

PROJECT FOUR: MILESTONE 3 – COVER PAGE

Team Number: 

Tues-31
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Please list full names and MacID's of all *present* Team Members.

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

## MILESTONE 3.1 – REFINED CONCEPT: INITIAL PROTOTYPE

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1. Copy-and-paste picture(s) of each team member's refined concept (initial prototype) on the following pages (1 team member per page)
  - Be sure to clearly indicate who each refined concept belongs to
2. Include details on how concept was refined (what feedback was incorporated, what features are different than previous concept exploration, etc.)

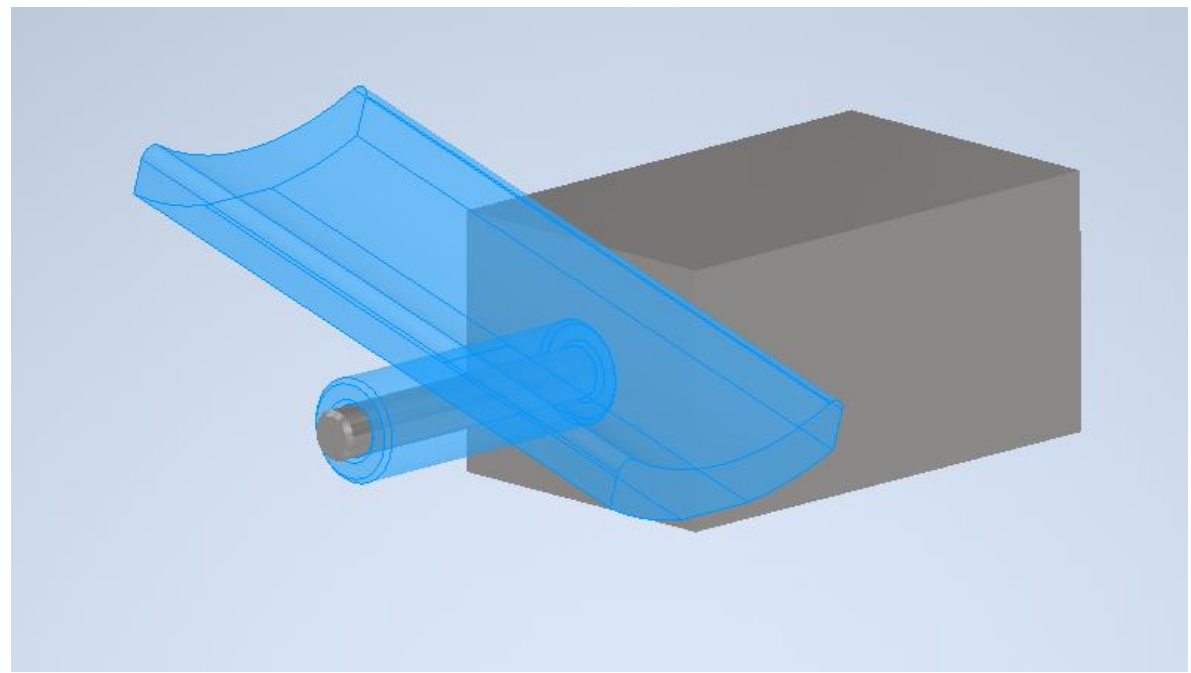
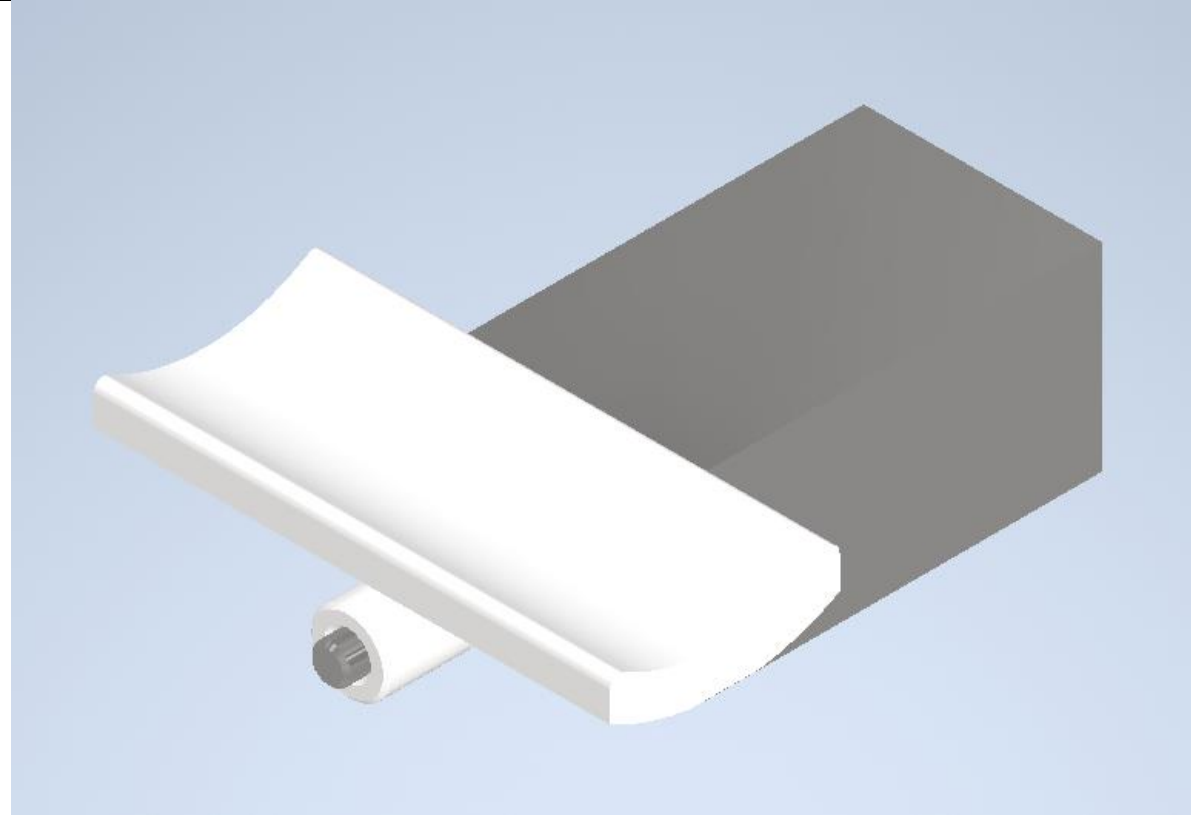
We are asking that you submit your work on both worksheets. It does seem redundant, but there are valid reasons for this:

- Each team member needs to submit picture(s) of their refined concept with the **Milestone Three Individual Worksheets** document so that it can be *graded*
- Compiling your individual work into this **Milestone Three 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: Tues-31

Name: Luigi Quattrococchi

MacID: quattrl



ENGINEER 1P13 – Project Four: *Power in Community*





ENGINEER 1P13 – Project Four: *Power in Community*



ENGINEER 1P13 – Project Four: *Power in Community*

Name: Luigi Quattrociochi	MacID: quattrl
<p><i>The original thought that sparked the idea for this concept came from my desk lamp and its wide 3-dimensional range of movement. During a team discussion about how the range of motion is pertinent to our client I figured that a system allowing the same kind of 3d motion would be ideal. The inspiration behind this design was further drawn from wall/VESA mount TV stands that allow lateral movement. The low fidelity prototype was created using carboard and tape for the body of the arm, and a toilet paper tube was used as the axis of rotation. A pull-up bar was used as the stand. A CAD model was also created in Autodesk Inventor to demonstrate what the arm rest might look like when attached to the end of the arm body. The refined concept was heavily inspired by the initial concept exploration and sketch; no changes were made to the design in the low fidelity prototype, since feedback on the design by group members and instructors prior to the design review was positive and non-constructive.</i></p>	

Team Number: Tues-31

Name: Avanish Ahluwalia

MacID: ahluwa6

Concept - Swivel arm rest with pneumatic tube





ENGINEER 1P13 – Project Four: *Power in Community*





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Name: Avanish Ahluwalia	MacID: ahluwa6
<p>Since the client has difficulty painting for long times with one arm, I focused on bearing the weight of her dominant arm while providing comfort and big range of motion. The initial prototype created is a swivel arm rest with a pneumatic tube, created from my Concept 1 sketch. The idea originated from an adjustable office chair (can be raised or lowered). The pneumatic or hydraulic tube is able to bear the weight of client's arm and possibly the weight of her body. The pneumatic tube provides motion in one direction, while the addition of wheels could provide motion in the other two dimensions. For the placement or stabilization of the arm, I thought of a curved arm rest with soft material to add comfort. Since she would want to move her arm left or right while keeping the forearm stationary, I thought implementing rotation about the vertical axis using ball bearings attached to the armrest and pneumatic tube. The limitation of my design was the height she can raise the armrest to because the tube would have to be longer and possibly heavier for better vertical displacement, making it difficult for the client to move it around her house.</p>	

Team Number: Tues-31

Name: Ziad Ahmad

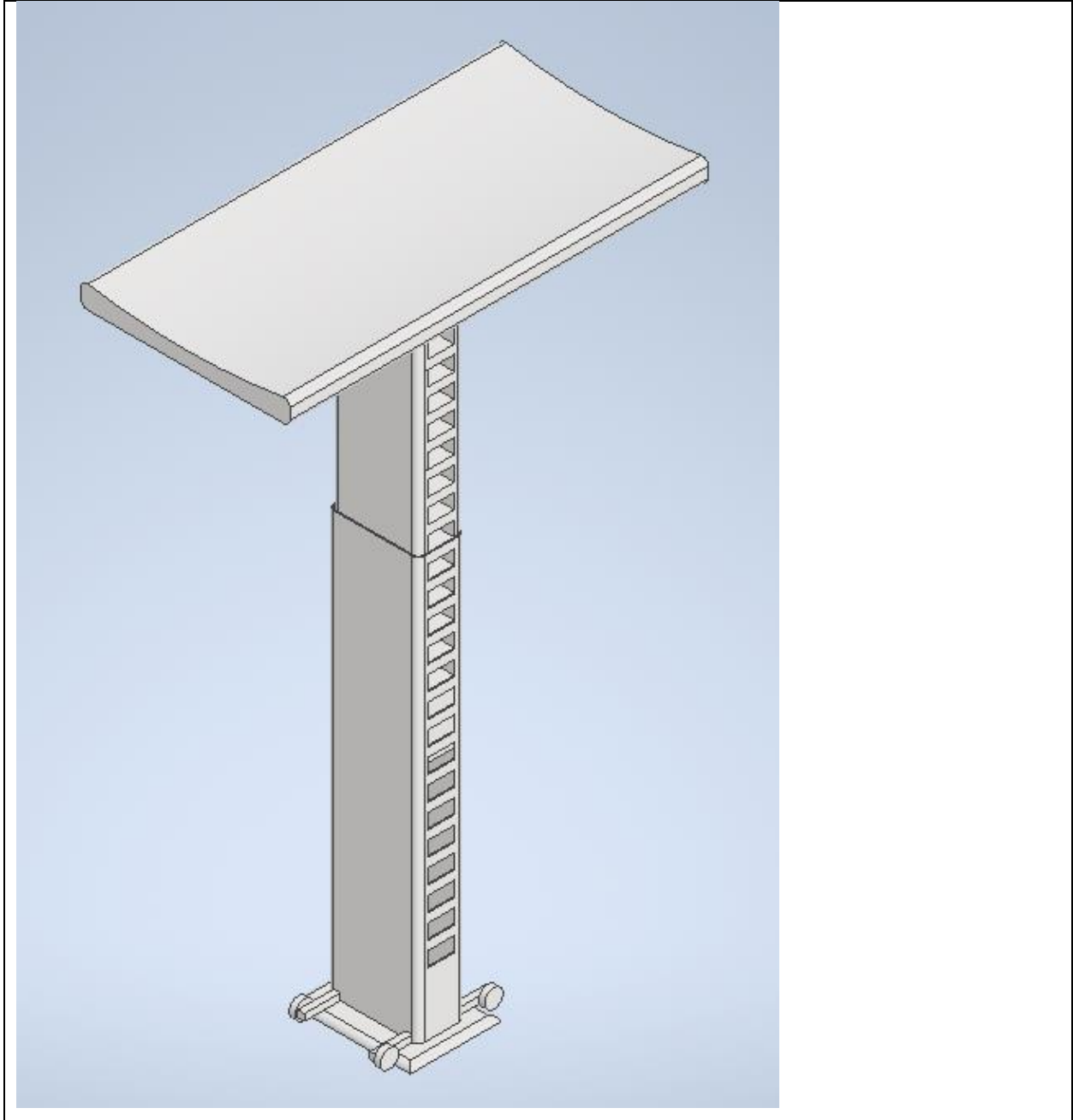
MacID: ahmadz18

*The memory foam glove*



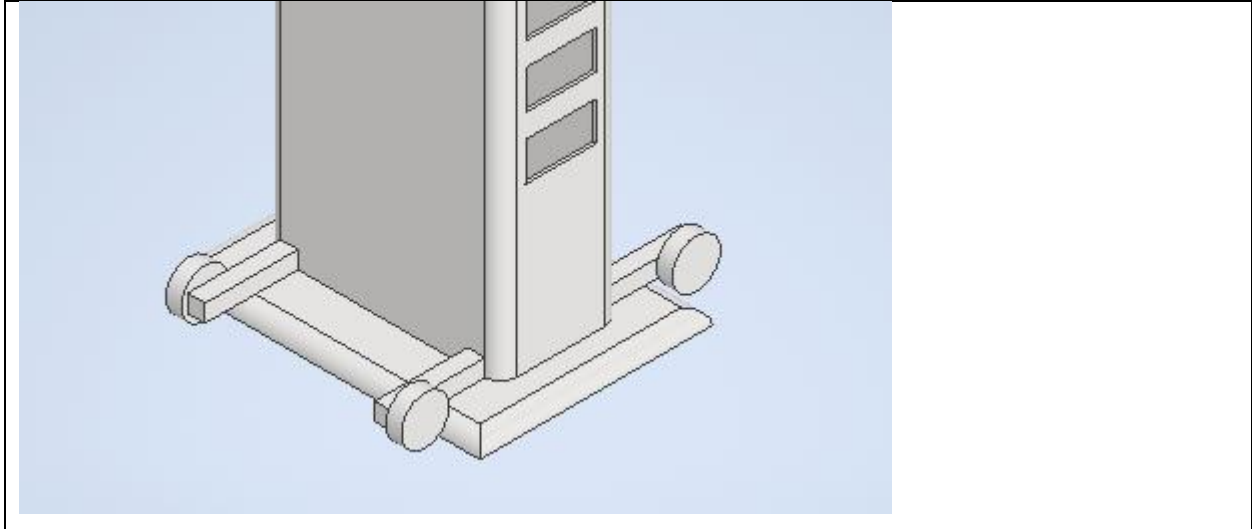
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## ENGINEER 1P13 – Project Four: *Power in Community*



Name: Ziad Ahmad

MacID: ahmadz18

Fibromyalgia affects joints and muscles, so I created a glove design that would create less agony on the client's hand or arm while painting as I implemented some memory foam or sponge-like material. This provides her arm with extra lightweight support and comfort, instead of laying her hand on a hard surface and having to stop her activities due to pain. In addition, I added a wooden piece at the bottom of one of the fingers to support a clamp/strap, which is used to hold paint brushes in place while leaving distance so there is no interference with her hand. I established that idea to remove pain she gains when holding paintbrushes and can therefore use the motion of her fingers to paint. If the client paints vertically on a stand, I also implemented an adjustable lift to rest her arm while painting, and I added wheels to the design to always allow maneuverability for the arm. Furthermore, this results in the ease to move vertically and horizontally across a canvas. Some feedback I gained is to improve the range to where the client can reach the canvas, to allow maximum comfort by using less effort to reach.

Team Number: Tues-31

Name: Michael Ferlisi

MaclD ferlisim





Name: Michael Ferlisi	MacID ferlisim
<p>This idea sparked from the concept of a skateboard and how it can tilt and move when pressure is applied. Combining both concept sketches, this initial prototype was created. The armrest can twist left and right as needed to make the artist more comfortable when trying to paint or draw. Unlike wheels on a skateboard, the wheels provided can move in all directions, so it does not limit her ability to move her arm around the canvas. The armrest would have the ability to move up or down to the specified height but was not included in the prototype and was provided as feedback from group members. Along with the adjustable height, more feedback was provided sparking the question “will she be able to use this concept if she wanted to stand.” Given the small identity, it would not be feasible for her to use this concept when standing unless it had a platform to rest on. This had a large impact on the design and minimized the chances of it being used as one of the top two chosen concepts.</p>	

## MILESTONE 3.2 – DECISION MATRIX

- As a team, use a decision matrix to aid you in choosing two concepts to proceed with.  
→ Your concept titles should be descriptive (i.e., “Pencil with Hook” instead of “Design A”)

### Ranked criterion matrix

Criterion	Lightweight	Easy to use	Comfortable	Durable	Final weight
Lightweight	1	0	0	0	<b>1</b>
Easy to use	1	1	0	0	<b>2</b>
Comfortable	1	1	1	0	<b>3</b>
Durable	1	1	1	1	<b>4</b>

### Decision Matrix

Criteria	Weight	TV-stand-arm		Swivel arm rest with pneumatic tube		Memory Foam Glove		Skateboard-type armrest	
Durable	<b>4</b>	4	<b>16</b>	5	<b>20</b>	3	<b>12</b>	2	<b>8</b>
Comfortable	<b>3</b>	4	<b>12</b>	3	<b>9</b>	5	<b>15</b>	3	<b>9</b>
Easy to use	<b>2</b>	5	<b>10</b>	3	<b>6</b>	3	<b>6</b>	3	<b>6</b>
Lightweight	<b>1</b>	3	<b>3</b>	4	<b>4</b>	5	<b>5</b>	4	<b>4</b>
Total		16	<b>41</b>	15	<b>39</b>	16	<b>38</b>	12	<b>27</b>

*\*Scale for rating concepts: 1 to 5 (1 being the lowest and 5 being the highest)*

*\*\*Raw score on the left, weighted score on the right (in bold)*



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2. The numbers you associate with your criteria (objectives and constraints) will probably be an estimation at this point, so **your top two concepts may not always end up being the top two scoring from the decision matrix.** You should provide justification for your team’s thought process in choosing the top two concepts. This should include, but is not limited to, explaining:
- Your choice of decision matrix tool
  - Your rationale behind your choice of criteria
  - Why you prioritized criteria the way that you did (if ranking and/or weighing them)
  - What metrics you used to decide your scoring of concepts within the criteria

	<i>Insert your team’s top two concepts below.</i>
Concept 1:	TV-stand-arm
Concept 2:	Memory Foam Glove

The chosen tools were the ranked criterion matrix and the weighted decision matrix. The rationale behind these choices of tools is that we felt as if it is important to prioritize some criteria over some others. This way, as opposed to a binary matrix or any other type of matrix considered, we would get a more accurate range of scores.

The criteria chosen were the primary and secondary objectives chosen in the previous milestone and were selected and ranked based on the situation of our client and her needs.

The prioritization order of our criteria was dependant on our client's needs. We selected durable as in can withstand the forces of our client’s weight as the top priority. After consideration, we realize that this is the most important objective because if it scored poorly in this metric, then the function of the device would suffer. Comfortability is the next highest priority, followed by easy to use and lightweight, as governed by the notes taken from the client visits.

As per the previous milestone, metric were mostly subjective rankings of the devices and how applicable each criterion is to that device. An additional consideration that was included noted that the rankings of each device should not be taken at face value, as all the information given was preliminary.

To conclude, with all of this in consideration, the top two concepts that were distinct from each other were the TV-stand-arm design and the Memory Foam Glove design. The TV-stand-arm design generally encompassed the features and ideals of the other two designs, so they were assimilated. Despite the Memory Foam Glove design not scoring as highly as others in the weighted decision matrix, it was selected as it provides a mostly different idea than the others.

MILESTONE 3.3 – DESIGN REVIEW

Team Number: Tues-31

Include your feedback from both your peers and the science students below.

Name: Avanish Ahluwalia, Michael Ferlisi (Notetakers) Luigi Quattrociochi, Ziad Ahmad (Presenters)	MacID: ahluwa6, ferlisim, quattrl, ahmadz18
<p><b>Peer evaluation</b></p> <p><b>Concept 1:</b></p> <ul style="list-style-type: none"> <li>• <i>Minimize the space it will obstruct within her studio</i></li> <li>• <i>Could add a heating system to the rotating armrest to provide warmth to the arm and reduce the possibility of intense pain.</i></li> </ul> <p><b>Concept 2:</b></p> <ul style="list-style-type: none"> <li>• <i>Provide the glove in different materials (silk)</i></li> <li>• <i>Add the paintbrush on the underside of the index finger</i></li> </ul>	
<p><b>Science student evaluation</b></p> <p><b>Concept 1 (TV-stand-arm)</b></p> <ul style="list-style-type: none"> <li>• <i>Steel or wooden material is recommended (minimize weight)</i></li> <li>• <i>Possibility of wheels attached on the bottom to allow movement around the room and can lock themselves when necessary</i></li> <li>• <i>Adjustable Velcro straps can be applied to stabilize the arm on the armrest</i></li> <li>• <i>Add support to her elbow (memory foam) to maintain contact with armrest and provide comfort to the bones of the arm.</i></li> <li>• <i>Find a solution for the joints to maintain all necessary weight</i></li> <li>• <i>Add a flat cushion with curvature for the forearm.</i></li> </ul> <p><b>Concept 2 (Memory Foam Glove)</b></p> <ul style="list-style-type: none"> <li>• <i>There are many different paintbrushes, so it is possible to allow replacement of different brushes by attaching them to a common mechanism clamped to the finger.</i></li> <li>• <i>Consider dexterity, she may have difficulty putting on the glove</i></li> <li>• <i>Accommodate the way she can hold the brush. i.e., holding the paintbrush with a different finger, clamp to her whole hand rather than one finger</i></li> </ul>	