take the contents out of the avocado. To complete these tasks a small force will be required and deducted a minimum 15 Newtons of applied force.

Reflection of client meeting

The meeting with the client took place during the Zoom lab session on September 21 2022. The majority of the interview plan was followed. Two of our members questioned our client to better build our perspective of the problem and the necessities of our concept. Another two wrote down the conversation focusing on key product details and the client's problem. Finally the last two members observed the client's behaviour and gave constructive criticism to the team. During the interview we had discussed the primary use of the product. The client discussion permitted a better grasp of the scenario and gain insight on why the product is needed. It further allowed us to understand why comparable products weren't satisfactory to the client and allowed us to identify what was missing. Initially, the client explained in detail the disability which made the task troublesome. The user "does not have any fingers on his left hand and lost feeling in his left thumb". They then proceeded to explain in detail the problems the user was having cutting an avocado. They mentioned that the client had certain tools to help them cut the avocado but the biggest problem was scooping out the fruit with one hand. Therefore, the priority of the design would be to stabilise the avocado and the scooping action to extract the edible portion of the avocado.

Conclusion

To conclude, a list of the client's needs has been made and ordered from the highest to lowest priority to better identify the problem at hand. Following the priorities list, we were able to convert the client's needs into a metrics table. We were also able to create a calibration table which compares our different product concepts by using values based on the importance of our metrics. Finally, because the client's specifications were given before the creation of the concept, we will be deploying a prototype based on the client's necessities and designed with empathy and understanding towards the client's inconveniences. Moving forward, a general conception of the product will be created, as well as solutions to solve the problems that the client is experiencing.

Bibliography

[1] AMAZON. « Blaze AU Vegetable Chopper » dans Amazon,

[https://www.amazon.ca/Blaze-AU-Vegetable-Chopper-Multi-

Purpose/dp/B08ML6H91N/ref=sr_1_10?crid=2HO4OU03U2YJ&keywords=fruit+cutter&qid=1664136009&qu=eyJxc2MiOiI1LjM4IiwicXNhIjoiNS41MyIsInFzcCI6IjQuOTcifQ%3D%3D&sprefix=fruit+cu%2Caps%2C93&sr=8-10]

[2] AMAZON. « BRITOR Bamboo Cutting Board with 4 Containers » dans Amazon,

[https://www.amazon.ca/BRITOR-Bamboo-Cutting-Board-Large-Chopping-Board-Easy-Grip-Handles-Food-Sliding-Opening-Carving-

 $\frac{Board/dp/B08H4GQZYF/ref=sr_1_4_sspa?crid=2XKMK4DNOTRHG\&keywords=fruit+cutting+board\&qid=1664136097\&qu=eyJxc2MiOiI0LjAxIiwicXNhIjoiMy4xOCIsInFzcCI6IjIuOTcifQ\\ \underline{\%3D\%3D\&sprefix=fruit+cutting+\%2Caps\%2C85\&sr=8-4-}$

spons&psc=1&smid=A2RZISYK9NSZM8]

[3] AMAZON. « Aiyola Avocado Slicer,3 In 1 Avocado Slicer Multifunctional Avocado Tool » dans Amazon,

[https://www.amazon.ca/Aiyola-Avocado-Slicer-Multifunctional-

<u>Kitchen/dp/B08DFJCJ9K/ref=sr_1_6?crid=3JBEY9VHSIDYH&keywords=avocado+slicer&qid=1664136230&qu=eyJxc2MiOiIzLjA3IiwicXNhIjoiMi43NyIsInFzcCI6IjIuNjQifQ%3D%3D&sprefix=avoca%2Caps%2C93&sr=8-6]</u>

[4] AMAZON. « Apple Peeler, Apple Slicer and Corer with Stainless Steel Hand » dans Amazon,

[https://www.amazon.ca/Geyou-Stainless-Vegetable-peelers-

Powerful/dp/B091TLSCJF/ref=sr_1_4_sspa?crid=10L1F00QYGPY3&keywords=fruit+peelers&gid=1664136404&qu=eyJxc2MiOiIwLjAwIiwicXNhIjoiMC4wMCIsInFzcCI6IjAuMDAifQ%3D%3D&sprefix=fruit+peelers%2Caps%2C85&sr=8-4-spons&psc=1]