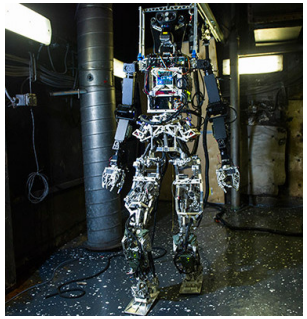
Importance	Customer Statement	Interpreted Need Statements	Group Summary
1	**Safety** for the workers of the ship.	Has an integrated emergency stop system.	Safety
1	Plug into **constant power** for 24/7 operation	Equipped with a 120-volt plug (surge protection is a bonus)	Reliability
1	Must be able to **withstand expected working conditions**	Needs to be water-resistant at minimum, if not waterproof.	
2	Easily **fixable** and maintained	Simplistic design elements along with easily accessible & identifiable repair points.	
2	Possess three ways to **move**	Has three degrees of freedom along the x, y, z-axis (pitch, yaw, and roll.)	Task completion
3	Needs to complete a logo/shape design	The ability to draw with a pencil autonomously	
3	Easily **portable** around tight spaces along the ship	Made with lightweight materials.	Mobility
3	Must be able to **store** in small spaces	Able to be folded/dismantled and stored away.	
1	**Detachable components** (each part no heavier than 20 pounds)	20 pounds or lighter, or able to disassemble and weigh 20 pounds (easy to carry)	
3	Little to **no need to supervise** the robots	Able to function autonomously, no supervision needed (eg. work through the night.)	User experience and interaction
4	Must be **operable by boatswain**	User-friendly to non-tech savvy users.	
4	**Open source code** build on a common language (C++, python) and well documented	Easy-to-read code and building instructions.	

Group 12 - Project Deliverable B

Problem Statement:

The Department of National Defence needs a portable, reliable, and safe robotic arm to paint surfaces on the Halifax Class Steel Warship which can be operated by boatswains to free up sailors so they can complete other tasks.

Benchmarking:

Company	Arduino	Line-us	CMA robotics	University of Virginia Tech
Product Name	**Braccio robot** 	**Line-us drawing robot** 	**GR 6100 HW** 	**SAFFiR** 
Cost ($$)	$228.90 USD ($292.32 CAD)	£98.00 ($167.62 CAD)	Unknown	N/A (not in market yet)
Dimensions	9 x 14 x 52 cm	9.7 x 2.5 x 7.9cm	100 x 100 x 50 cm	Height: 5’10” No details on width or length (similar to a human being)
Weight	792 g	Unknown (presumably lightweight)	240 Kg	63.5 Kg
Drawing Area	80 cm	~6 x 9 cm	18 m	Same as human (presumably)

Versatility and Ease of Use	Some assembly required, designed to work with Arduino microcontrollers	Very easy to use; connects using wifi and Line-us mobile app	Offline programming, point-to-point system. Easy maintenance.	Designed to take orders from a human controller but can also complete tasks autonomously Lots of specs such as infrared and rotating light detection and ranging to allow to see through dense smoke. Handles hoses on its own and takes measured steps and can walk over rough surfaces
Power Source	5 VDC @ 4A	USB, 5vdc, 1A	400V	30 minutes battery life
Degrees of Freedom	3 degree	2 degrees	6 degrees	33 degrees
User Reviews (If applicable)	4.85 Star Average from 6 reviews “The Braccio arm went together very cleanly and fast with no surprises. I was afraid that its size would make it unstable but it is very solid and stable.”	5 Star review average from 2 reviews	No reviews available	No reviews available

Further Questions:

- How to remove old rust, taken off of the ship?
- How to code the robot to do each task?
- How can environmental contamination be managed?