

DDD80013-DFM Practice: Innovation & Interdisciplinary Collaboration 2

Team Steve Project Report

“The Steve Swing”



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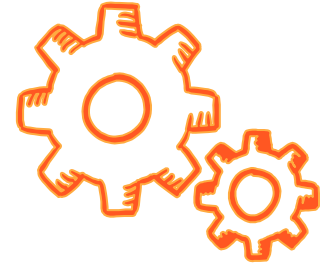
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Our Team:

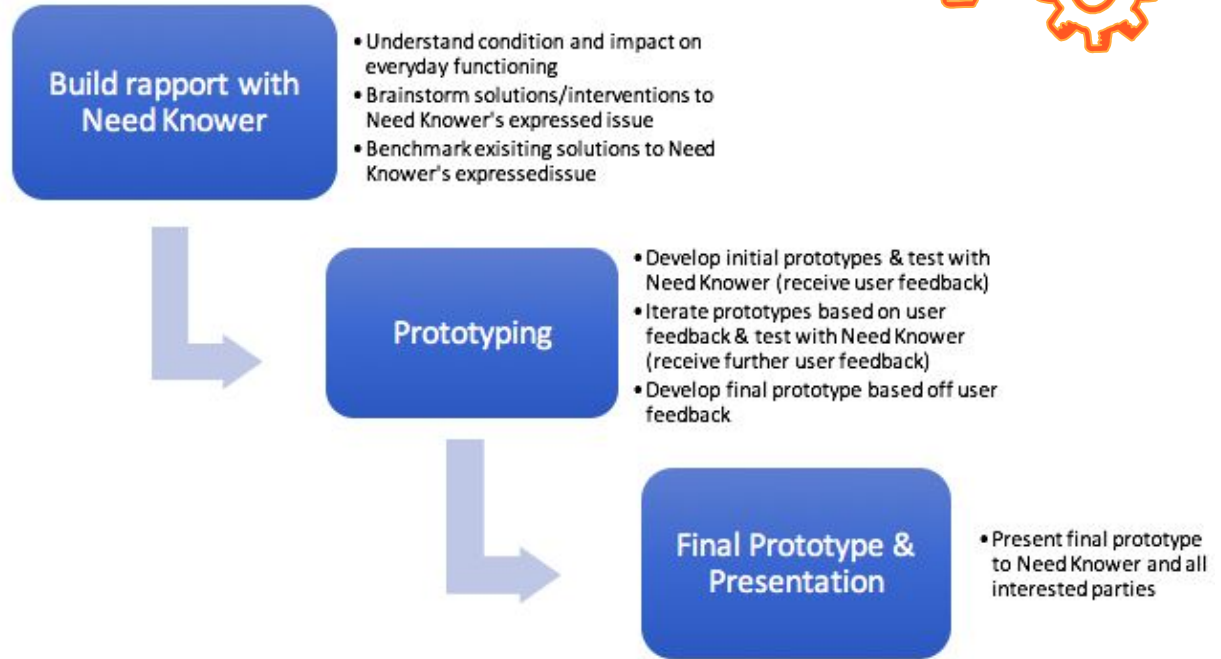


Project Brief & Our Process



BRIEF:

Working closely with a Need Knower, team to develop a well-defined and functional prototype of an intervention whose form and function has been informed by, and is targeted to, the Need Knower.



Need Knower: Steve

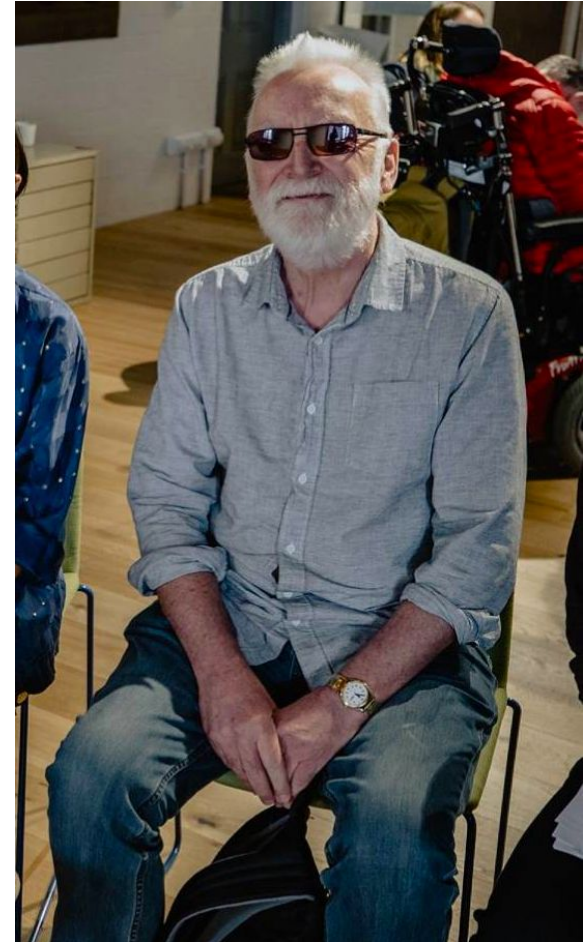


Steve experiences genetic Macular Degeneration, a condition also experienced by his father and grandfather. As a result of his condition, Steve has experienced complete loss of his central vision, whilst maintaining limited peripheral vision.

Steve uses various visual aids (i.e., eyeglasses and magnifying glass) and a Rollerball cane to assist him in his everyday life.

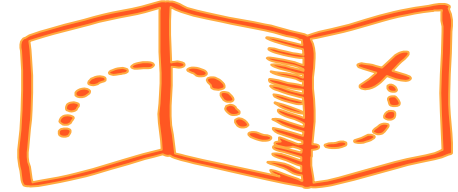
Despite his condition, Steve maintains a great level of independence. With the use of his cane, Steve is able to engage in his everyday activities including independent travel, grocery shopping and caring for his granddaughter. However, as a visually impaired person Steve does have some concerns about his safety in community.

Steve has expressed a desire for a less cumbersome accessory that serves to protect or safeguard him from dangers whilst out in the community.



**“I’ve got about
10% limited
vision on either
side, but nothing
in the middle.” -
Steve**

Journey Map



For the purpose of this activity, we have chosen to focus on a typical period Steve spends in the community setting.

Throughout our project, our team worked with a strengths-based focus. When doing so, it is equally important to acknowledge the client's strengths as it is to address the areas needing assistance and/or intervention. Whilst we did ask Steve about his 'typical' day, he did not appear to want to discuss certain parts in great detail. We recognised that these were not relevant to our project and, therefore did not need to be explored further.

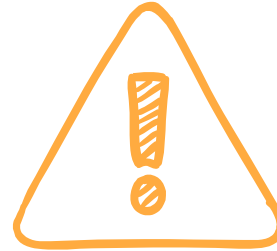
Below is a journey map of a typical grocery shopping trip for Steve:

Journey Map: A Typical Shopping Trip



Problem Statement

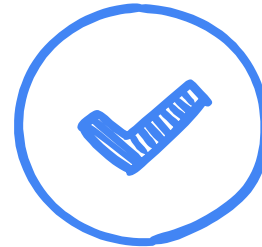
A person with vision loss requires multiple visual aids in their everyday life. Additionally, they may require various assistive technologies (e.g. walking cane, Seeing Eye Dog etc.). Often, visually impaired people find juggling different visual aids to be an elaborate and arduous task.



How Might We?



How might we support Steve's independence in the community setting by facilitating easier access to priority visual aids?

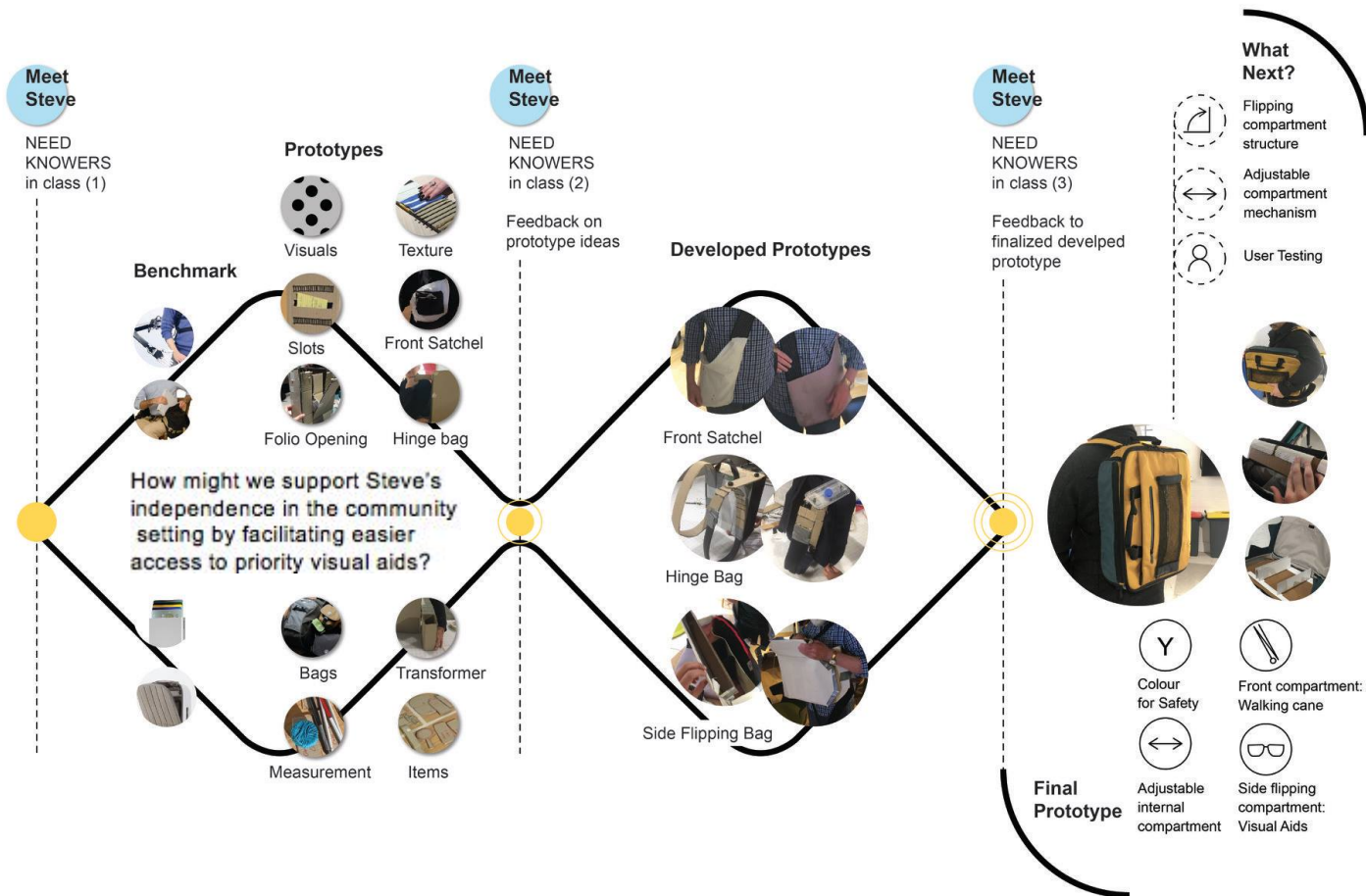


Critical Insights



- **Fostering Independence**
 - Recognise Steve's strengths as opposed to focusing on his limitations thus, empowering him to maintain his level of independence in everyday life
- **Tactile**
 - Accessory will need to be constructed from discernibly different textured fabrics to facilitate ease of use for Steve
- **Comfort**
 - Accessory will need to sit comfortably on the body for Steve, not obstructing right arm in which he carries his walking cane
- **Familiarity**
 - A key element to success will be familiarizing Steve with the various design elements of the accessory for example, allocated areas for eyeglasses, magnifying glass, cane etc.
- **Ease of Accessibility**
 - Accessory will facilitates easy access to priority visual aids
- **Security**
 - Accessory will require various design elements aimed at improving Steve's security as a visually impaired person whilst in the community setting

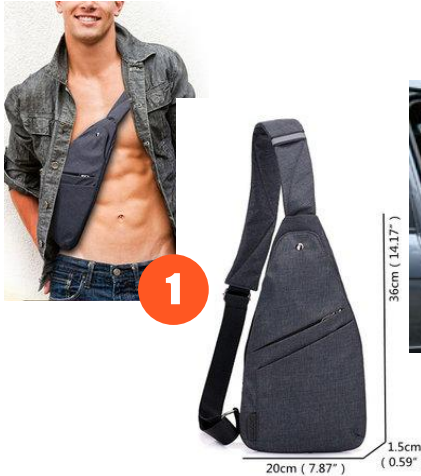
Double Diamond



Benchmarking

1. Anti-theft Sash Bag

Wear it like a sash close to the body. Allows easy access to priority items in front of body.
Cons: Bag is too small and flat, designed more for tourists.



2. T-backpack

Designed for those with a vision impairment. It essentially is 2 satchel bags worn on each side of the hip for easy access to items close to hands. Users don't have to remove the bag to sit down. **Cons:** bulky. Harness system makes it difficult to navigate bag when packing or unpacking unless worn.



3. Messenger bag

Common satchel bags have the capacity to carry everyday items with easier access on the side of the body. **Cons:** Not very ergonomic. Constant contact with the gluteal muscles or against side of hip joint. Uncomfortable for Steve against his pockets where he stores other priority items. Required opening of overflap.



4. Carry-on Closet

Suitcase made with integrated shelving system that expands vertically from the top. This product lead to ideas about rigid compartment design.

Cons: Practical for unloading items in hotel/house at the end of the day but not while shopping or going about daily duties.



Benchmarking

5. Tortoise Suitcase

The design unzips from the top down for easy access in the upright position. This idea led to our 'frontpack' forward opening lip prototype. **Cons:** Items inside need to be secured to prevent from falling out. Wearing a backpack in front of chest can be uncomfortable and restrictive.



6. Big Clapper

Designed as an art project by Japanese designer Masato Takahashi to cheer up the world. The hands clap together when the motion sensor detects someone walking past. This product inspired our designer to use motion or sound sensors in subsequent prototypes.



7. Push Pop Wallet

Wallet with mechanism allows you to pop out your cards with one simple touch of a button to save time fumbling in your wallet to retrieve a card.

We applied this idea to Steve's visual aids (one touch button to release from his backpack) in one of our prototypes

Cons: Risk of dropping items, difficult for someone with a visual impairment



8. Robotic Arms

Pair of robotic arms worn like a backpack and controlled using VR headset or a second user from a remote location by seeing through the cameras on top of the bag. **Cons:** Complex and very unnatural (draws attention). Not practical as the arms need to be controlled by a second user. Does not carry the capacity of a bag (one item per hand). Obstructive to others. Steve is an able-bodied person with functioning arms.



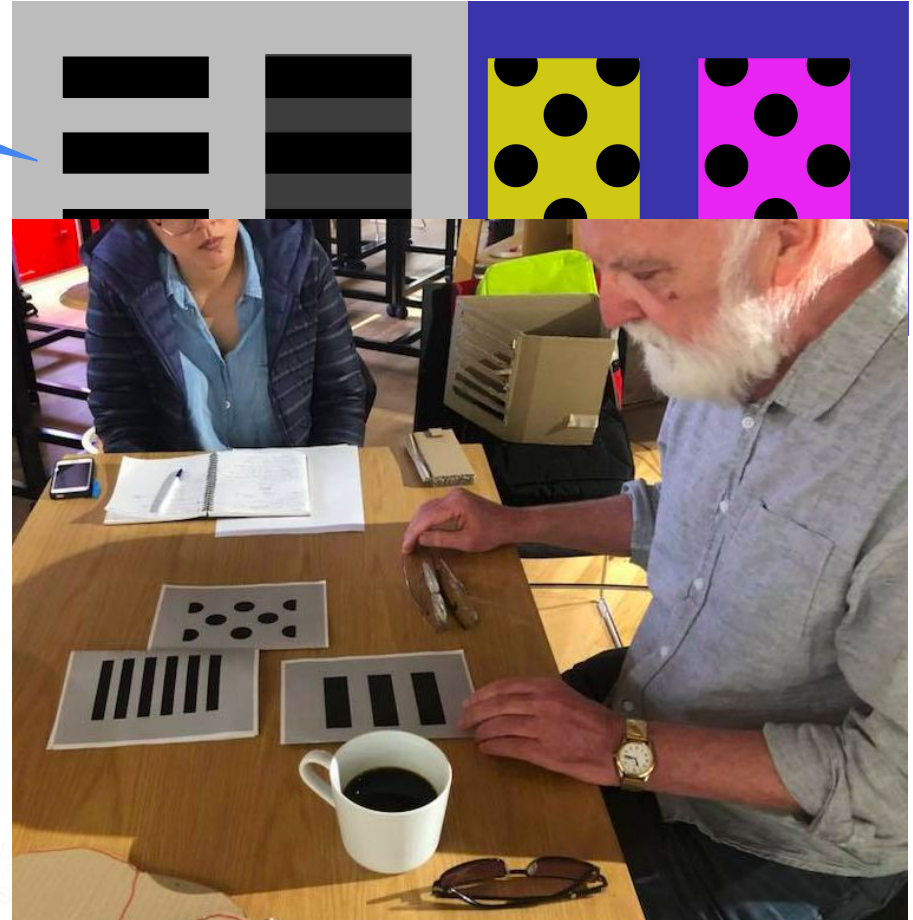
Visuals

easiest shade/pattern
to detect

Designing an accessory with easy to detect colour tones and patterns was deemed a key design consideration. In our initial consultation, Steve described his limited visual field. He stated that he has suffered complete loss of central vision whilst maintaining partial peripheral vision. Furthermore, Steve noted that he struggles to see bright colours. He noted that black and white and, dark tones of purple are easiest for him to detect.

A number of visual samples were developed to enable user feedback on preferred colour tones and patterns. This was done by creating computer mock-ups of different patterns (circles and lines) in different colour tones (black and white and, shades of purple). Mock-ups were printed out on A4 paper to present to Steve for user testing.

Steve noted a preference for black and white toned patterns. He specifically noted the block lines to be the easiest to detect of the various patterns presented. This provided the team with meaningful feedback to be utilised in future development of the accessory.



Texture (touch) Board

Developing an accessory from durable and easy to identify fabrics was deemed a key design consideration. In regards to designing an accessory for the visually impaired, it was believed that integrating discernibly different textured fabrics would produce a more meaningful result.

A Texture (touch) Board was developed to provide user feedback on preferred tactile surfaces. This was done by taking a number of different fabrics and textured surfaces, cutting out samples and, gluing them to a length of cardboard.

Steve noted a preference for some textures, a dislike for others and an inability to detect a number from each other. This provided the team with valuable feedback for future development of the accessory.



preferable tactile surface

Steve's Priority Items

As Steve mentioned in our first meeting, the items in his backpack are all necessary, but difficult to find and reach for at times. At this stage in the development process, we were unsure what form the bag was going to take: big, small, deep or shallow. Therefore, we decided to have Steve prioritise all items he would regularly (and seasonally) have in his backpack. This was done as items selected may have informed design of bag. Opposingly, decided form may have meant certain items may need to be placed elsewhere.

Priority items as identified by Need Knower::

- Eyeglasses 1
- Eyeglasses 2
- Magnifying glass
- Walking cane/aid

Additional items:

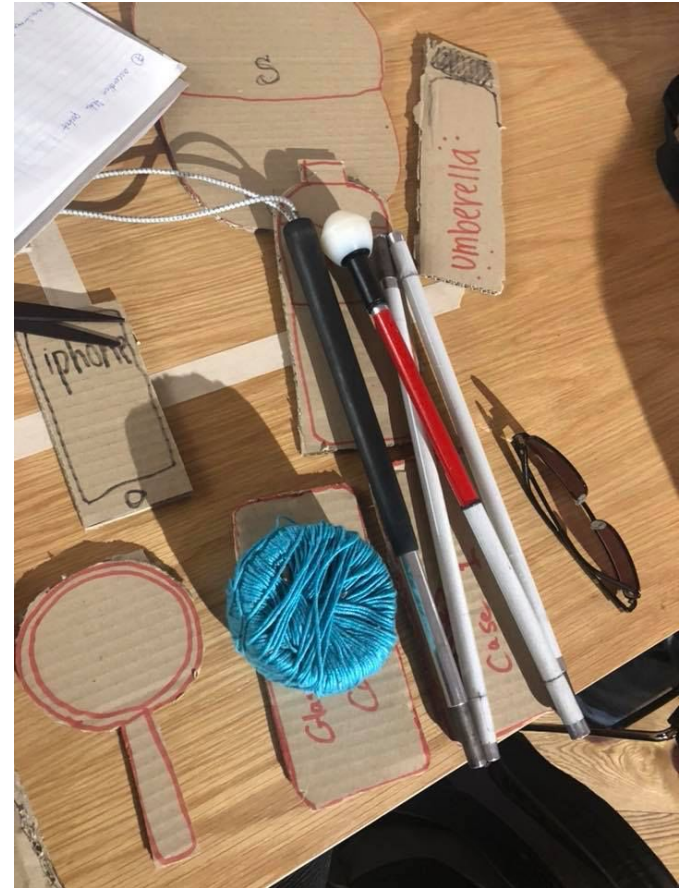
- iPhone
- Umbrella
- Keys
- Wallet
- Cap



First group of items were identified by Steve as being of the utmost priority to include in the bag. Particularly, visual aid items as he does not keep them in cases. Steve noted he felt cases were “fiddly” and “difficult” to maneuver in a backpack. Team suggested an inbuilt glasses compartment within the bag. We stated that this would assist in Steve not losing anything or not being able to see where items were placed.

Steve noted that he really appreciated this idea and would think about it before making a final decision. Also raised at this meeting, Steve had not recognised the paramount importance of providing an area for his walking cane.

Moving forward, the information we received navigated the way we thought about future development of the bag.



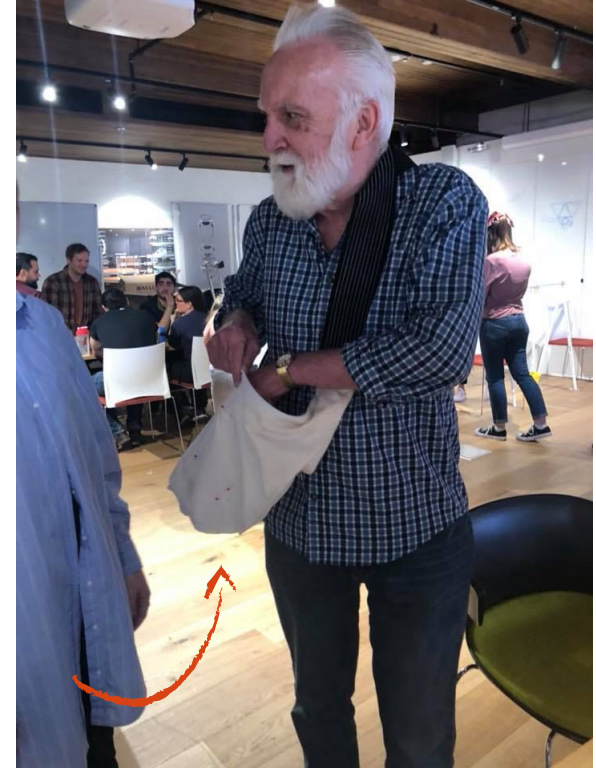
Teardrop Neoprene/Front Satchel Bag



For an early bag design, we developed a cross-body satchel, from neoprene. We believed this design may allow easy access as it was not to be worn across the back. Therefore, Steve would have the ability to feel and access it with minimal physical effort. When developing this design, we were aware that Steve would need free range of movement of his right arm in order to safely and efficiently use his walking cane.

Steve was responsive to this design however, noted that if he was to go to the shops and purchase groceries the bag may become quite heavy. Consequently, causing strain across the front of his body.

Moving forward, we iterated designs whereby the bag was to remain on Steve's back. From user feedback, this seemed more practical for holding not just his priority visual items but any other items which he may want to carry in his bag (e.g. groceries).



Slots Machine

Steve suggested a bum-bag or utility belt as potential solutions to explore for his visual aids in our initial Need Knower session. The Slots Machine prototype is a small bag that sits on a hip belt, which acts like a track. This allows a smooth transition from your American Fanny (backside) to your Australian Fanny (front side).

1

Back
Storage



2

Front
Access

When positioned at the front, the user can release the item of choice through one of the side slots (on the right) by pressing the assigned button on the left panel.

Insights from Testing:

Steve reiterated that dropping items is an issue for people with his condition and that the design adds to the problem. Bearing weight through the lower back can aggravate back pain. Tray compartments on the inside only carry flat items, there is no option to reconfigure the interior to fit groceries.

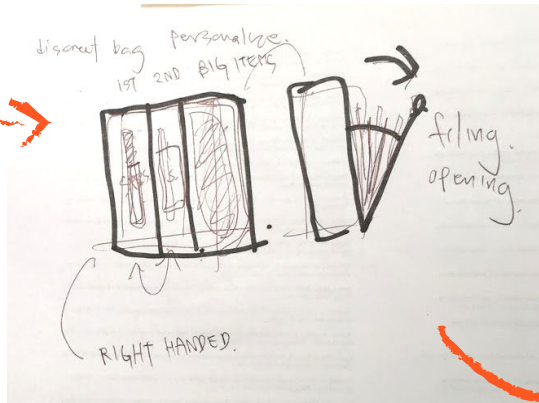
*Inspired by real
life fanny packs*



Folio Front Opening Compartments

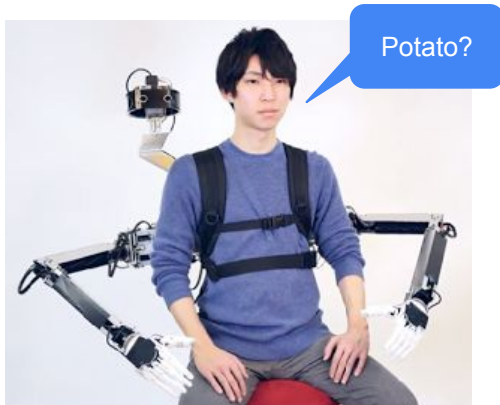


The idea of a 'frontpack' with forward opening single tray (like an airplane tray) was iterated and prototyped into a unit with three smaller flaps. This was to address the issue of Steve reaching into his backpack to fumble around to retrieve items. The folio accordion-like sides helps contain the bag's contents to prevent them from falling out the sides upon opening. Steve tested the prototype and did not see any benefit from the outward opening pockets. Testing provided us with insight on how restrictive it is for a person to wear a backpack in front of their torso while performing activities such as using an ATM or texting on a phone.



Transformer/Voice control

Inspired by Inspector Gadget. Voice controlled robot arms retrieve items from the backpack. The sides of the bag incorporates the push-pop wallet mechanism to release flat items.



We did not proceed with this prototype as Steve said that he was not interested in anything too complicated. Insights informing our next steps:

- We need to remember that many people with a vision impairment are able-bodied and we should be focusing on their strengths rather than suggesting they would benefit from extra limbs
- Creating robot arms makes the bag less accessible to marginalised groups due to high costs
- Steve said that on a crowded tram the arms would knock the surrounding passengers if he activated it with his voice to retrieve an item, making it impractical
- Implications about programming a bag to one individual's voice so that others do not activate it
- Item pop ups increases risk of dropping them



The hinge bag concept was a novel concept that Steve was interested in since the first testing session. He liked the idea of having and using a conventional backpack (like his current bag) that only swivels to the front when required. Our first cardboard prototype tested well due to the rigidity of the cardboard strap and box, creating a door-like hinge. We had to create and test interactions that were more realistic in order to gain insight about usability.

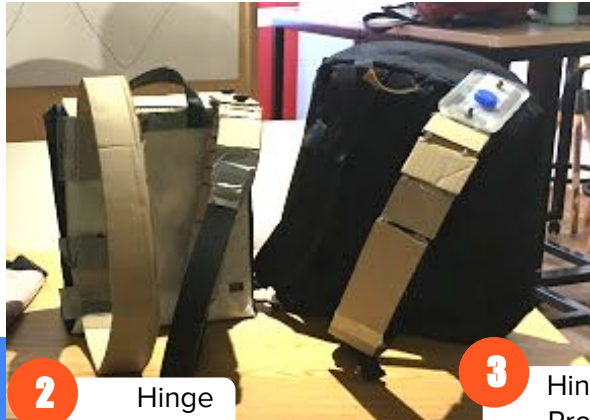
The solution was to relocate the hinge above the shoulder strap to overpass the shoulder joint and upper arm. Further testing identified problems that would inform our next prototype:

- Reaching over shoulder is uncomfortable
- The bag sits too close to chin once swivelled to the front
- Mesh side compartment is an ideal storage solution for Steve's cane

Static Arm Strap & Hinge Bag



1 Cardboard Prototype



2 Hinge Prototype



3 Hinge 2.0 Prototype

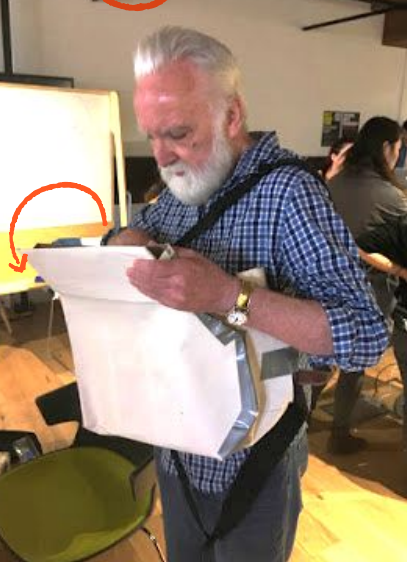


Testing

Side Access Backpack

Backpack wearers are familiar with the underarm swinging motion required to access their items throughout the day. However, the top/rear opening of a conventional backpack always seems to be in the wrong position, resulting in sliding the bag off the shoulder for unzipping. This prototype repositioned the main zipped opening to the side of the bag, which becomes the top facing surface when swinging a backpack to the front. The trap door style opening flap would provide hard case housing to store and protect Steve's visual aids while providing easy access. The inside has a large flat pocket for books and paper, while the main compartment has removable dividers, secured by velcro. Steve really liked the concept and felt very comfortable with the prototype during testing. He felt that this backpack combined the function and qualities he wanted from the both the front satchel bag and hinge backpack.

Insights that informed our final prototype: The trapdoor opening needs something to restrict it to a 90 degree angle so that it does not tip out the visual aids if extended too far. Larger compartments at the closer to the base to hold heavier items like water and vegetables. Adding handles to both the top and bottom of the bag for easier handling and positioning. Making the bag yellow for higher visibility. Larger shoulder straps as Steve is a relatively taller gentleman. The blood, sweat and tears from sewing this bag from scratch made us realise we should invest our time into modifying a quality bag for our final prototype.



Final Prototype: ***'The Steve Swing'***

90°
opening
panel



Microfibre lined
compartments:
for priority VA
items



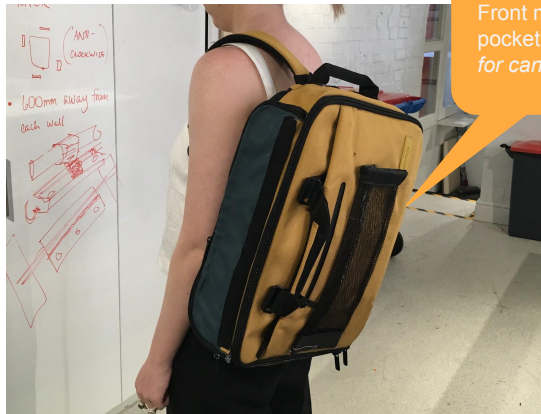
Front
swing &
grasp
function



Bright yellow
body with
contrasting
teal side
panel



Front mesh
pocket:
for cane



Internal
adjustable
compartments



How We Got Here...



Throughout the iteration process, the team constructed a number of prototype bags from raw materials. Whilst this was sufficient for progressive prototypes, it was decided that the sewing and production skills required to produce a sophisticated final prototype within the timeframe were beyond that of the team. The team discussed the potential of purchasing a pre-fabricated bag with the aim of deconstructing it, modifying and rebuilding it for our solution. Upon consultation with Ben Shemesh (TOM), it was decided that this was the best option. Ben noted that it would be extremely difficult to construct an original bag from raw materials and, for the purpose of the prototype it would be appropriate to purchase a pre-fabricated bag. The team explored a number of bag retailers. After comparing available options, the 'Credential' bag from Crumpler was decided to be the most suitable. This bag had a number of key design elements that would be difficult for the group to manufacture or manipulate in the time (i.e., colour and body/frame). However, the bag was also selected for the design elements that were obviously able to repurposed (i.e., internal fabrics, straps, zips etc.). Whilst the Crumpler bag may be considered expensive, the cost was deemed worthwhile due to the potential it presented for a more refined final prototype.



Constructing *'The Steve Swing'*

1. Deconstruct

Initial stage of prototype development involved deconstruction of prefabricated bag. We removed the backpack straps (for reuse), removed all additional straps (for reuse), gutted bag of all existing internal compartments and removed various existing zipper toggles



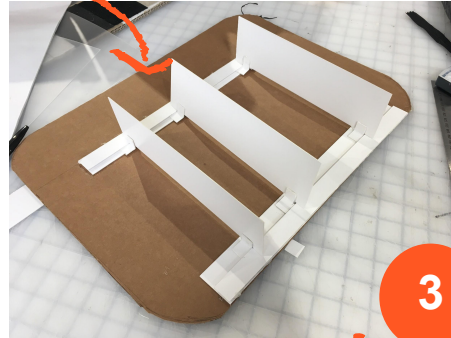
2. Repurpose Elements

Identified elements that were able to be repurposed including backpack straps, additional straps, internal fabrics, various zippers. Re-positioned backpack straps to suit Steve, repositioned relevant straps for functional use and cut up fabric for use on top/side opening panel



3. Construct Internal Elements

Using two different strength cardboards, stanley knife and a hot glue gun constructed internal sliding compartments. Measured cardboard base to internal base of prefabricated bag to ensure a secure fit.



4. Install Internal Element

Ensured to measure for a secure fit prior to construction. Once construction was complete, underside of cardboard base was sufficiently covered in hot glue and placed into bag. Base was pressed on to ensure that it was securely attached for approx. 1 min.



Constructing *'The Steve Swing'* ctd.

5. Construct Side Panel

Using fabric removed from the original internal elements, constructed the 90° opening panel. Created an opening in bag along the side (using stanley knife and scissors). Removed existing zip from this section of bag. Measured opening width and length. Cut out fabric and cardboard to these measurements. Inserted cardboard piece into open side panel and glued. Attached zip to one side of side panel (other side to be attached to bag)



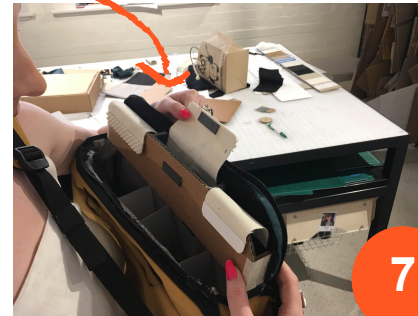
6. Attach Side Panel

Attached long side of panel (side without zip) to bag using hot glue. Zipper side should be facing outwards when bag is worn on the back. Attached second side of zipper to opposite side of opening. Ensured that the two sides of zipper line up prior to securing with hot glue. Once both sides were attached, tested that side panel is able to be closed and zipped with relative ease



7. Construct & Attach

Using cardboard, repurposed fabric from the original bag, calico, rubberised material and magnets constructed compartments to sit in panel. Prior to construction, measured priority VA items. Measured and cut cardboard and fabric to fit side panel (already inserted). Created 3 compartments to fit priority VA items. Compartments lined with microfibre material. Each compartment given individual pattern of rubberised material for ease of identification



8. Attach External Pocket

Mesh fabric removed from previous prototype (black backpack), elastic removed from prefabricated bag. Pocket was measured and cut to the length of Steve's walking cane. All elements secured using hot glue



Key Design Elements of *'The Steve Swing'*

- Bright yellow body with contrasting teal panel
 - Steve noted security to be a key concern in regards to final design. He stated that having the bag be a 'bright' colour would assist in bringing motorists and cyclists attention to himself when he is trying to cross the road and navigate street corners
- Rigid body
 - Steve noted the yielding structure of his current backpack to be an issue. He stated that it made it difficult to place items securely, locate priority items and, in instances where the bag was dropped out of his visual field, it was particularly challenging to reach and grasp for it. In order to eliminate these issues and increase 'ease of use', bag was developed with a rigid body.
- Backpack straps
 - Steve noted that he favoured wearing his backpack on his left shoulder. He stated this was in order to keep his right arm free and clear to operate his walking cane. Whilst Steve elected to wear the bag with one strap, both left and right straps were attached to allow for universal user preference.
- 90° opening panel (with customised in-built compartments)
 - Steve noted experiencing difficulty accessing internal compartments of his current backpack whilst still slung across his shoulder. He demonstrated this action to the team. In order to facilitate more comfortable and easy access to internal compartments, bag was developed with a panel that opened to 90°. Built in to this panel were several compartments customised to the size of Steve's priority visual items.

Key Design Elements of *'The Steve Swing'* ctd.

- Front swing and grasp motion
 - In order to facilitate easy access to the 90° opening panel, bag was developed in such a fashion that the user is able to swing it underarm and hold against front of body without ever having to remove back straps.
- Customised in-built compartments
 - Steve noted his current backpack did not have any allocated space for his various priority visual items. He stated, as he has to go between the items so frequently he does not place them inside proper cases, instead letting them sit loose in the backpacks front compartment. Steve noted that he was concerned about items being damaged in his current backpack. In order to afford greater security for Steve's visual aids, structured compartments were built into 90° opening panel. Each compartment was lined with microfiber to act as an in-built 'self-cleaning' component.
- Additional grasp straps
 - Additional grasp straps were installed to increase stability and security of the 'front swing and grasp' motion. Straps were installed on both ends of the bag to allow the user to grasp the bag with whichever hand they prefer and use the other to access internal compartments.

Key Design Elements of *'The Steve Swing'* ctd.

- Internal adjustable compartments
 - Steve noted considerable difficulty placing and locating items (water bottle, jacket/hat, groceries etc.) in his current backpack. He stated as there were few compartments everything fell in together. In order to facilitate easier access to the aforementioned items, adjustable compartments were installed in the main body of the bag. Depending on the size of the item, Steve is able to move the compartment panel to fit.
- Full body zip
 - In order to facilitate access to the internal compartment, bag was developed with a full body zip. It is believed that this design element will assist Steve in unpacking his backpack whenever necessary by allowing for more complete and open access.
- Front mesh pocket
 - Steve noted that his current backpack does not have a 'safe' place to store his cane when he is seated. He stated that the side pocket (umbrella/water bottle slot) was too shallow and the cane would fall out. Steve noted his other option storage option to be in his pant pocket. However, he again faced the issue of the cane falling out. In order to provide a safe and easy to access storage space for Steve's cane, the bag was developed with a mesh pocket, measured to the length of the cane when folded and, installed on front panel of bag.

'The Steve Swing': Best Solution for Steve

As a result of his condition, genetic Macular Degeneration, Steve experiences a number of challenges in his everyday life. Steve has developed strategies to overcome many of these challenges for example, utilising APPs on his iPhone. However, he still experiences significant difficulty in regards to managing his priority visual aids and everyday items in one 'easy' bag.

Over recent years, Steve has experimented with a number of different designs all of which he has found to be 'not quite right' for his needs. His current backpack fulfils some requirements however, it does not ensure security or easy access to priority items. Specifically designed to address these concerns, '*The Steve Swing*' ensures security, accessibility and, usability.

Previously mentioned key design elements (*slides 28-30*) were specifically developed in response to Need Knower, Steve's expressed issues, desires and ideas.



The Steve Swing' : Best Solution for All

The innovation of 'The Steve Swing' lies within its universality and usability by all people.

Although the internal compartments were made with Steve's visual aids in mind, there is no reason why anyone who experiences difficulty locating important items couldn't use this bag to assist them.

We also note the very high potential for upper limb amputees and people with an arm palsy to use this bag, and use it effectively. Whilst Steve prefers to position the bag across one shoulder, it was designed to sit comfortably using one or both straps. We were particularly mindful throughout the entire creative process that no matter the end result, the final product was not to draw obvious attention to any disability.

During our TOM@university DFM exhibition, we were also approached by a representative from Vision Australia who recognised the universality of the bag to anyone experiencing impaired vision, whether it be partial or complete vision loss.

\$249

Cost of our prototype to create

The bag itself cost \$249, and we repurposed many of the included materials such as extra zips and internal structuring. DFM items such as plastic, cardboard and hot gun glue was used in the construction process. These item costs need to be considered when remaking the bag.

Please see Bill of Materials.

Next Stage of Development:

Our next stage of development would be ensuring that the internal compartments, which we fabricated, are made with a more durable and sturdy material than that which we made them with.

As it is a bag, the internal elements would most likely need to be constructed using an industrial sewing machine, we were not able to locate and learn to use in time.

Furthermore, if there was access to this kind of machine, it may prove cheaper to construct the Crumpler bag from scratch - although this could prove more tedious.

Reaching out and, establishing a relationship and open dialogue with the company Crumpler may be something for TOM to consider. If explained effectively, Crumpler may be made aware of the work that is being done and the amount of people this design could reach and provide assistance to. They then may be interested in further developing and producing this design.

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Thank you, from Team Steve.



Build Instructions: "The Steve Swing"

Assistive backpack for all

Developed by : Team Steve

Grace Moore, Jaime Do, Stephanie Balis, Suntaree Wachirawan




Approximate Cost: \$249 AUD

Time Required: Approx. 6 Hrs.

General Warnings and Cautions

 **Read through entire manual before attempting to build this device.**


 **Do not attempt a step if you are unsure of what you are doing.** Certain steps in this manual require experience with fabrication tools. <<General Warning>>. For assistance or clarification of any step, contact *Insert contact info here*.


User Assistance


For any questions regarding the assembly, operation, or specifications of this device, please visit *Insert project website URL*. You can also contact send an email to *Email Address* or call *Phone number*.

Icon Glossary

The following icons may be used throughout this manual—each with its own purpose.

 **Caution:** The caution icon is used to signify whenever someone attempting the procedure may injure themselves or damage their equipment.

 **Note:** The note icon is used to signify useful bits of information that complement the instructions.

 **Reminder:** The reminder icon is used to provide information for after the procedure is completed, such as tips for disassembly.

Purpose of Device:

The Steve Swing is a solution for Steve who has genetic Macular Degeneration and experiences difficulty in regards to managing his priority visual aids and everyday items in his bag. The solution aims to increase his accessibility to his required items. The developed solution later has the potential of universality and usability by all people.

Physical Description:

The Steve Swing is a bright yellow bag with rigid body and customized in-built side compartments. The function is front swing and grasps motion of user to access to their belongings from side-flip compartment.

History of Development:

The development process took 13 weeks semester of Swinburne University of Technology, Design Factory Melbourne in partnered with TOM@University. The team consists of three Occupational Therapy and one design student, an interdisciplinary team. The challenge is from Steve's who experienced complete loss of his central vision with limited peripheral vision from genetic Macular Degeneration. The challenge is how might we support Steve's independence in the community setting by facilitating easier access to priority visual aids. Steve is a part of our co-design with prototype ideas and help shape the final prototype with his feedback.

Bill of Materials

Product Name							
The Steve Swing							
Assembly Name:			The Steve Swing	Approval Date:			02/11/2018
Assembly Number:			1	Part Count:			-
Assembly Revision:			N/A	Total Cost:			\$249 AUD
Part ID	Part Name	Description	Qty	Units	Supplier	Unit Cost	Cost
01	Bag	Pre-made Backpack	1	1	Crumpler PTY LTD	\$249	\$249
	Total		1				\$249

Tools Required

- Mockup (Premade) Backpack
- Cutting tools; scissors, cutter
- Measurement tools: Ruler, Measure tape
- Hot glue, masking tape
- Cardboards

Parts Inventory:

- All required parts are mentioned in the assembly instructions

Assembly: The Steve Swing



Approximate Cost: \$249 AUD

Time Required: Approx. 6 Hrs.

Step 01: Shoulder straps

Parts and Tools Used In This Step:

- Mockup backpack's Shoulder straps
- Repurpose black fabric strip from Mockup Backpack
- Metal wire
- Scissors, Cutter, Pliers
- Hot glue



* The change of Shoulder strap position is based on the swinging point of our user, left shoulder and the bag opening of the premade bag

Instructions:

To swap the Shoulder straps upside down

- Cut both shoulder straps out from the bag
- Install the straps to the new position with metal wire joint and hot glue
- Covered the joints with black fabric by hot glue

Step 02: Side Opening for Side-flip Compartment

Parts and Tools Used In This Step:

- Mockup backpack
- Scissors, Cutter
- Hot glue



Instructions:

- Cut out the highlighted side of the bag

Approximate size: 100 mm x 390 mm

- Fold and glue around the edges

Step 03: Side-flip compartment construction 01, The cover

Parts and Tools Used In This Step:

- Mockup backpack with side opening
- Repurpose backpack elements: Internal hard partition, Green fabric soft case with zipper opening, black fabric strap
- Scissors, Cutter
- Hot glue



Repurpose Backpack's elements



Instructions:

To make fabric cover with zipper

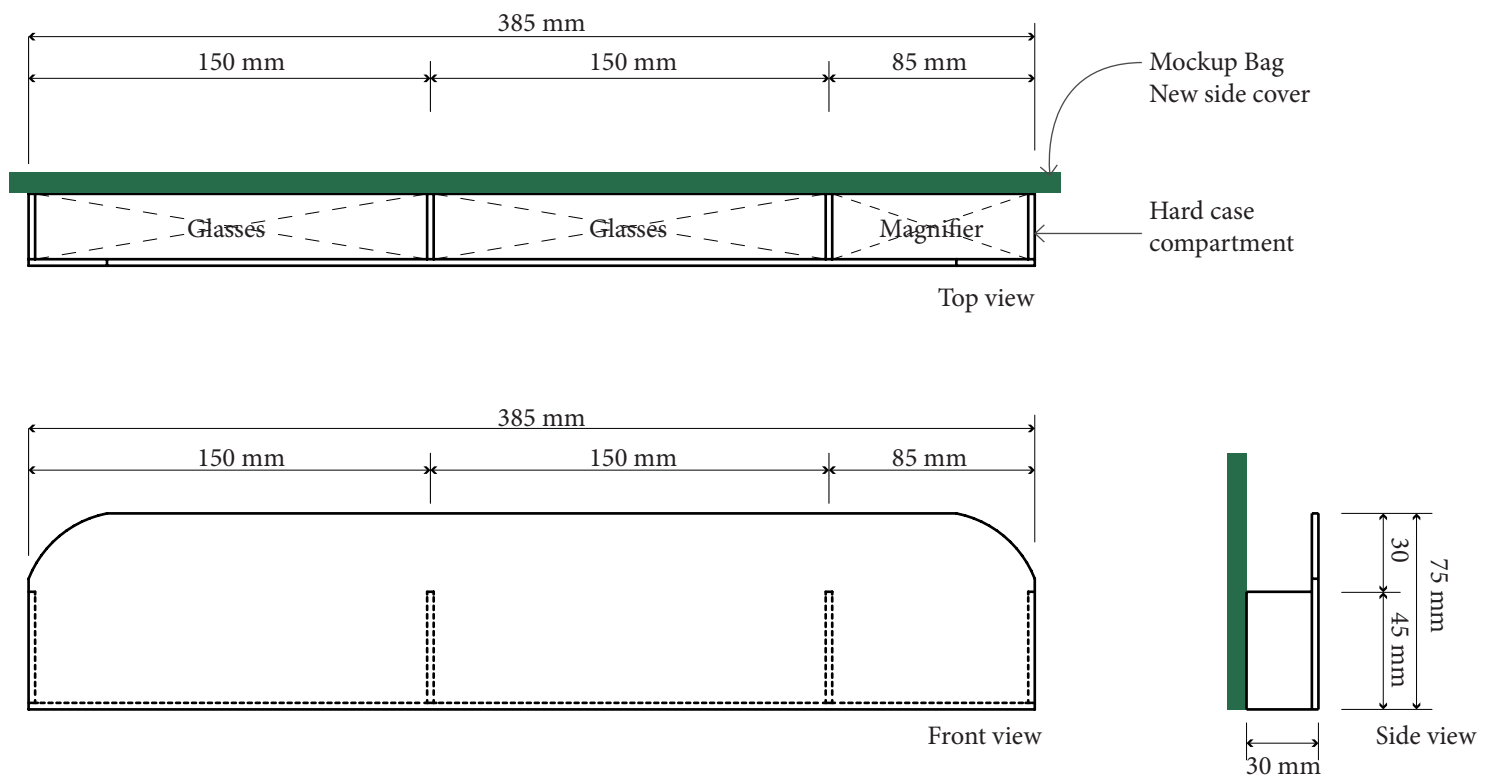
- Cut Green fabric soft case to match backpack's side opening.
- Layer the fabric cover with hard partition, attaches with hot glue
- Upholster with black fabric for internal side of the cover, attaches with hot glue
- Reconstruct Green soft case zipper to attach with bag side opening
- Attached the cover flipping side with black fabric strap.



Step 04: Side-flip compartment construction 02, The side hard case compartment

Parts and Tools Used In This Step:

- Mockup backpack with side opening and new green side cover
- Repurpose backpack elements: Backpack's internal green flannel fabric (substitute of microfiber fabric for glasses)
- Cardboard
- Scissors, Cutter, ruler
- Hot glue



Instructions:

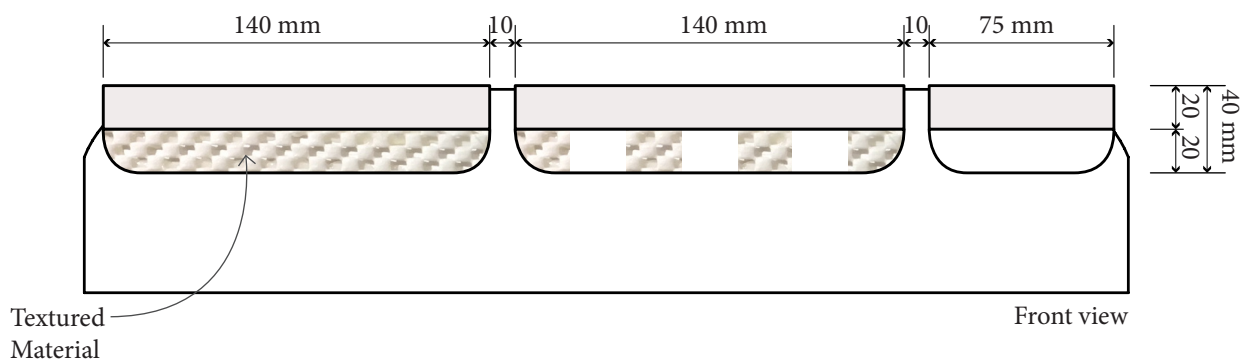
To make hard case compartment from cardboard

- Cut and glue cardboards as per provided dimensions
- Upholster internal side of the cardboard compartments with flannel fabric
- Attach cardboard compartment to Backpack's new side cover with hot glue.

Step 05: Side-flip compartment construction 03, The side compartment Cover

Parts and Tools Used In This Step:

- Mockup backpack with new side compartment
- Cotton fabric
- Magnetic tape
- Textured Material (White checkered pattern multi-purpose anti slip mat from Daiso)
- Cardboard
- Scissors, Cutter, ruler
- Hot glue, Masking tape



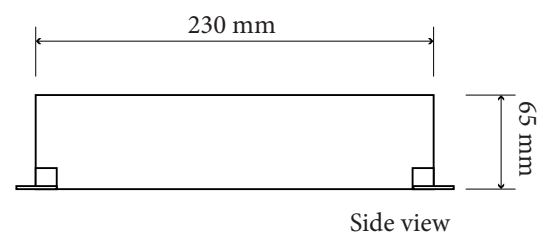
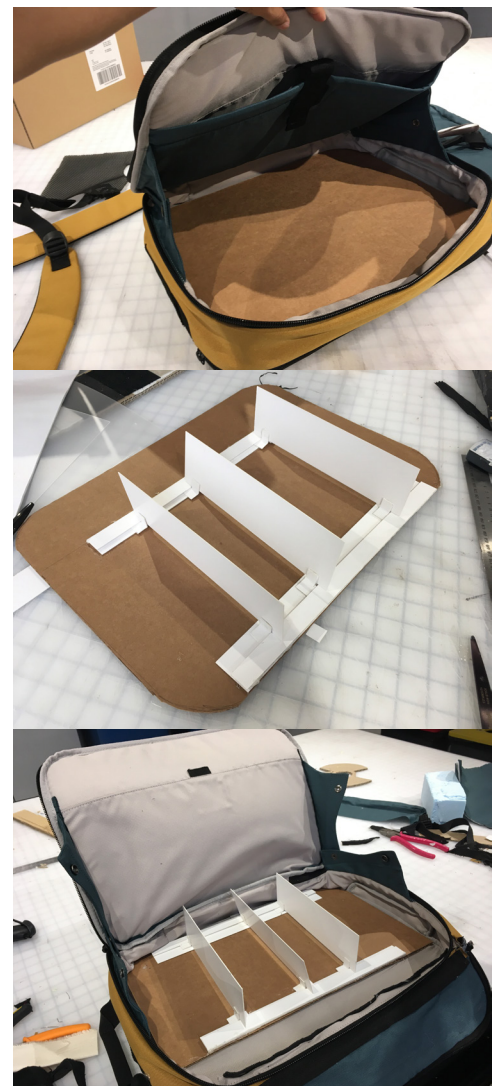
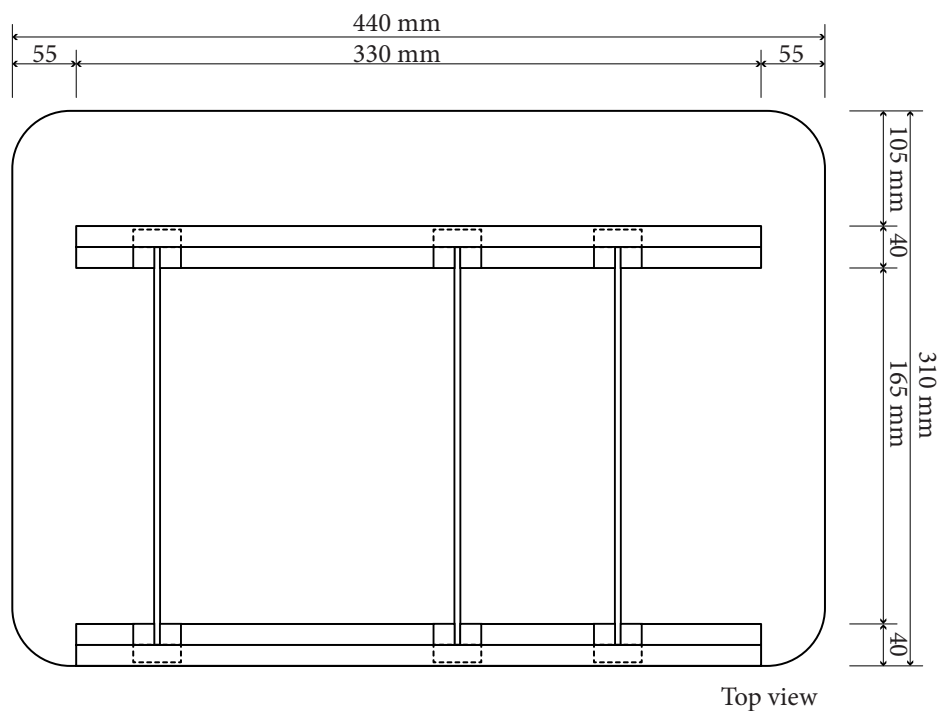
Instructions:

- Cut cotton fabric, cardboard, textured material as per provided dimension
- Attached the cover elements together with hot glue
- Attached the cotton fabric to Backpack internal side cover.
- Attached magnetic tape on hard case compartment and under the cardboard cover as shown in the photos.

Step 06: Internal Adjustable Compartment

Parts and Tools Used In This Step:

- Mockup backpack with new side compartment
- Cardboard
- Scissors, Cutter, ruler
- Hot glue, Masking tape



Instructions:

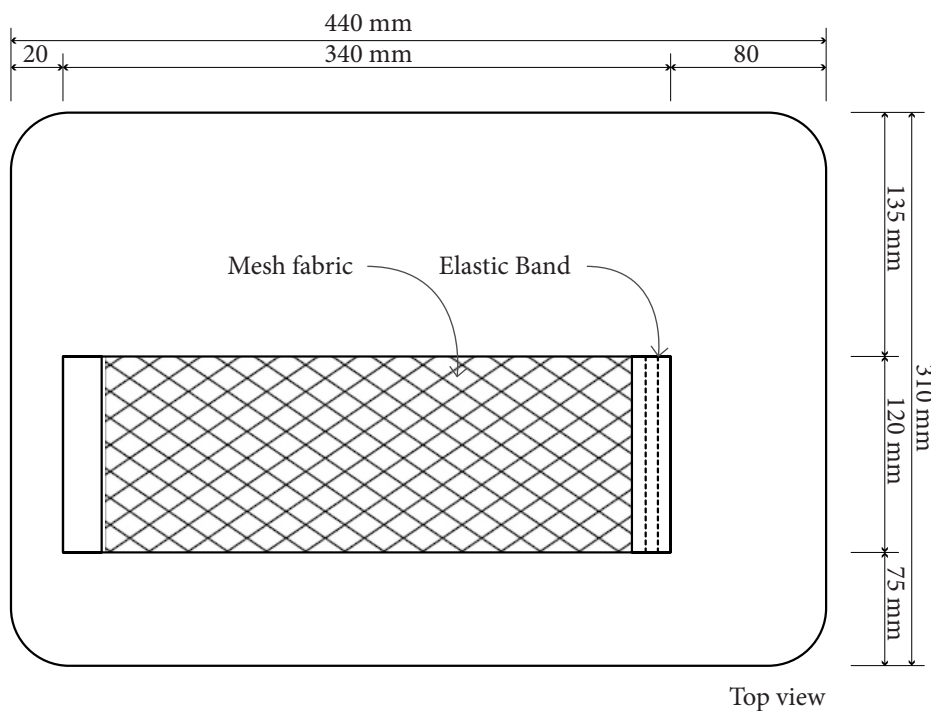
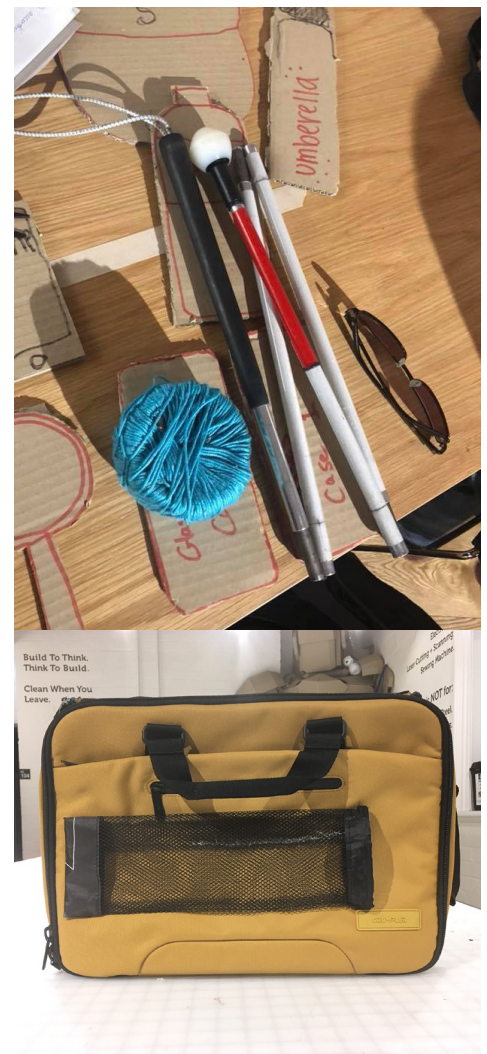
To make Internal Adjustable Compartment

- Make hard base support layer from cardboard, match the size with the bag's internal size
- Make sliding track and compartment from cardboard as provided dimensions.

Step 07: Front pocket for walking cane

Parts and Tools Used In This Step:

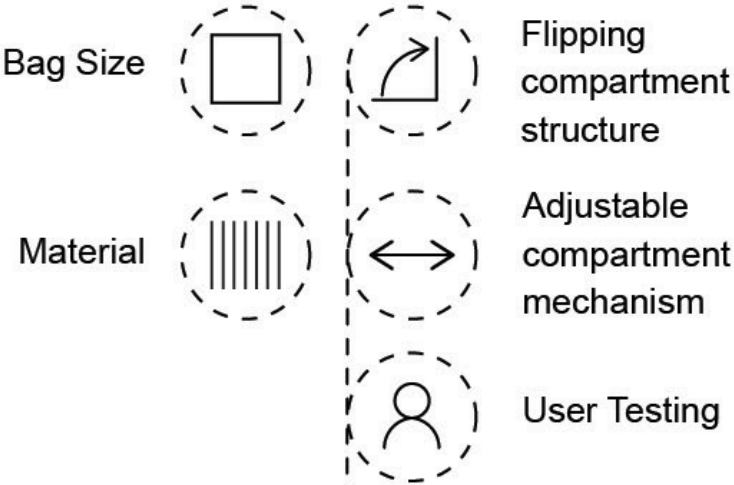
- Mockup backpack with new elements
- Repurpose backpack elements: Black mesh fabric
- Black elastic band
- Scissors, Cutter, ruler
- Hot glue



Instructions:

- Cut black mesh fabric as per provide size
- Attach to the front cover of backpack as shown
- Insert black elastic band at top opening to tighten the walking cane in the pocket.

What Next?



Final Prototype



Development of

01 Flipping Compartment Structure

02 Adjustable sliding compartments Mechanism

03 Finalized concept materials

04 Finalized Practical Bag size
(The final prototype bag and proposed compartment sizes are based on the premade mock up bag.

The suitable bag size to user should be explored)

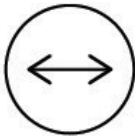
05 User testing



Colour for Safety



Front compartment for Walking cane



Adjustable internal compartment



Side flipping compartment for Visual Aids with Microfiber upholstery



"The Steve Swing"

