Part 1: Data Collection

Targeted User Group

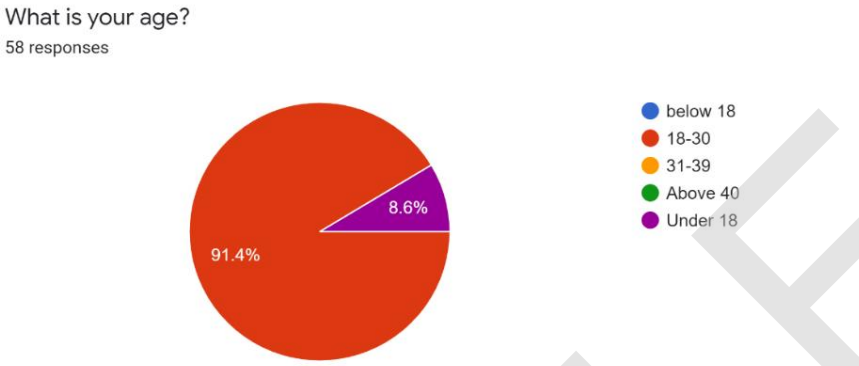
	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	
CRITERIA DESCRIPTION	Reachable	Sizeable	Affordability	Receptive to technology change	Perceptible user problems or needs	
	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	WEIGHTED SCORE
WEIGHT	5	4	2	1	3	15
PREFFERED USER GROUPS	Criteria 1 SCORES	Criteria 2 SCORES	Criteria 3 SCORES	Criteria 4 SCORES	Criteria 5 SCORES	
[redacted] *Teenagers or younger kids who crash at the arcade often*	4	4	2	4	2	50
[redacted] *Safe distancing staff/ police who patrol parks and gardens often*	3	3	3	4	3	46
[redacted] *Frequent gym-goers and staff who work out at community gyms*	5	4	4	5	3	63
[redacted] *gardeners who grow and harvest vegetables in greenhouses environments*	2	2	3	3	4	39

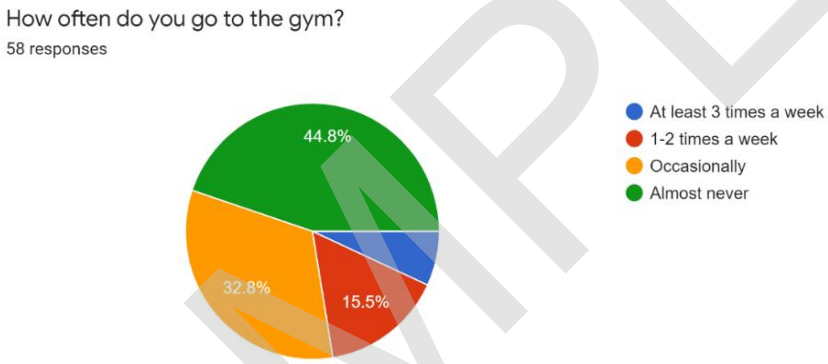
Questionnaires

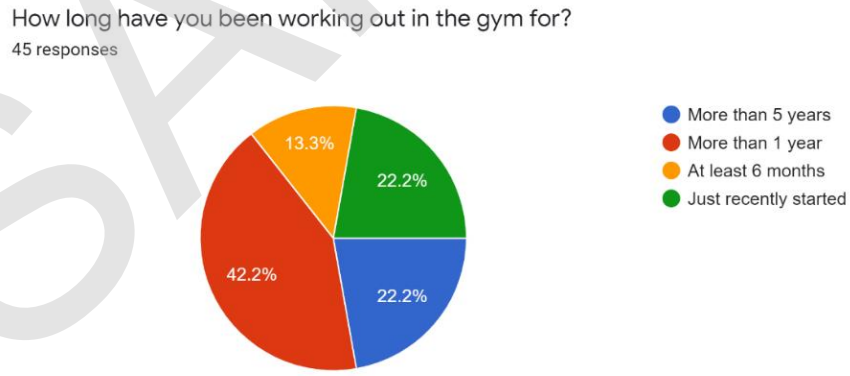
1) What is your age?
2) How often do you go to the gym?
3) How long have you been working out in the gym for?
4) What features would you like to see in a smart gym equipment or facility?
5) What machines do you think require rep-counting sensors?
6) What safety features do you wish to see being deployed in a gym?
7) What does it mean for you to have a successful training session?
8) Do you prefer facial recognition/ app/ band to identify your profile (to log your weight and progress etc) at the Gym entrance?
9) Do you prefer an app/ band to connect with the gym's smart equipment to store your rep count and machine weight for a specific exercise?
10) Do you wish that the gym had a question board where trainers can answer anon questions on the spot?
11) Do you have a standard routine when going to the gym?
12) Do you prefer to have someone to generate your workout routines?

Part 2: Data Management, Interpretation and Analysis

Data Graphical Representation



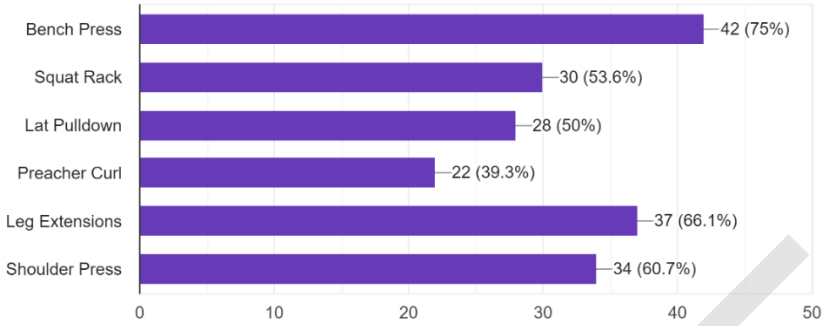




From the survey results, we filtered the data by limiting our scope down to only people who visit the gym often, as well as those who have worked out for more than a year. We also observed that majority of the respondents are mostly in the 18-30s range.
By cleansing the data, we can collect credible and accurate data that are backed up by experienced gym goers instead of data that is irrelevant to our project.

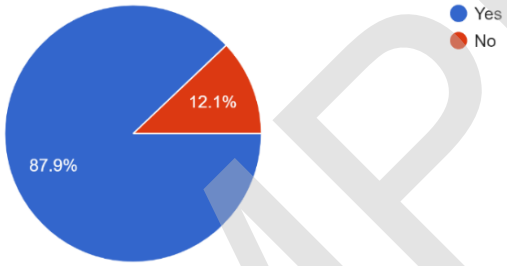
What machines do you think require rep-counting sensors?

56 responses



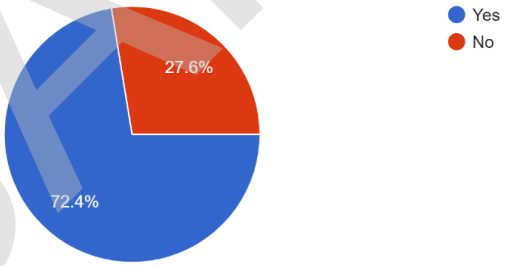
Do you prefer an app/ band to connect with the gym's smart equipment to store your rep count and machine weight for a specific exercise?

58 responses



Do you prefer facial recognition/ app/ band to identify your profile (to log your weight and progress etc) at the Gym entrance?

58 responses



In order to enhance the user's experience in the gym, we asked our respondents which machines they would like to see doing automatic rep-counting for them, out of the 6 machines that we have included, bench press and leg extension had the highest votes with 75% and 66.1% respectively. We also asked them if they would like their data to be stored after exercising and 87.9% of them answered 'yes'.

Since our group collectively agrees that the process of entering the gym and logging into user's own profile is tedious, we wanted to simplify that and provide users an alternative method of logging into their profile, which is by facial recognition. To our surprise 72.4% of our respondents agreed to it despite the mask situation that covid has put us in.

Features users would like to see implemented in a smart gym:

Easy access to gym
The gym provide device to track our calories lost
a watch that perhaps has features that analyse posture if doing weights with dumbbells etc.
a way to track my workout reps easily without any manual inputs
smart cones for circuit drills where theyll light up and you have to go touch the cones for the dirll
Safety features
Anything
a zone with sensors for cones, sensors that track your feet, speed etc. so you can create a fun drill/workout, challenge your friends etc, or like a punching bag with force sensor to know how strong your punches are
a system that helps indicate whether a gym equipment/machine is occupied or not
Private sections
smart floor that can track your movements, force, location, objects to create a fun workout experience
Something smart
smart locker where you can use your phone to lock/unlock
Better instructions/ guidance/ safety measures
A nice photo taking area with cool effects/smart mirror
one of the feature i really like is the machine that gathers details like body fat percentage and etc.
Smart mirror? (Detect body fat, etc..)
A timer

We wanted to make sure their opinions matter to us and that they have a chance to provide their input. Hence, we asked them what features they would like to see implemented in a smart gym. We have observed that the responses vary person to person and there is no commonality, therefore we settled on a few that we believe will likely make the most positive impact: rep-counting, smart zone with cones that can track users speed and movements, machine occupancy detector, smart locker, and lastly a timer display (for countdown).

User Persona

Part 3: Idea Generation and Evaluation

List of Ideas

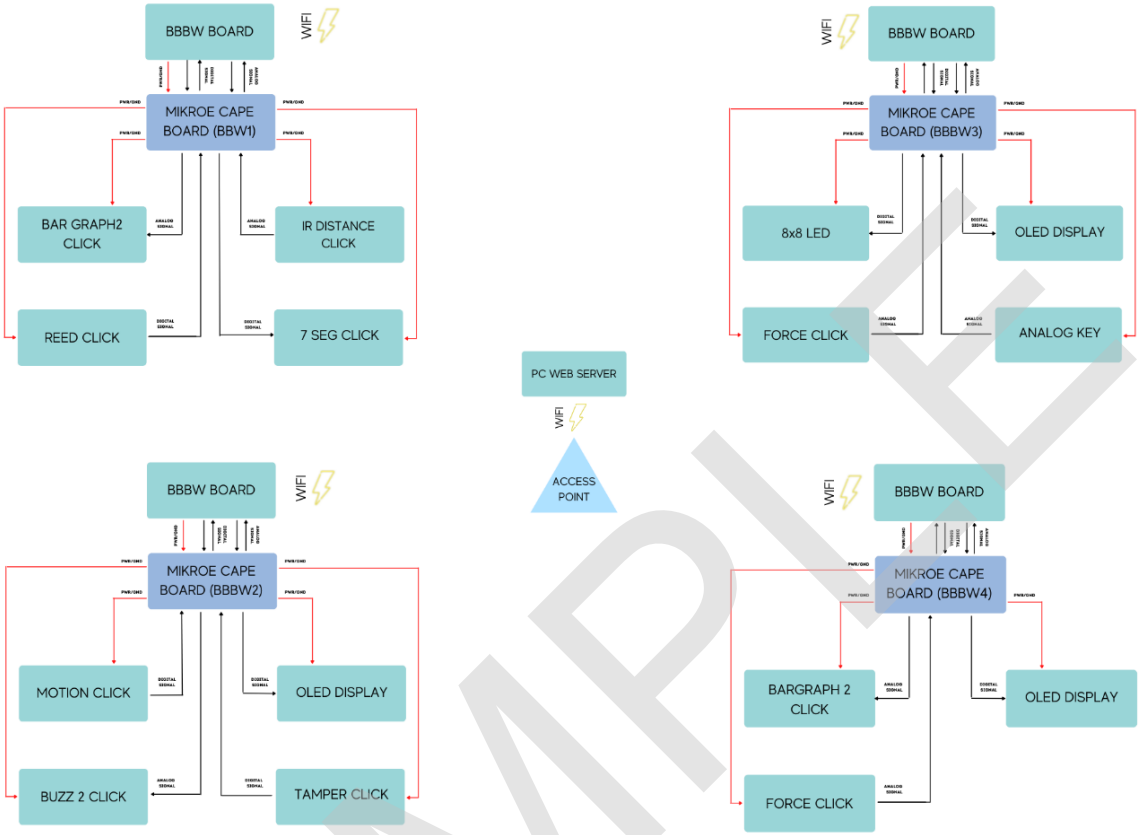
- A heart rate and hydration monitor on gym equipment
- A Body temperature sensor
- Auto-disinfectant on equipment
- Rep-counting sensors for machines such as Bench Press, Squat Rack, Leg Extension, Shoulder Press, Lat Pulldown and Shoulder Press
- Facial recognition for when checking in the gym and creating their own profile
- A question board where users can ask questions and answers anonymously
- A Central Hub where users can view their progress on a big screen
- An emergency button for unprecedented events
- A sensor that can detect if machines are occupied
- Private sectors in gym with glass that will turn opaque when room is occupied
- A smart zone
- A smart locker

Evaluated and Selected Idea

IDEA EVALUATION DECISION MATRIX TABLE

	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	
CRITERIA DESCRIPTION	Efficiency	Automated	Safety	Easy to use/ adapt	Tackles user frustration	
	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	WEIGHTED SCORE
WEIGHT	4	1	3	2	5	15
PREFFERED IDEA	Criteria 1 SCORES	Criteria 2 SCORES	Criteria 3 SCORES	Criteria 4 SCORES	Criteria 5 SCORES	
Rep-count for gym equipment such as Bench Press and Leg Extension	5	4	4	4	5	69
Smart Boxing bag that can measure and track how much force was propelled by the user	4	4	4	5	3	57
A dashboard showing which machine is being occupied at the center of the gym	5	4	4	5	5	71
A smart zone that can track the speed of user running from one point to another	4	4	4	4	5	65
An emergency button that will produce a siren when pressed	5	4	5	5	5	74

System Block Diagram



Part 4: Project Development Plan

Project Title:

Smart connected Gym

Project Description:

As Engineers, our role is to create technological advancements and improve the quality of life for others. In this project, our team aim to create a more sustainable lifestyle for our community. We know that Singapore is moving towards becoming a Smart Nation, with the growing trend in more Singaporeans investing time in gyms exercising and maintaining a healthy lifestyle, it is our goal to make enhancements to gym equipment, as well as making the gym environment more accessible and convenient for all users. Regardless of the user's demographic or fitness background, we strive to create a more sustainable lifestyle for them as they adopt healthier habits when working out frequently.

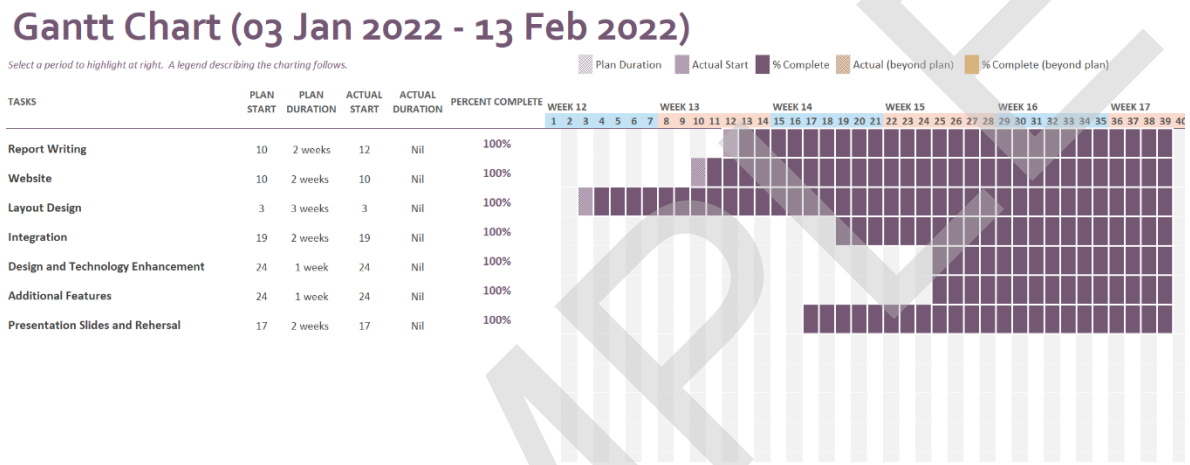
PowerPuffGym is a "technology enabled" connected fitness environment where users' activities are monitored and supported through strategic use of industry 4.0 IoT tools. PowerPuffGym constantly updates users with essential personal fitness data through their personal gym accounts, such as number of repetitions, running speed and punching force, making it extremely convenient to keep track of their progress. We provide users with fitness insights measured through a series of connected sensors installed on gym equipment by applying IoT sensors and principles to a gym environment. In order to access one's workout history and previous body-metric data, users can simply log in to their personal accounts by face recognition at the Check in area. To start using the equipment, user must link their account to the equipment and the PowerPuffGym sensors will track your exercise and store workout information. Thereafter, you can view all your workout information anytime at the Dashboard after refreshing your personal data platform.

In this project, we introduced new features that are unique to our Connected Smart Gym. We have sensors that keep track repetitions currently installed on two types of gym equipment: 1) Legs Extension Machine, 2) Bench Press Machine. We also implemented 3) an emergency button that will produce a siren when pressed on all gym equipment and 4) Force sensors that reflect the magnitude of the force that is applied by the user are built into Punching Bags. Furthermore, our gym also has 5) a smart zone with cones that tracks how fast the person is running from one point to another, lastly 6) a smart locker for users to store their belongings. 7Seg Clicks and Oled are installed on our gym equipment to act as visual displays to indicate user's number of reps, speed, and distance.

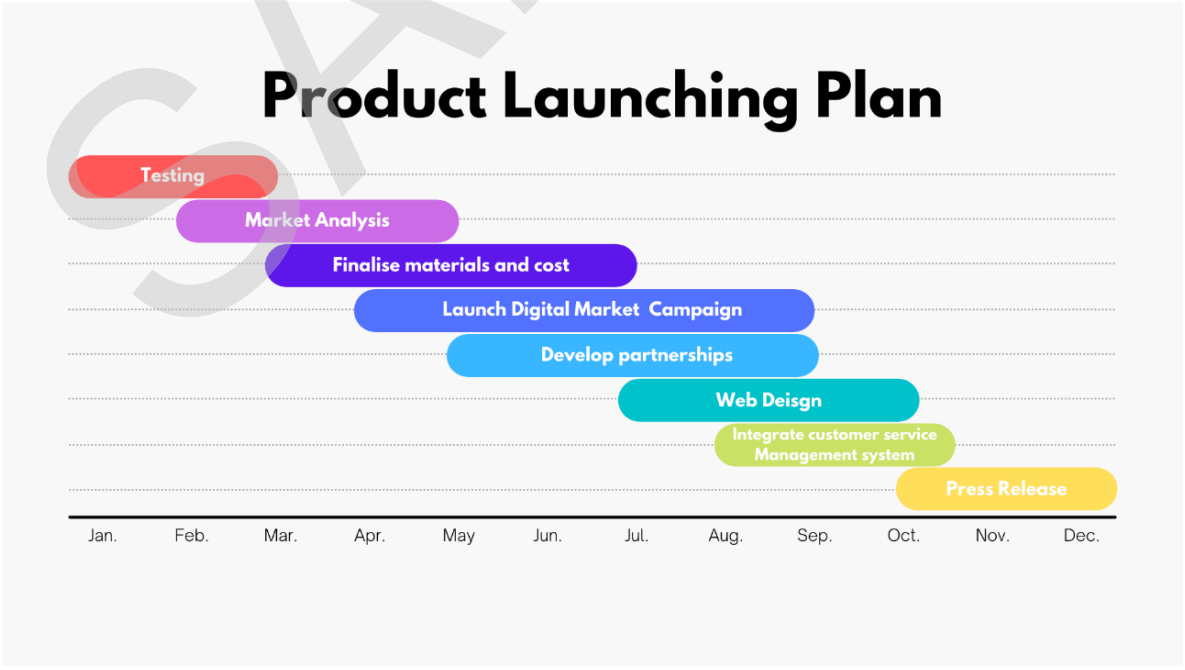
Action Plan

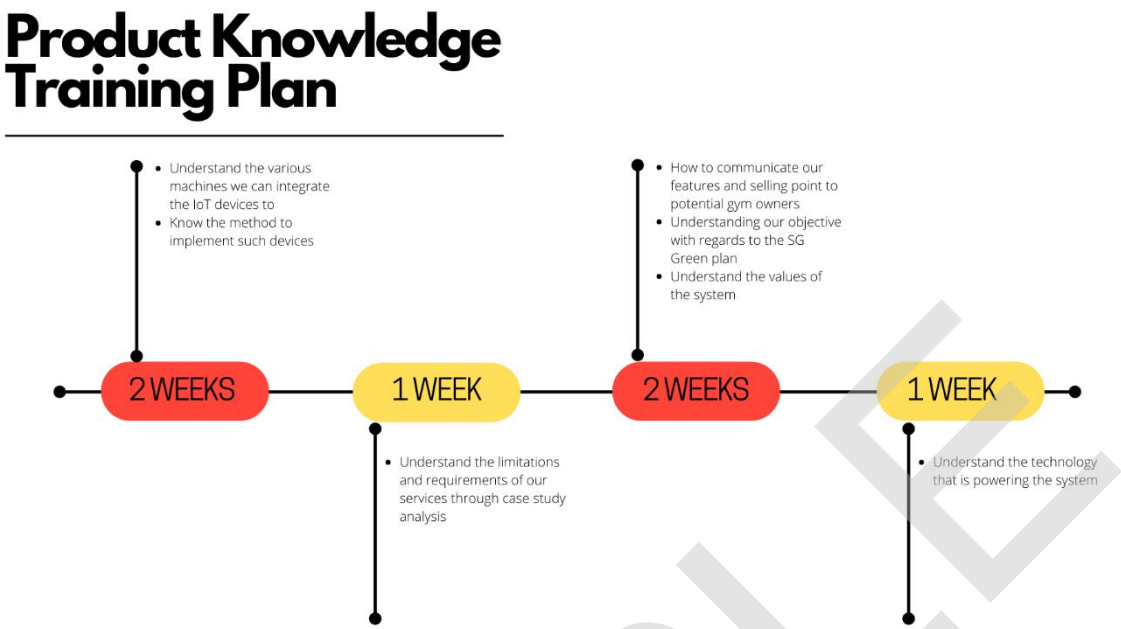
Task Description	Estimated Duration	Required Resources	Responsible by
Group Report (Part 1-5)	1 week	Canva, Icons8	Alex
Website (Coding)	2 weeks	Vue, Node/Express Js	David
Website (Animation & Design)	1 week	TailwindCSS and AnimeJs	Peter & Joel
Integration	1 week	4 BeagleBoards, sensors	Kent & Melvin
Prototyping (Materials and planning)	2 days	Cardboards, Lego blocks and clays	Alex
Prototyping (Design)	1 week	Gluegun, acrylic board, penknives	Peter
Additional Enhancement (Digital)	1 week		All members
Making Presentation Slides	1 week	Canva	All members
Script + Rehearse for Presentation	3 days		All members

Gantt Chart



Part 5: Project Deployment Plan





Product Maintenance and Support Plan

- ✓ Warranty coverage for IOT Devices: 5 Years
- ✓ System related issues:
  - dispatch an Engineer to attempt and on-site evaluation and resolution
    - if issue cannot be resolved immediately: remove said device for further evaluation at the office
    - if device is found to be faulty due to wear and tear: do a 1 to 1 replacement
- ✓ Network related issues:
  - if dashboard system is down, our Network Engineer will attempt to resolve the issue remotely. (Available 24/7)
    - if issue found is related to hardware malfunction, refer to section 2.

Marketing Plan

To promote PowerPuffGym, we aim to launch a campaign collaborating with ActiveSG, where users could undertake a daily challenge by completing a set of exercises based on three difficulty levels. Users can start off with level 1 and work their way to level 3 through this challenge. The difficulty of the exercises was proportional to the number of reps or duration. At the end of each level, users could claim rewards such as wristbands and ActiveSG towels for completing level 1, reusable facemasks for completing level 2 and a dri-FIT sportswear for completing level 3.