

GNG2101 Deliverable B.1

Introduction to Product Development and Management

GNG 2101

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Group Z13

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Abstract

The primary goal of this deliverable is to establish the problem statement and understand the client's requirements. Once the problem is defined, our next step will involve providing a list of need-inspired metrics with appropriate units, and conduct benchmarking on similar solutions. Subsequently, we will outline our target specifications, providing approximate values for attributes like dimensions and weight of the device. Lastly, we will reflect on how the client meeting assisted us in addressing our inquiries and gaining a comprehensive understanding of her needs.

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Introduction

After our meeting with Travis, we got to understand the problem that Veronica (Nicki) faces. She has cerebral palsy which affects her ability to move, to maintain balance and have proper posture. Sometimes she will accidentally swing her arms, causing it to knock over her mug that she drinks from. Living independently most of the time, when she drops her drink, it can take time before somebody like her boyfriend comes to help her. This issue has become very frustrating for her and she would love a solution to her problem. Our task is to design Nicki a device that will prevent her drink from spilling when it is knocked. From what Travis mentioned, he couldn't find any type of cup holder that would properly solve her problem, our potential solution could help not only Nicki but even other people facing the same issue. This deliverable will focus on going over our client needs, defining our problem, creating a metric that will classify the importance of the client needs, and listing our target specification.

List of Client Needs:

- When cup holder is attached to the wheelchair, it should not increase width of the wheelchair to allow for easy entry and exit from smaller doorways
- Cup holder is removable from tray
- Cup holder holds one cup, typically
- Cup holder is small enough to fit in backpack
- Cup holder is solid and reliable when it is bumped
- Cup should be removable from the cup holder with some force needed (so that drink doesn't spill)
- Cup holder is easily washable (preferably in washing machine, but can be done by hand)
- The height of the device is shorter than the cup
- The device is easily repairable (the user has a 3d printer)

Not all values are known. Travis let us know in the client meeting that he will take more photographs and measurements and email them to us. Values given during the client meeting were approximations used to make the target specifications. Once the final measurements are given, the specifications of the project may differ slightly.

Problem statement:

Design a strong and removable cup holder to be attached to a wheelchair tray to prevent a drink from being knocked over. The design should provide value to wheelchair users who often knock over their drink.

Client Needs and Metrics

Importance Levels:

- The need is critical (5)
- The need is highly desirable (4)
- The need would be nice, but not necessary (3)
- The need is not important (2)
- The need is undesirable (1)

Table 1. Client Needs and Importance Value

#	Client Need	Importance
1	Width and transportability of wheelchair remains the same	4
2	Device is washable without damage (preferably machine washable)	3
3	Device is solid and doesn't move when bumped	5
4	Cup holder is small and fits in a backpack	3
5	The cup is removable from the cup holder (with some force)	4
6	Height of device (shorter than half the height of the cup)	2
7	The cup holder is removable from the wheelchair tray	5
8	The device is easily repaired or made (Travis has a 3D printer)	3

Table 2. Metrics

Metric #	Need #	Metric	Unit
1	1, 3, 6	Dimension	cm
2	2	Material heat tolerance	Celsius
3	3, 5, 7	Force to install/use	N
5	1, 3, 4, 5	Weight of product	g
6	5, 7, 8	Assembly/repair time	minutes
7	8	Cost	\$
8	8	Development Period	Weeks

Benchmarking

Technical benchmarking is the process of gathering data of specifications from other companies who have created the same product we intend to create, and then evaluating that data.

The data is evaluated on a colour scale:

3 = Green

2 = Yellow

1 = Red

Green has the highest score.

Table 3. Technical Benchmarking

Metric	Importance	LÅNESPELARE IKEA [1]	Easy to Use Products [2]	W4W Stroller Cup Holder [3]
Cost (CAD)	3	16.99\$	24.99\$	19.95\$
Material	4	wood veneer, aluminum	ABS plastic, rubber	Silicone, plastic
Durability	5	Very durable	Not durable	Somewhat durable
Dimension	4	Height: 9 cm Width: 11 cm	Height: 14 cm Width: 10 cm	Height: 10.2 cm Width: 10.2 cm
Reliability	5	Very reliable	Reliable	Reliable
Ease of use	5	Very easy to use	Easy to use	Easy to use
Weight	2	340 g	118 g	200 g
Total:		80	50	62



Figure 1. LÅNESPELARE IKEA [1]

Description: Cup or mug holder that can be attached to any type of table as long as the horizontal surface thickness does not exceed 4.2 cm.



Figure 2. Easy To Use Products [2]

Description: Cup or mug holder that can attach to any cylindrical surfaces with a maximum diameter of 2 inch with the help of a strap band.



Figure 3. W4WStroller Cup [3]

Description: W4W cup holder can be expanded to fit any size cup. The cup holder has a non-slip silicone handle and allows 360 rotation.

Target Specifications

Table 4. Target Specifications for Functional Requirements

Metric #	Functional Requirements	Relation	Value	Unit	Verification Method
1	Minimum opening (clamp)	>	2.55	cm	Test
1	Cup holder height	> <	5 - 10	cm	Test
1	Cup holder diameter	> <	7.6 - 8 (approximate)	cm	Test
6	Time to assemble	<	15	seconds	Test

The minimum opening of the clamping mechanism must be more than 2.55 cm as that is the thickness of the tray that the cup holder must clamp onto. The height of the cup holder itself must be between 5 and 10 cm to accommodate the typical height of a travel coffee mug. The cup

holder diameter must be between 7.6 to 8 cm, as that is the typical diameter of travel coffee mugs. The time to assemble must be below 15 seconds, as the product should be quick and easy to install and uninstall.

Table 5. Target Specifications for Non-Functional Requirements

Metric #	Non-Functional Requirements	Relation	Value	Unit	Verification Method
5	Total weight	<	500	g	Test
2, 6	Reliability	>	2	Years	Test
2, 3	Material	=	Hydrophobic Sturdy	N/A	Analysis
3, 5	Ease of use	N/A	N/A	N/A	Test
1	Total height	<	15	cm	Test
1	Total diameter	<	12	cm	Test

The total weight of the device was chosen to be less than 500 grams to ensure that all users are able to lift and install the device, as well as transport it easily. The lighter the device, the easier it will be to use. The reliability of the device was chosen to be greater than 2 years because this will prevent the user from having to repair or re-make the device too often. The longer the reliability the better. The material was preferred to be hydrophobic so that it can be easily washed, as well as sturdy, to help prevent wear and tear as well as withstand the accidental forces of the cup being hit. The ease of use is also an important non-functional requirement. This data will be found by testing the prototypes to ensure that they are easily installed and utilized. The total height and diameter was chosen to ensure that the product is not too large or thick and is easily stored when not being used.

Table 6. Target Specifications for Constraints

Metric #	Constraints	Relation	Value	Unit	Verification Method
7	Cost	<	50	\$	Analysis
8	Time to complete project	=	14 July 2023 (design day)	Date	Scheduling

The cost of the project and the time to complete it are not part of the product attributes, but are factors to consider and manage when proceeding with the project so that they don't become a hindrance in our way. Due to budget constraints, the cost of materials cannot exceed \$50 and the day our project is due is 14th July 2023, which is the day we will display our product.

Conclusion

In order to make a valuable product, we must learn what attributes we want our product to have first. The problem definition process helps us achieve this by learning about our customer needs, prioritizing them, gathering data from other companies who have created a similar product in the past (benchmarking), and setting target specifications for our product based on that data and the client's needs. This process helps us organize our information and learn our priorities. Our main goal is to satisfy as many client needs as possible while making our product viable at the same time. What we came up with was a list of needs, metrics and target specifications that we believe can be met through good design practice and be ideal for our client.

References

- [1] *LÅNESPELARE Mug holder, black - IKEA CA*. IKEA. <https://www.ikea.com/ca/en/p/lanespelare-mug-holder-black-90507844/>
- [2] *Mobility Cup Holder, Portable Drink Holder, for Walkers and Wheelchairs* : Amazon.ca: *Health & Personal Care*. https://www.amazon.ca/Mobility-Holder-Portable-Attachment-Adjustable/dp/B0822YSSRN/ref=asc_df_B0822YSSRN/?tag=googleshopc0c-20&linkCode=df0&hvadid=459550286385&hvpos=&hvnetw=g&hvrnd=7881944684564927536&hvpon=&hvptwo=&hvqmt=&hvdev=c&hvdvcmidl=&hvlocint=&hvlocphy=9000668&hvtargid=pla-1033666696751&psc=1
- [3] *W4W Porte-gobelet universel pour poussette – Pince réglable très résistante qui s'adapte à n'importe quel vélo, déambulateur, fauteuil roulant, voiture – Grand porte-gobelet réglable s'adapte à toutes les tailles de gobelet, bouteille d'eau, canette, etc. :* Amazon.ca: *Bébé et Puériculture*. https://www.amazon.ca/-/fr/Porte-gobelet-universel-pour-poussette-porte-gobelet/dp/B08572VFPJ/ref=pd_vtp_h_pd_vtp_h_sccl_1/130-2601163-4355701?pd_rd_w=PNumM&content-id=amzn1.sym.784dbf25-14e4-46dd-9f22-a125dd50df3c&pf_rd_p=784dbf25-14e4-46dd-9f22-a125dd50df3c&pf_rd_r=TPYZNKCR2RBWAYDVMTH6&pd_rd_wg=XM8n7&pd_rd_r=a1ef7d6a-1273-42a6-9825-bef1275fb09d&pd_rd_i=B08572VFPJ&psc=1