

PROJECT FOUR: MILESTONE 1 – COVER PAGE

Team Number:

Tues-31

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

Full Name:	MacID:
Luigi Quattrociochi	quattrl
Ziad Ahmad	ahmadz18
Avanish Ahluwalia	ahluwa6
Michael Ferlisi	ferlisim

MILESTONE 1.1 – CLIENT NOTES

Team Number:

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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

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Name: Luigi Quattrociochi	MacID: quattrl
<p>Notes from P3 Module (background)</p> <ul style="list-style-type: none"> • About her – retired midwife, mother of two children, painter, does meditation, stretches, exercises daily, Brazilian jiu jitsu (as recommended by rheumatologist), enjoys gardening, sewing (can't anymore because of hand pain, pricking infection risk) • The client has autoimmune diseases – ankylosing spondylitis (inflammation of spine and other joints), fibromyalgia, breast cancer survivor, chronic lymphedema in arms, shoulder, chest, back. <p>Notes from live lecture</p> <ul style="list-style-type: none"> • Has a website: https://inapowerfailure.com • Art style - Prefers acrylic on large canvas paintings, but also sculpts • She feels better while mobile (if she stays in the same position for a long time, becomes sore) <ul style="list-style-type: none"> ○ Has a fire feeling in forearm, pain in hands ○ Can't do precise things anymore (i.e. hold small brushes) (hand pain, inflammation) • Wears many medical devices (chiropractor, physiotherapist, osteopath, naturopath, functional medicine, medical specialists. Used heat belts, canes, roller walker, tens machine.) (The design solution shouldn't be very restrictive on her physically) • Must hold arm up while painting, bearing weight of own arm is difficult often changing positions - sitting, standing, floor (A solution to this could potentially involve bearing the weight for her somehow) • While painting: uses stool for sitting, pillow for kneeling (perhaps a design solution could involve improving her comfortability in the sitting or kneeling position?) 	

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Name: Ziad Ahmad

MacID: ahmadz18

Introduction of Client:

- Has a background in midwifery
- Was a health care provider for 15 years
- Worked in reproductive health
- In 2016, she accumulated enough autoimmune diseases that she had to stop being a midwife
- Worked long hours so she had a lack of sleep that affected her body and immune system.
- Had a car accident that injured her in a different of ways.
- After, she got breast cancer and had to get treatment and surgery.

Activities and How Illnesses affects Client:

- In 2017, she started painting a lot to focus on healing her body and doing some work she enjoys
- She directs her resilience into sculpture work and training Brazilian Jiu Jitsu, which adapted to help heal her body
- She got into dynamic daily yoga, and meditation practice that assists her with managing the unpredictability of living with multiple chronic illnesses
- Longest painting took her 8 months in 201 because she could only work for short periods of time as she has physical limitations that impact how she paints (working with different tools)
- Enjoys bigger paintings than smaller ones
- She struggled with holding smaller brushes with her hand.
- The more detailed the painting is, the longer it takes to complete it
- Prefers to work with small brushes though as she enjoys adding more detail.
- The issue is that she lives with constant unpredictability each day.
- Does not know what physical challenges she faces each day (example: back or hand problems)
- Accessing what she loves brings her comfort (such as painting. Could work on making her feel comfortable holding paint brushes with minimal pain)
- My possible objective is to make it easier for her to paint when her body hurts

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- In terms of how she paints and works with her limitations. As she must deal with complex things in her body, which are unpredictable
- There is a spondylarthritis in her body that affecting her sacroiliac joints, mobility, ability to sit and stand.
- She likes to constantly move rather than sitting or standing while painting.
- She has lymphoedema in her arms and her trunk from the breast cancer surgery she had. That impacts her ability to wait bear at times.
- She needs to wear a series of medical devices whenever she is painting
- Even for simple yoga, she must wear compressions sleeves to avoid flare for weeks. Happens rapidly
- She feels pain in her muscles because of fibromyalgia that flares sometimes independent of other things (pain especially in her hands).

How the client's life has been affected:

She cannot drive, bend to load and unload dishwasher as it is painful due to sacroiliac joint pain, picking up things from floor requires her to physically get on the floor to pick it up. She must take multiple breaks and naps during the day. Load bearing on arms is painful, accidentally forgets limitations and accidentally does too much. Gets tired unpredictably. Impacted her cooking such as cutting using knives.

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Name: Avanish Ahluwalia	MacID: ahluwa6
<p>Client's Background</p> <ul style="list-style-type: none"> • She is a mother of two children, a talented painter and has retired as the head of Midwifery. She enjoys doing different exercises. • Was a healthcare provider who worked in reproductive health for few years. A kind and benevolent person as she always focused on helping others during her professional years. • She got diagnosed with autoimmune diseases, that caused her to limit work and be on call every 27 out of 30 days. • In 2016, she retired as a midwife due to the accumulation of autoimmune diseases such as ankylosing spondylitis (fusion of vertebrae bones reduce flexibility and movement of spine), fibromyalgia (pain and fatigue all over the body) and chronic lymphedema (swelling of lymph nodes, major effect on the immune system). • She met with a fatal car accident and is a breast cancer survivor after many treatments and surgeries. • In 2017, she started painting to cause pain relief and therefore, devoted a lot of time into this passion of hers. She also enjoys sculpting (creating sculptures and refining them). • She has trained in Brazilian Jiu Jitsu to help heal her body by making it adapt to certain complex movements slowly and gradually. Also performed daily yoga and meditation to relive psychological stress and keep her body used to basic and repetitive movements. • She has done many beautiful art pieces of which some of them could be found here: https://inapowerfailure.com/ <p>How the client manages their daily life:</p> <ul style="list-style-type: none"> • She works with acrylic paint on a canvas and prefers working on big pieces (allows her to think more creatively) rather than small paintings. Worked with oil paints and collage. • She has also done sculpting and has worked with metal, paper, wire, staples, etc. Worked on utilizing old and different materials and objects in a creative way to showcase certain aspects of her sculpting pieces. • In 2019, she attended an art exhibition. She worked for 8 months on a painting for the exhibition. This was due to her physical limitations such as holding/gripping different tools to make her artwork more intricate. It is possible to provide her with a solution to increase grip strength and muscle support for longer times. • She is diagnosed with ankylosing spondylitis, causing unpredictable pain in her sacroiliac joints, and affecting her mobility and ability to sit and stand for longer than normal times. It is possible to help increase her mobility by reducing pain and providing support to the joint for complex movement. • She prefers to move more while performing activities/tasks. She specifically prefers to move more during painting to add creativity and detail to her work. 	

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- Due to her past surgeries related to breast cancer and also due to lymphedema, she cannot bear weight for longer times (hard to use tools while painting). Causes her a fiery type of pain in her forearm that is irresistible. This requires her to wear numerous medical devices (uses compression sleeves while performing yoga). Could focus on providing physical support to her arms and hands to help her paint for longer times.
- She has acquired tools that are big in size (e.g., squeegees) for comfort and easy to grip but do not allow her to add small detail and affects her precision. Could possibly help her increase range of motion and precision in movement.
- Has to focus on physical movement most of the time and supports her dominant arm (arm that she paints with) with her other hand due to less strength in the forearm. Could be possible to provide an object to allow her to rest her arm on while painting for longer periods.
- It is difficult for her to bear weight on her shoulder, biceps, triceps, and pectoral muscles.
- Prefers to work on her art piece while sitting on the floor rather than standing. Uses a stool to elevate the canvas from the ground to a perfect height where she can pant comfortably.
 - She sometimes wears knee pads and kneels on her meditation pillows to distribute her body weight on to the objects and require her to make less effort of maintaining a certain posture.
 - Could be possible to create something to keep her arms rested in an elevated position while sitting on the floor.
- Uses devices that assist motion and span of body limbs such as a claw to reach for objects at a distance.
- Washing dishes, cutting vegetables, are hard to do due to the inability of bearing weight on her forearms
- Visited chiropractors, osteopath, occupational and physical therapists, a functional medicine specialist, naturopath, etc.
- Used vibrating heat belt, canes (also plans on using rolling walker), lymphedema compression gear, arthritis gloves, sacroiliac joint brace, Epsom salts and body pillows.

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Name: Michael Ferlisi	MacID: ferlisi
<ul style="list-style-type: none"> - Background information: - <i>Recently retired</i> - <i>Painter, mother of two children</i> - <i>Diagnosed with three autoimmune diseases (ankylosing spondylitis, fibromyalgia, breast cancer survivor, chronic lymphedema)</i> - <i>Illnesses affect her daily life, cannot continue with certain hobbies because of her conditions</i> - Notes based on hobbies and illness/medical problems - <i>Her body is unpredictable meaning no set times she can work.</i> - <i>Muscle pain drastically impacts her work, impacts and injuries need to be avoided and a solution needs to be found.</i> - <i>Large paintings are preferred to small, usually using an easel when drawing/painting. She works sitting or standing depending on how she feels at that moment in time.</i> - <i>Issues come from bending at the waist (picking up items that require bending down).</i> - <i>Needs to wear medical devices while painting and needs to move consistently.</i> - <i>List of medical devices used: chiropractor, physiotherapist, osteopath, naturopath, functional medicine, medical specialists. Used heat belts, canes, roller walker, tens machine.</i> - <i>*Movement is the best gift.</i> - <i>Her condition affects grip strength. -> Uses larger brushes</i> - <i>Spine, shoulder, wrists/hands are the joints that cause the most issues.</i> - <i>Stress aggravates her condition.</i> - <i>Final goal is to make painting less painful and to support body in everyday challenges.</i> 	

MILESTONE 1.2 – INITIAL PROBLEM STATEMENT

Team Number:

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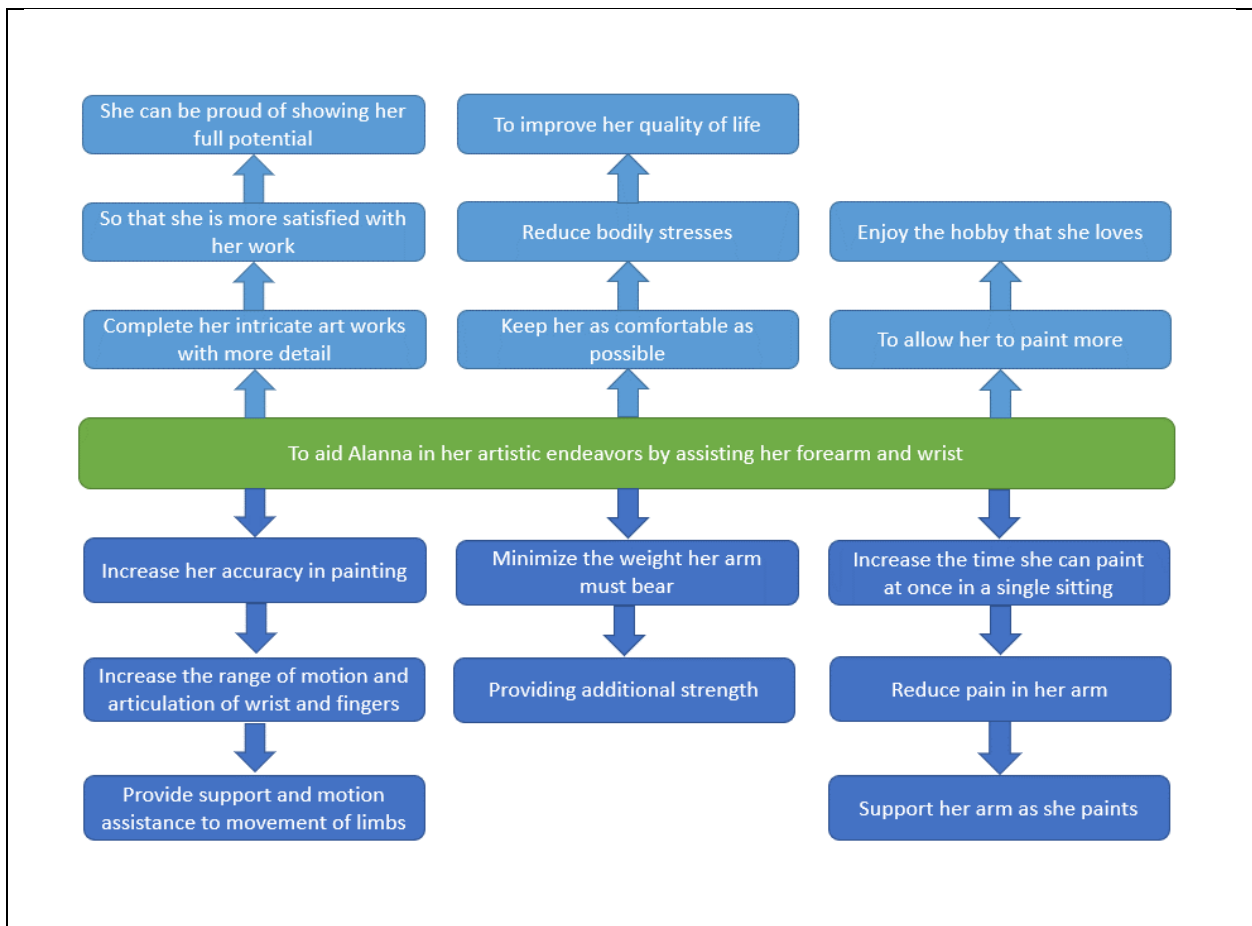
1. As a team, come up with an initial problem statement and include it in the space below.
 - Make use of your client notes to define your primary function
 - Remember to avoid solution-specific statements
 - Focus on what your design *should* do for the client in a general sense (not *how* to do it)

To aid Alanna in her artistic endeavors while feeling as comfortable as possible for prolonged periods of time given her lymphedema and fibromyalgia by supporting her forearm and wrist.

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

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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):

The design tool chosen was a How-Why ladder. The reason for this choice is because the how-why ladder allows for more freedom to create more generalized statements, as opposed to

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objective tree is structured in a way in which the question is responded to in terms of objectives and constraints. Additionally, for our purposes, the how-why ladder is more effective at communicating and is easier to read at a glance the gist of the project than the objective tree would be. This is partially because the information is structured in a logical way spatially in the ladder (vertically in columns), rather than the equivalent information in the format of an objective tree hierarchy with multiple branches spread across. This structure lends itself more to this open-ended problem and allows us a broader view of the problem as a whole. Therefore, we can expand our design space using the How/Why ladder.

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

Lightweight
Ease of use
Comfortability
Durability

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

Objective 1: Lightweight

Rationale: Because of her fibromyalgia, our client has a difficult time bearing weight, specifically she has troubles bearing the weight of her own arms (because of this she must physically hold one arm up with the other while she is painting). Because bearing the weight of her own body is difficult, an obvious objective would be that our design solution should be lightweight - ideally then, the mass of the design solution that weighs directly or indirectly on her arm should be minimized.

Objective 2: Ease of Use

Rationale: Our client has been diagnosed with the autoimmune diseases, fibromyalgia, and ankylosing spondylitis. These diseases restrict the movement of the hand and vertebrae, therefore restricting the range of motion and increases pain and time consumption. We would want to focus on delivering a solution that is easy to use for our client and reduce stress by avoiding the use of additional limbs (the other arm). The solution would be easy to use by requiring less time to apply/utilize it and consist of less components to deal with. The client would be less stressed and support them psychologically.

Objective 3: Comfortability

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Rationale: Alanna is looking for a solution that adapts to her medical issues that can help her feel as though her condition does not impact her everyday life. Our client is wanting to paint for a longer period so the comfortability of our design is a must. Providing comfort to her hobbies not only allows the general comfort she feels while completing these activities but ultimately along with support, supplies enjoyment while painting. Without comfort, this objective could worsen her ability to paint for longer durations.

Objective 4: Durability

Rationale: Because of her fibromyalgia, our client has a difficult time bearing weight, specifically she has troubles bearing the weight of her own arms. Because the solution must support and bear the weight of the client's arm and body (as she would off-load her weight on to the design solution), it should be able to withstand certain forces such as the weight force of her arm. The design solution, then, should be durable enough to withstand these forces for prolonged periods of time.

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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:	Lightweight
Unit/Metric:	Mass (kg)

Objective:	Ease of Use												
Unit/Metric:	<p>A sample of design testers should be employed to rank their subjective ease of use experience on an objective numeric scale from 1 to 5 as shown below</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">User feedback</th> <th style="width: 30%;">Numeric score</th> </tr> </thead> <tbody> <tr> <td>Not easy to use at all</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Slightly easy to use</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Easy to use</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Moderately easy to use</td> <td style="text-align: center;">4</td> </tr> <tr> <td>Very easy to use</td> <td style="text-align: center;">5</td> </tr> </tbody> </table> <p>The mean score of the sample should be taken as the final metric for ease of use.</p>	User feedback	Numeric score	Not easy to use at all	1	Slightly easy to use	2	Easy to use	3	Moderately easy to use	4	Very easy to use	5
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	The mean score of the sample should be taken as the final metric for comfortability.
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Objective:	Durability	
Unit/Metric:	Stress Analysis Test subjective ranking scale	
	Test result	Numeric score
	Can withstand up to 5kg	1
	Can withstand up to 10kg	2
	Can withstand up to 15kg	3
	Can withstand up to 20kg	4
	Can withstand more than 25kg	5
The design solution would be stress tested under various loads; the highest score would be taken as the metric.		

MILESTONE 1.4 – PROJECT PLAN

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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.

Experiences:

Luigi: I have a lot of experience with software prototyping and computer coding. I have used Arduino and Raspberry Pi in various projects, as well as coded in many different languages. I learned computer coding from computer science class, computer science club, robotics engineering class, robotics club, as well as on my own time. I have some experience in CAD from the Eng 1P13 course lectures and labs.

Ziad: I had 2 years of experience in modelling from high school clubs and during graphics labs, while I gained my computing and materials knowledge in the 1P13 curriculum.

Avanish: I have had coding experience in different languages from high school and the 1P13 course. I have used Arduino in my computer engineering class in high school. I understand the concepts of CAD modelling in the 1P13 course and have applied them in the graphics labs and Project 3.

Michael: Previous experience with CAD in high school along with practice during free time. General computing knowledge comes from the labs and projects within the 1P13 course.

Useful Resources:

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- We can create concept sketches of various components via the Microsoft Suite or other platforms.
- Autodesk Inventor can be used to create a design prototype and create a physical prototype by the help of our inventor design to test the comfortability of it.
- Arduino or Python code can be used via Arduino pins and Raspberry Pi GPIO to control motors or other electrical devices that may be used in the solution.
- We can use Granta to provide material properties and attributes based on weight, price, strength, etc. to assist us in reaching our design objectives.