PROJECT FOUR: MILESTONE 1 – COVER PAGE

Team Number: Mon-53

Please list full names and MacID's of all *present* Team Members

Full Name:	MacID:
Stephen Dorssers	dorssers
Danielle Fong	fongd5
Chuyuan Xie	Xiec19
Mohammad Muntazar Bhurwani	bhurwanm

MILESTONE 1.1 – CLIENT NOTES

Team Number: Mon-53

You should have already completed this task individually prior to Design Studio/Lab for Week 7.

1. Copy-and-paste each team member's client notes on the following pages (1 team member per page)
   → Be sure to indicate each team member's Name and MacID

We are asking that you submit your work on both the team and individual worksheets. It does seem redundant, but there are valid reasons for this:

- Each team member needs to submit their client notes with the **Milestone One Individual Worksheets** document so that it can be ***graded***
- Compiling your individual work into this **Milestone One Team Worksheets** document allows you to readily access your team member's work
  - This will be especially helpful when completing the rest of the milestone

Team Number: Mon-53

Name: Stephen Dorssers	MacID: dorssers

Copy-and-paste the notes from the introductory client visit for one team member in the space below.

- Alannah used to work as a midwife for 15 years and had been working in the reproductive health field since her 20's.
- 2016, Alannah developed autoimmune diseases, was in a car accident and developed breast cancer which all contributed to her having to stop working as a midwife.
- However, none of these circumstances has deterred Alannah's passion to make a difference in the world. She states that midwifery was how she was making a positive change previously, while now she does this through her art.
- Alannah meditates, does yoga, and adaptive Brazilian ju-jitsu, which all helps her with healing (I imagine this is great for physical health healing but also for mental health as well)
- Alannah loves to garden.
- Alannah has to change the way she paints depending on how her body reacts, stating that for one piece her hands started to spasm painfully, so she had to change the positioning of the canvas and get larger brushes.
- She starts many paintings but has to finish them much later and usually over many sessions and some do not get finished.
- She cannot work with clay for her sculptures. Uses collected objects for sculpture and the sculpture she created was physically taxing as it had cut her hands which can cause infections because of her lymphedema.
- Works with acrylic and oil paint. Makes collages sometimes.
- Her conditions can be unpredictable and flair up at a moment's notice. She also has problems bending at the waist due to her arthritis. She cannot schedule her work because of this as she does not know if she will feel pain during work and have to stop.

- Alannah experiences brain fog which can make her forgetful. This deters her from painting as she may forget an idea she had for a piece and must come back to it later.
- Alannah wants to paint intricate art but that can be extremely difficult and take a long time.
- She cannot sew anymore as this could cut up her hands.
- Frequently she works on her paintings on the floor.
- Wants to plant her own herb garden as she can make medicine with the herbs. She has a great knowledge in gardening but cannot do the actual planting process anymore without help from friends to plant for her (she can still maintain the garden without help).
- Quarantine has meant that she has had to stay home since March. Alannah has had to adapt her schedule, her yoga practice and meditation around the fact that she must stay home (only group mediation, yoga courses online).
- Stress increases her pain from her conditions.
- She talks about wishing that she could paint with a paint brush without it being in her hand. Her body feels better when working on the floor, however she is not sure exactly why except that it makes her feel more comfortable.
- Moving around helps her relieve pain. (Changing frame positions, sitting then going to standing, etc.)
- Some days Alannah can have more energy and strength than other days. This ties back to the problem of not being able to schedule any of her work.
- She wants to see tools that can make painting less painful. This could mean focusing on relieving hand pain during painting.
- She wants us to focus on COMPASSION. Being compassionate towards her pain and her conditions to develop a device to help her.

Team Number: Mon-53

Name: Danielle Fong	MacID: fongd5

About Client:

- Background in healthcare
- Midwife for over 15 years
- Car accident and diagnosed with breast cancer that caused physical injuries and challenges
- New challenges every day, unpredictable schedule each day
- Strives to make a difference in the world through art and painting to communicate to the world
- Hobbies: painting, yoga, adaptive Brazilian jiujitsu, sculpting, gardening, sewing

Alternative Methods or Necessities:

- Using wider paint brush handles to soften the grip for the hand
- Weight and pressure required for sculpting
- Adjustable gripper/device in case of swelling
- Support for the weight of the dominant hand
- Stability and strength when painting intricate designs or lifting anything
- Exoskeleton arm

Design Objectives:

- Comfort
- Strength
- Reduce weight
- Stability and control
- Delicate movements

Team Number: Mon-53

Name: Chuyuan Xie	MacID: xiec19

QUESTIONS:

What types of artwork do you usually do? How does the artwork help you? Is there any types of motion that you find more difficult than others?

NOTES:

Breast cancer and car accident causes her to have difficulties.

Canvas art work, usually acrylic and oil paint, sometimes collages.

Hand muscles were so weak that when doing artworks, tools are required to keep the brushes in her hand.

Cannot do sewing anymore

Sometimes her kids help with her art-work, and she needs help while gardening.

Sometimes artworks takes more than 8 months for her to complete.

Artwork keeps her busy and gives her strength, doing yoga also helps her to find a way to transform and feel safe in the body.

Team Number: Mon-53

Name: Mohammad Muntazar Bhurwani	MacID: bhurwanm

- Alannah worked as a midwife for over 15 years (reproductive health) the early twenties - 2016
- **Difficulties:** Developed autoimmune diseases which stopped her from working as a midwife and got in a car accident causing several injuries and was diagnosed with breast cancer.
- **Hobbies**: Started painting as a means of healing to communicate with the world about resilience and inspiration. Meditation, yoga, sculpting, gardening, and jujitsu are some other ways of relaxing.
- Adapted new approach of using brush with wider handles due to muscle spasm.
- Worked with sculptures, built a three-dimensional torso, used hospital bracelets for ribs and connect using wires.
- Lymphedema causes risk of swelling and infection with any cuts or wounds on hands and arms.
- Prefers to work with acrylic paints and oil paints - cold wax medium which creates a layering effect.
- **Big Challenges:**
    - No predictability in her body
    - Spondylar arthritis (auto-immune) impacts mobility and ability to bend.
    - Pain also affects her cognition causing brain fog. Memory is also impacted by brain fog.
- Cannot sew anymore due to difficulties faced.
- **Current Medical Devices:**
    - Lymphedema - medically prescribed compression sleeves, wears a compression vest for the torso when painting, exercising, lifting.
    - Spondylar arthritis - uses an SI brace, helpful for walking but uncomfortable to wear.
- **Objectives:**
    - Comfort
    - Stability
    - Ease and control over her movements
    - Should be easy to use so no exertion

MILESTONE 1.2 – INITIAL PROBLEM STATEMENT

Team Number: Mon-53

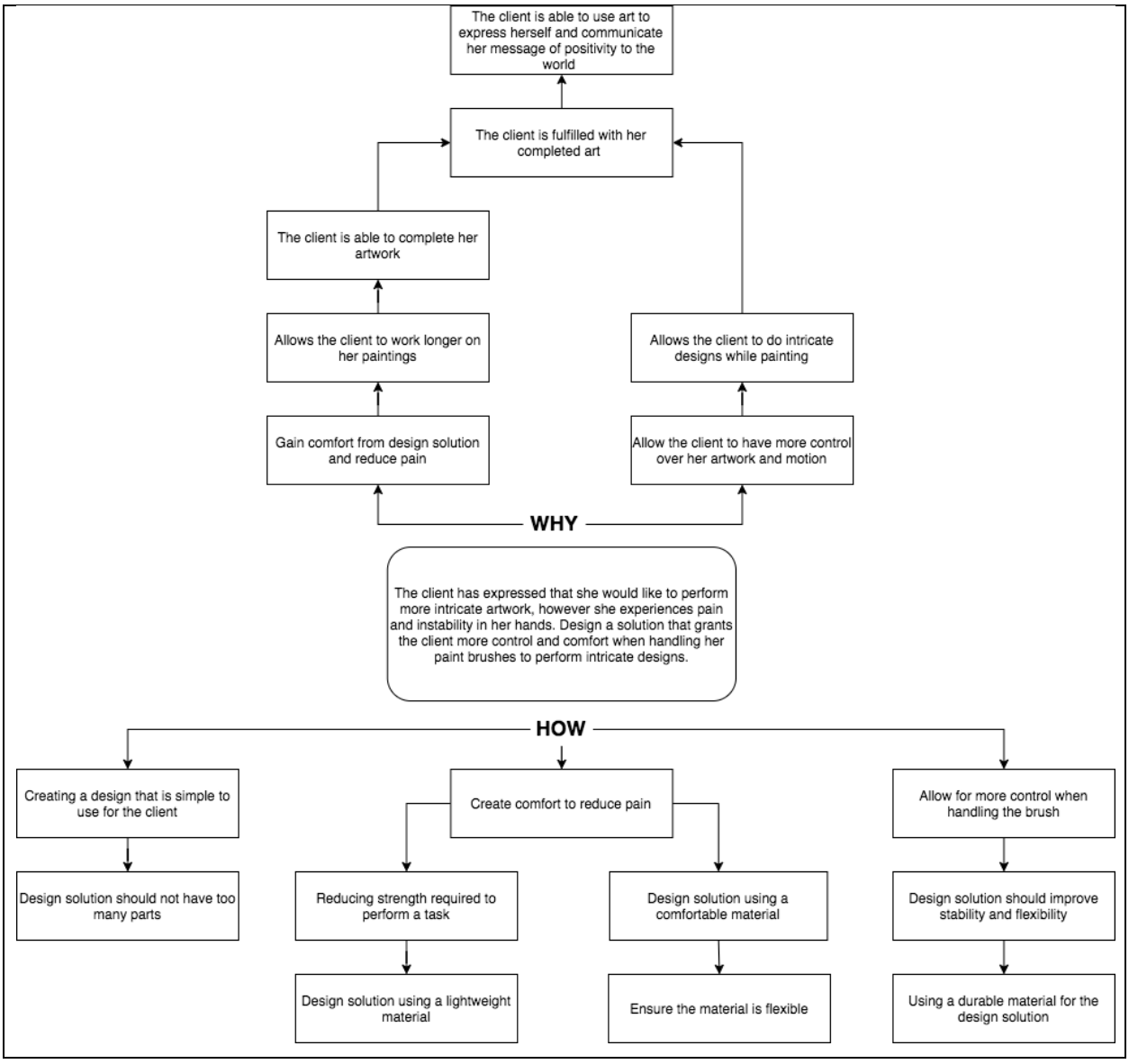
1. As a team, come up with an initial problem statement and include it in the space below.
   - → Make use of your client notes to define your primary function
   - → Remember to avoid solution-specific statements
     - Focus on what your design *should* do for the client in a general sense (not *how* to do it)

The client has expressed that she would like to perform more intricate artwork, however she experiences pain and instability in her hands. Design a solution that grants the client more control and comfort when handling her paint brushes to perform intricate designs.

MILESTONE 1.3 – OBJECTIVE TREE, HOW/WHY LADDER, METRICS

Team Number: Mon-53

1. As a team, use an objective tree and/or How/Why ladder, to refine and guide the focus of the project.
   → If your team chooses to do both, copy and paste the blank box on a separate page
   → Your diagram(s) can be hand-drawn or done on a computer. Please make sure it's well organized and ***readable***.
2. If you need to see examples of each tool see "Review of Design Process" lecture – Wednesday, Feb 24th.



Justify your team's reasoning behind the choice of design tool(s):

We chose to use the How/Why Ladder instead of the Objective Tree. The How/Why ladder allows us to delve deeper into why we are helping our client, while the Objective Tree does not provide that same functionality. The Objective Tree would help us plan what our solution should accomplish and what constraints that solution must have, but it would not tell us the bigger goal of the project, such as the specific problems we are trying to help the client overcome. The How/Why ladder allows us to focus on the design objectives for our solution using the How side, while also using the Why side to focus on the fact that we are creating this solution for a client's specific goals and needs. The Ladder also allows us to branch out and have multiple thought processes without comprising on any idea.

1. What are your top objectives (in no particular order)?

Durability
Flexibility
Light Weight
Comfort

2. What is your rationale for selecting each of these objectives? Write maximum 100 words for each objective.

Objective 1: Durability

Rationale: Most of the client's work is creating art and she hopes to create even more with the proper design solution. Because of this, the solution must be able to withstand stress for a long time so that our client can continue to use the design solution to create more of her artwork. Also, the presence of children means that the design should be durable so as to not break it easily.

Objective 2: Flexibility

Rationale: Since the client experiences pain when creating her artwork, it limits her flexibility to paint and is also challenging for her to hold her paint brushes comfortably. The material used for this design solution should be flexible so that it allows her to hold her paint brushes with ease and not requiring much exertion.

Objective 3: Light weight

Rationale: Since the client has instability in her hands, she is not able to carry tools that have heavy weight. Therefore, the material should have a mass that is as low as possible to allow the client to create artwork easier with the tool.

Objective 4: Comfort

Rationale: The client currently owns devices to support her body, but she explained that they weren't comfortable so she couldn't wear it for a long period of time. Therefore, the material used should have a low elastic modulus which will allow the client to use the device with ease.

3. Fill out the table below with associated metrics (including units) for each objective.
   Remember: Metrics should be something you can actually test or measure as part of your process (e.g., calculate weight of a part by iProperties in CAD, test results of a physical prototype).

Objective:	Durability
Unit/Metric:	Stress over time (σ/s)

Objective:	Flexibility
Unit/Metric:	Stiffness (Pa) [lower is better]

Objective:	Lightweight
Unit/Metric:	Mass (kg)

Objective:	Comfort
Unit/Metric:	Elastic Modulus (σ/ε)

MILESTONE 1.4 – PROJECT PLAN

Team Number: Mon-53

1. As a team, outline a project plan where you:
   → Include a few sentences describing each team member's prior experience with physical and/or software prototyping
      • From previous projects in the course, or any other relevant experience
   → Compile a list of potentially useful resources, materials, and/or tools for prototyping

   Reminders:

   → The prototype can be either physical (e.g., cardboard and tape, 3D printed), digital (e.g., Inventor simulation or rendering), software (e.g., code for Raspberry Pi) or some combination of physical, digital and software
   → Keep in mind that there are no ENG 1P13 physical prototyping resources available to you because we are learning online, which is why we are asking you to take inventory of how you might accomplish prototyping as a group
   → As you think about how to prototype, remember that you will eventually need to validate your work somehow. Your validation approach will depend on what prototyping technique you use. Examples of validation approaches include (but are not limited to): hand calculation, physical test, software demonstration or simulation.

Danielle Fong:

- Designed and created cardboard model and CAD model for project 2
- Wrote python code for project 3
- Created flowchart for project 3
- Designed a robotic crane controlled by breadboarding a joystick and motors
- Circuited a mini traffic light simulation

Chuyuan Xie:

- Created a few CAD models of mechanical components and three house designs in high school
- Built a paper prototype and CAD model for Project 2
- Made both Pseudocode and flowchart for project 3

Stephen Dorssers:

- Built cardboard prototype of sterilization container for Project 2
- Made Pseudocode and flowchart as a prototype for the Project 3 code solution
- Built a model rollercoaster in grade 12
- Built a small circuit in high school

Mohammad Muntazar:

- Made pseudocode and storyboard as well as used Python to code a solution for Project 2
- Inventor modelling for Project 3 including a modified hopper
- Participated in McMaster Design League's Designathon recently, used Inventor to build a prototype of an Hyperloop.

Resources:

- Granta: allows us to explore different materials and their properties
- Raspberry Pi: allows us to code a program that can be designed to control robotics
- Python: allows us to code inside Raspberry Pi and control the device
- Autodesk Inventor: allows us to quickly model our solutions and test their motion using simulations
- Crafting Materials (cardboard, paper, etc.): allows us to build a prototype of a device that can be modified and adjusted before finalizing a design
- Drawing software/Pencil and Paper: quickly draw out potential solutions to help visualize ideas

Based on our previous experiences and the resources available to us, our group plans to use digital resources to devise our solution. We would also be using physical resources such as cardboard to plan our solution first-hand before implementing it digitally.