***Need Identification and Problem Statement***

***Objective:***

Empathize with your client and truly understand their problems, limitations, frustrations, desires, and needs. Translate their statements into a list of interpreted needs. Then, organize and prioritize their needs and formulate a problem statement. Reflect this information as a team to determine whether you are actually “solving the right problem”.

***Instructions:***

Teams will put together a briefing (2-page max) regarding their clients’ needs. This will be based on their first meeting with the clients.

1. This briefing should contain many needs, which will be identified by empathizing with the clients. Feel free to speak to other potential clients related to the project on your own and to look at other similar products on the market. This will help strengthen your results.
2. It is important to take the time to convert what the client is saying and/or doing into properly interpreted need statements.
3. Once a list of needs has been identified, organize these needs into similar groups and prioritize them, justifying what you do as you go along.
4. Once you are confident that your team has identified all of your clients’ needs, use them to formulate a problem statement, including all important aspects, while ensuring that it remains short, specific and sexy.
5. Remember to also benchmark *user perceptions* of similar products (i.e. user benchmarking) to make sure that you have a thorough understanding of the problem and related needs of the eventual and for other potential users.
   1. Remember: your client may not know or be able to put into words all the things that they want or need.
6. There may also be unknown information that needs to be clarified or defined (i.e. issues or questions that were not addressed in the initial client meeting). There may also be new issues or needs that are identified *after* that meeting too. These all need to be documented here and in the next deliverable, depending on when they are identified.

**Problem statement**

To be able to refurbish and paint all areas of the halifax class destroyer ship without increasing the cost of staff by using robotics. An inverse kinematics solver that is easy to use, light-weight, cost-effective, and portable with three degrees of freedom with an end effector which is able to hold a pen, water gun, camera holder with scan, and light.

**Technical Requirements**

* **Two Build Options**
* Build inverse Kinematics that works off of G code, can potentially be expanded two
* Open Source designed for x,y,and z axis
* Inverse Kinematics for movement of arm (should be compatible with Gerbil or something similar)
* End Defector (Should be connected)
* Scan space to plan path of water blaster spray
* Takes paint and applies to surface
* 3 degrees of movement in arm
* Arm should have pivot mechanism
* Built off of common language (Python, C++)
* Should be modified off of current robot (Thor arm)
* Should be aware of surroundings for minimal contact with objects
* Easily usable even for inexperienced people using the arm
* Functionable/Usable by only one person
* Should be able to connect to nearby water reservoirs
* Not too much processing power is required(>$100)
* Arduinos, Raspberry Pie
* Date should be extracted from robot for future inspection
* Should be able to detect an area that has been corroded

**Physical Requirements**

* Needs to be lightweight, preferably 20 pounds or less for each part
* Should be able to enter in harsh conditions(low oxygen, low light, cold)
* Could possibly have a vacuum to suck up excess water from washing
* Should be able to be plugged into a 120v outlet instead of running on battery power
* 3 degrees of freedom
* Should be able to work for at least 24 hours, and ideally need minor repairs every 3 months and major repairs every 6-12 months
* Doesn’t need to have the ability to move, will most likely be fastened down.
* Needs to fit through a 1 m2 gap
* Will need a 100+ psi compressor
* Lights attached to robot to keep light levels constant or even night vision
* The arm should be able to support weights of up to 1kg
* Flashlight mount required
* Some form of cabling/scaffolding the robot to reach harder to reach areas