A.S.S.W
(Alcohol Sensing Steering Wheel)

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Course Code: ENG 2001

Due: 17 Dec 2016

Toronto, Ontario
York University

PROJECT DEFINITION

PLANNING

EXECUTION

DELIVERY

Project Definition

Project Objective *Section A*

The objective of this project is to prevent impaired drivers from entering the roadways. In Canada, approximately 180 people are injured due to impaired driving on a daily basis; it is projected that 1500 people are killed due to impairment-related incidents and more than 63000 are injured annually. For this reason, we would like to work along with organizations like Mothers Against Drunk Driving (MADD) and Ontario Students Against Impaired Driving (OSAID) to make the streets safer for everyone. Our goal is to create a steering wheel with multiple sensors (e.g. pulse sensor) to monitor the alcohol level of the driver and prevent them from starting the car if they are intoxicated.

Team Roles *Section B*

Project Manager: Mohammed Haque
- Plan, oversee and document all aspects of the project.

Statistics Researcher: Michael Vasiliadis
- Analyzes relevant facts and figures regarding impaired driving and road safety.

Design Manager: David Ornelas
- Designs an effective and efficient model of the product.

Product Engineer: Jordan Santorsola
- Ensure proper theoretical operation of the prototype.

Financial Advisor: Phuc Nguyen
- Calculates the costs affiliated with the production and materials of the device.

Product Marketing/Implementation: Kishor Sivapalan
- Researches types of potential buyers and focuses on product economics.

Expected Outcome *Section C*

By the end of the project, we expect to see/achieve the following:

- A working model of the Alcohol Sensing Steering Wheel with a user manual.
- The model was within the calculated budget.
- The product can be easily implemented into a vehicle.
- The community accepts this product with little or no backlash.
- The product is successful in the market.

Project Charter

Project Overview *Section A*

Project Name:	Alcohol Sensing System
Requested By:	ENG 2001 Section Z
Date Request Made:	September 8, 2016
Date Required By:	November 17, 2016
Functional Managers:	Mohammed Haque Michael Vasiliadis David Ornelas Jordan Santorsola Phuc Nguyen Kishor Sivapalan
Project Sponsor:	N/A
Client Contact:	eng2001@yorku.ca

Project Objective *Section B*

Project Purpose: The purpose of this project is to create a system that will read and monitor the alcohol level of the driver and prevent them from starting the car if they are intoxicated.

Project Deliverables:

- A sensor that detects alcohol levels from the user's breath.
- A sensor that detects alcohol levels from the user's touch.
- A computer unit that accepts the data from the sensors and is able to turn off the engine.
- User manual.

Measurable Success Indicators:
Safety of product
Compatibility of product
Cost Efficiency of product
Performance of product
Durability (Quality of product)
Consumer Interest in product

Project Scope:

Project Objective

The construct a system that will read and monitor the alcohol level of the driver and prevent them from starting the car if they are intoxicated.

Deliverables

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- A computer unit that accepts the data from the sensors and is able to turn off the engine.
- User manual.

Milestones

1. Proposal approved - October 17, 2016
2. Breath and touch sensor designs were created - November 1, 2016
3. Best prototype was chosen - November 9, 2016
4. Final presentation - November 24, 2016

Technical Requirements

1. Both sensors must return negative if the user's BAC (blood-alcohol concentration) is less than 0.08.
2. The computer unit must keep the engine off if the sensors return positive.
3. Breath sensor must only accept driver's input (i.e. not the passenger's breath).

Limits and Exclusions

1. The system will be built to the specifications that were approved by the customer.
2. Touch sensor will not function if there is material covering the user's hand (e.g. gloves).
3. Testing sensors in the lab is limited to Wednesday to Friday, 8am to 9pm

Customer Review

1. Changes to the original idea was approved - October 20, 2016
2. Presentation of product - November 24, 2016

Project Parameters *Section C*

Resource Requirements:	Staff Testing equipment Facilities (e.g. laboratory) Funding
Benefit:	Decreasing amount of impaired drivers Parental control over teen drivers
Constraints:	Cost of the product Time it takes to create the product Quality of the product Size of the product (i.e. small enough for installation) Sensor does not detect passenger inputs Limited resources
Assumptions:	All components will function as expected Team members will stay on schedule Consumers will be interested in the product
Customer Support Requirements:	Knowledge of the product (e.g. how the sensors work) Ability to be persuasive Clear communication skills
Critical Success Factors:	The system must be functional The system must be simple/straightforward Effective communication between members Deadlines are met by all members Effective marketing strategies

Scope Management Plan

Project Scope *Section A*

Project Objective

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Possible Changes *Section B*

Due to how specific our project is, we do not expect a lot of change to occur. The only changes that may occur are the following:

- Adding more sensors

  We will add another sensor for more accurate readings. This will be a touch sensor that will be added onto the "Start/Stop" switch of a car; it will allow the driver to turn on the engine if he/she is not higher than 0.08 BAC (blood-alcohol concentration).
- Making the device available for already purchased cars

  By creating the device to be available on already purchased cars, we will not alienate a large portion of our consumers. This can be done by making the device wireless (see below).
- Making the device with wireless communication

  Currently, we have a wired device that comes installed in a new vehicle. If we make the device wireless, we will be using less materials and it will be easier for installation.

Integration of Changes *Section C*

To initiate a change in our project, we must follow our Change Implementation Plan:

- The Project Manager will create a Change Log to track all changes associated to the project.

- To request a change, one must submit a Change Form (containing the idea of change). For this change to occur, this form must pass two requirements:
  1. The form will be evaluated by team members to see if there are alternatives;
  2. If none, then the form will be assessed to determine the cost consequence of implementing the change.

  If Change Form passes these two requirements, then it must be reviewed/confirmed by the Project Manager.

- All change orders will be reviewed/confirmed by the Project Sponsors and will be acknowledged by the Marketing team.

- The Change Log will be updated by the Project Manager to reflect the newly implemented change.

Communications/Reporting Plan

Senior Management

Communication	Dates	Originator	Information Flow	Comments
Meeting	Sep 16, 2016	Arraf Haque	Assigned roles/tasks to each project member	Functional Managers were appointed
Report	Oct 3, 2016	Arraf Haque	Project proposal	An outline of the project was made
Meeting	Oct 14, 2016	Arraf Haque	Created deadlines for each functional manager	Proposal follow-up meeting
Email	Oct 31, 2016	Arraf Haque	Checking status of all members involved	All members on schedule
Conference	Nov 14, 2016	Arraf Haque	Summary of the project	Discussion of how the project will be presented to the client
Report	Nov 16, 2016	Arraf Haque	Final report	Report that will be presented to client

Functional Management / Project Team

Communication	Dates	Originator	Information Flow	Comments
Report	Oct 21, 2016	Michael Vasiliadis	Statistics on impaired driving	Charts, numbers, graphs on fatalities
Presentation	Oct 26, 2016	David Ornelas	The first design/concept of the project	Feedback was given
Email	Oct 28, 2016	Phuc Nguyen	Estimated costs of first design production	Original design was too expensive
Meeting	Nov 2, 2016	David Ornelas	A new cost-efficient design	Design was approved by all members
Presentation	Nov 9, 2016	Jordan Santorsola	Several prototypes of the project were presented	The best model was chosen
Presentation	Nov 11, 2016	Kishor Sivapalan	Information on product marketing	Prepares members for product launch

Client

Communication	Dates	Originator	Information Flow	Comments
Proposal	Oct 12, 2016	ENG 2001	A project proposition was presented to the client	Proposal Approved (Oct 17, 2016)
Meeting	Oct 13, 2016	Arraf Haque	Made changes to the original concept	Instead of only a steering wheel, we are now creating a system
Presentation	Nov 24, 2016	ENG 2001	Delivery of Alcohol Sensing System	TBD

Task Responsibility

A responsibility is state or fact of having a duty/obligation with something. In a group project, it is important that the work and responsibilities are divided equally among the team members. The following table describes how this was done in our project:

	Meeting Organizer	Legal	Software Development	Documents	Project Design	Prototype	User Manual
Arraf Haque	R	R		R		C	C
Phuc Nguyen	R	A		C	A		
David Ornelas	R		C		R		
Jordan Santorsola	R		A		A	R	A
Kishor Sivapalan	R		R	A	A		R
Michael Vasiliadis	R		A	A	C	C	

LEGEND

R = Responsible

C = Contributes

A = Advises

Risk Management Plan

A risk is an uncertain event or condition that has a positive or negative effect on a project's objectives. In reality, we cannot expect everything in our project to go according to plan. Therefore, we created a Risk Management Plan to deal with such deterrents:

Risk Assessment Form

Risk Event	Likelihood	Impact	Detection Difficulty	When
Interface Problems	1	2	1	Post-instillation
System Freezing	2	5	5	Start-up
Hardware Malfunction	4	5	2	Installation and device overuse
Software Incompatibility	4	4	5	Installation
User Backlash	3	1	1	Post-product release

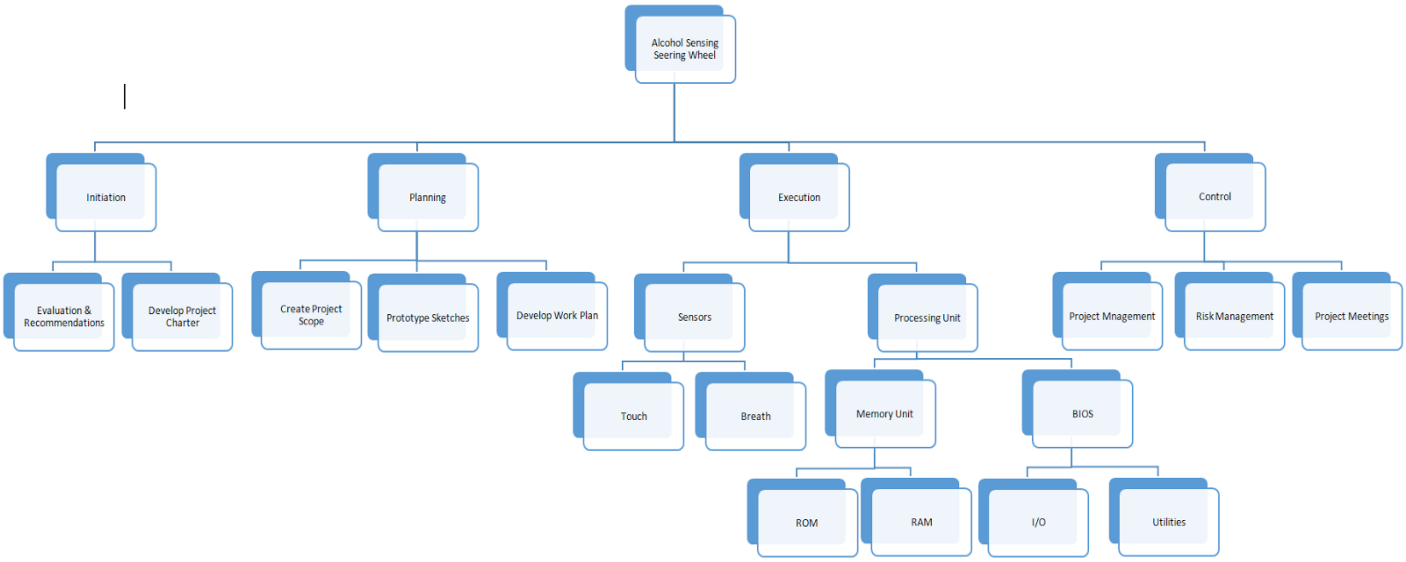
*Likelihood Scale: 1 - Not very likely; 5 - Very likely
*Impact Scale: 1 - Not very impactful; 5 - Very impactful
*Detection Difficulty Scale: 1 - Not very difficult; 5 - Very difficult

Risk Response Matrix

Risk Event	Response	Contingency Plan	Trigger	Responsibility
Interface Problems	Reduce	Restart and or update OS	Multiple occurrences	Jordan
System Freezing	Reduce	Reinstall OS	Still frozen after a period of time	Jordan
Hardware Malfunction	Transfer	Order different brand	Replacements do not work	Kishor
Software Incompatibility	Share	Work with software associates	Software does not initially work	Michael
User Backlash	Reduce	Increase customer support	Manager is requested	Arraf

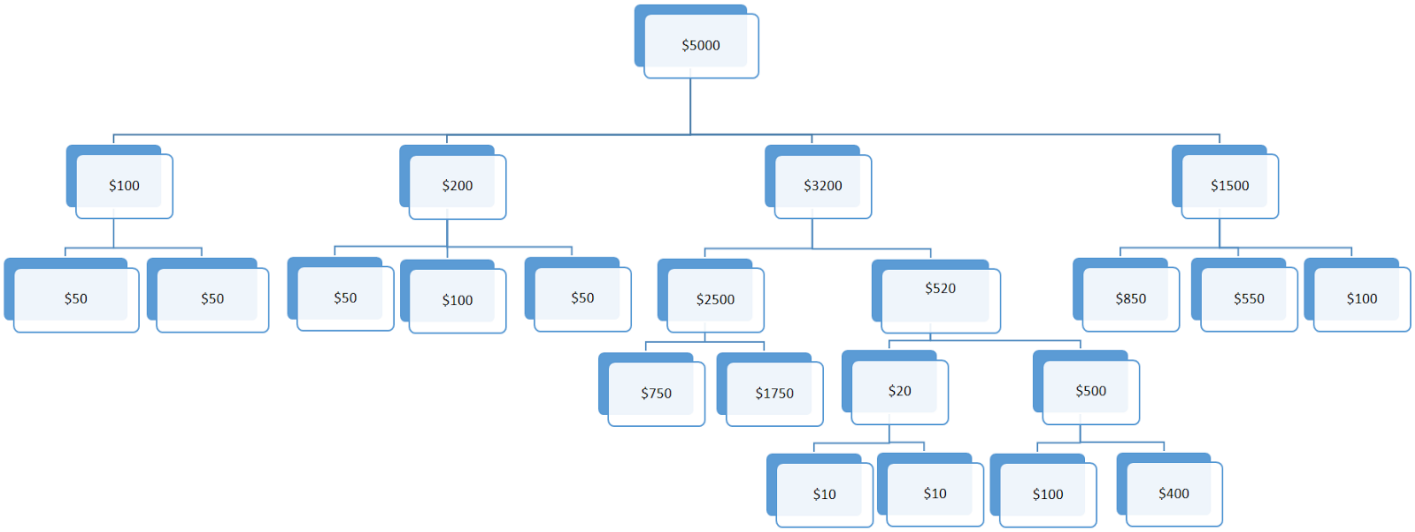
Work Breakdown Structure

The Work Breakdown Structure describes the work required to complete the project. It provides the framework for managing the project and facilitates the evaluation of time, cost, and resources of the project. The following is Work Breakdown Structure for our project:



Master Budget

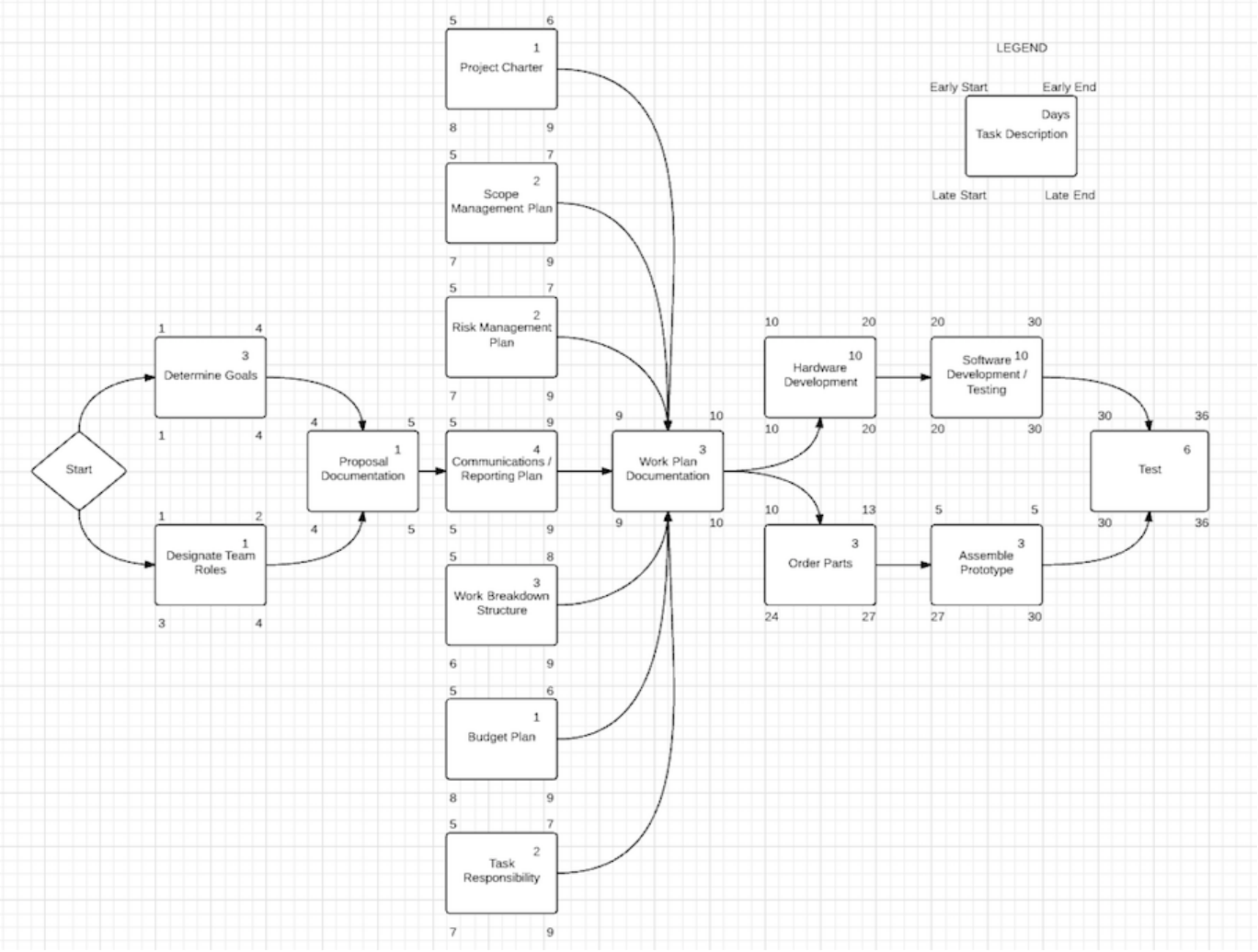
Assuming we get funding of $5,000 and partnership with a major a car company to (implement our product for testing), the estimated cost* of each component/task will be as follows:



*This diagram follows the same structure as the Work Breakdown Structure.

Critical Path

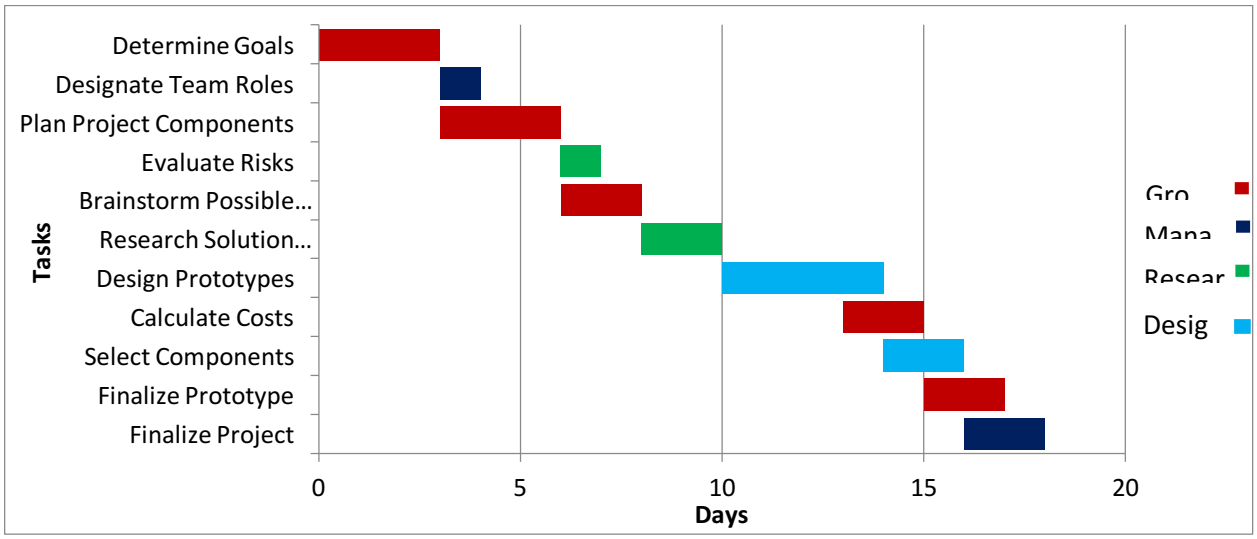
The Work Breakdown Structure (see Page 12) does not give any indication of time for each task; it also doesn't mention what parts of the project can be done in parallel with another task. The Critical Path diagram allows us to show this; the diagram below shows our critical path schedule:



Our critical path shows a total project completion of 36 days. It was broken down into 16 steps from the beginning to the end of the project. These steps include determining our goals, designating team roles, proposal/workplan documentation, hardware/software development, prototyping, and testing.

Gantt Chart

The Critical Path (Page 13) showed that our project had a total duration of 36 days. The following Gantt chart allowed us to reduce the total time of the project:



Product Prototype

Since we did not have the resources to fully build a functioning model, we created the logic of our project as a circuit. On the breadboard (see Figure 2), we constructed a circuit with 2 LEDs and a switch. In the original state, only the blue LED is turned on; if the switch is pressed, the greed LED will turn on and the blue LED will turn off. In our project, there are sensors that require an input for our device to function; the switch in our circuit is our input. This means that if the switch is pressed, the sensor identified the user as being impaired; if the switch is not pressed, nothing will occur (i.e. the circuit/car will function as normal).

The following are some images of our product during the prototyping phase:

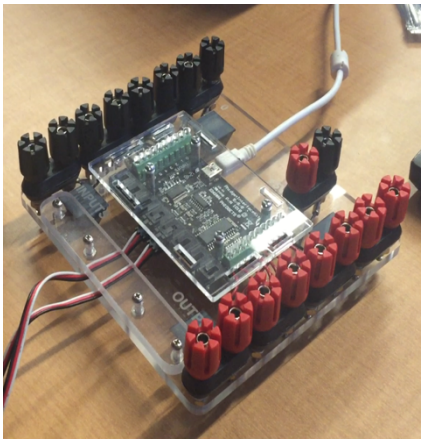


Figure 1: Interface Board

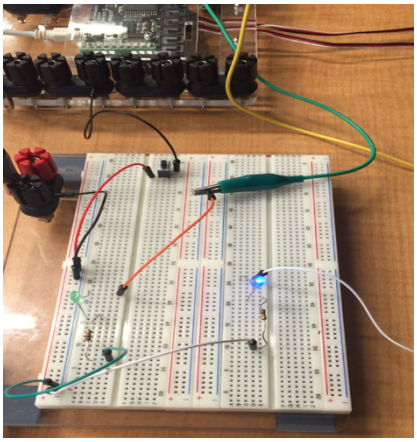


Figure 2: Breadboard

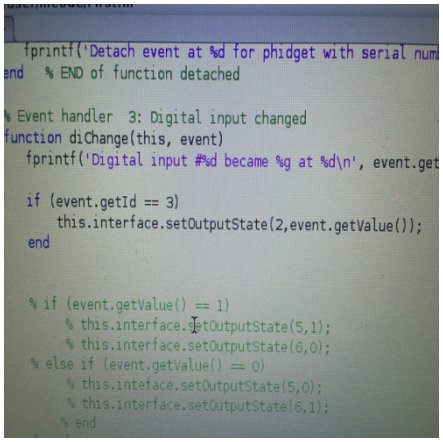


Figure 3: Code

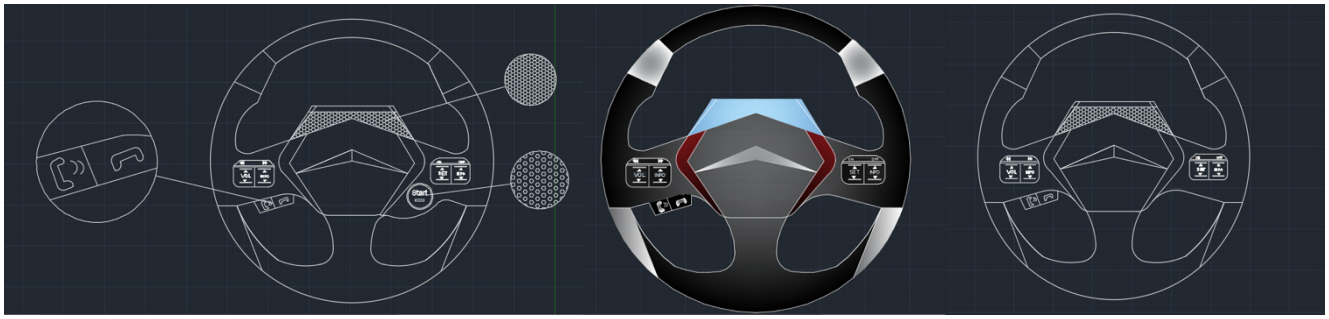


Figure 4: Steering Wheel Designs

Delivery

The final outcome of the project turned out successful based on the project's expected outcome. The goal was to design and create a solution to a problem using project management skills to ensure project completion. The group had successfully used several management skills which benefited the project by organizing group members to specific roles in order to reduce the workload and increase expertise in each field. The group also worked together to develop plans and assessments regarding communication plans and meetings, risk assessments, and task responsibilities. We brainstormed possible changes and integration of changes based on reasonability and importance of these changes which in turn will benefit the final design. Furthermore, we broke down the work required to complete the project, created a critical path analysis and developed a Gantt chart to simplify, organize, and improve the overall project. A reasonable prototype was created which included theoretical and physical components. This was the expected outcome based on the group's estimations during project planning.