EnPro 351 - Project Plan

Alcometre – Advancing Technologies, Saving Lives

"Don't drink and drive. Use Alcometre to save lives."

Table of Contents

1. Team Charter 3

a. Team Information 3

i. Roster 3

ii. Team member strengths, needs and expectations 3

iii. Team identity 5

b. Team Purpose and Objectives 5

i. Team purpose 5

ii. Team objectives 5

c. Background 6

d. Team Values Statement 10

2. Project Methodology 12

a. Work Breakdown Structure 12

i. Solve problems 12

ii. Team Structure 12

iii. Work Breakdown Structure or Gantt Chart 13

b. Expected Results 14

c. Project Budget 15

d. Designation of Roles 15

1. Team Charter

a. Team Information

i. Roster

Name	Major	Contact Information
Khairul Abdullah	1st Year Electrical Engineer	kabdulla@iit.edu
Olaoluwa Adeola	4th year Mechanical Engineer	oadeola@iit.edu
Kunle Apampa	4th year Chemical Engineer	aapampa@gmail.com
Renee Arrowood	4th Year Business Administration	rarrowoo@iit.edu
Jim Braband	Staff Sponsor	braband@iit.edu
Jason Entler	4th year Engineering Management	jentler@iit.edu
Jeremy Geelen	4th year Electrical Engineer	jgeelen@iit.edu
Kyu Sung Hwang	3rd year Electrical Engineer	Khwang1@iit.edu
Xingshuo Liu	4th year Business Administration	xliu70@iit.edu
Eduardo Morales	4th year Business Administration	Emorale3@iit.edu

ii. Team member strengths, needs and expectations

Name	Strengths	Weaknesses	Expectations
Jason Entler	• Personal experience with DUI • Experience with BAIID Devices	• Needs to improve interpersonal skills • Working within the framework of a team	• To incorporate the strengths of each individual member and leverage them towards a legitimate feasibility study and possibly a working prototype.
Khairul Anuar Abdullah	• electrical engineering background • can work in group • time management	• To build communication skills • be confident • to work in group and share ideas • Learn about business idea and business plan.	• To develop market for the product that can function to anyone who drive car. • To create a good business plan for this product and good team.
Xingshuo Liu	• strong problem solving skills • good at math • can handle stress	• Writing Needs work	• To work well as a team • To create a prototype

Olaoluwa Adeola	• Logical thinker • smart worker • engineering background • innovative interests	• how to write a business plan (what goes into creating one) • build team work abilities • prototyping	• To have a solid product to present w/ having most questions answered as to things like the market, feasibility, costs (financial and time), size, and other such things
Kyu Sung Hwang	• background information about sensors • experiences about team work	• learn how to make business plan • Knowledge about sensors.	• make a prototype that works well
Kunle Apampa	• Passionate about the project • Willing to work hard to see it get off the ground • Knowledgeable • Intelligent	• Sharpen communication skills • Learn from other disciplines.	• To evaluate if the idea is economically viable • To feel the thrills of working with a team. • To see the project progress over time, knowing that a substantial amount of work will be put into it.
Renee Arrowood	• Human resources and financial/accounting experience. • Previous business plan designing and new business (EnPro) start up knowledge.	• Looking for further her knowledge into the technical side of this venture	• To successfully join two technologies together for the safety of the public against drunk drivers. • To successfully design a prototype and create a valid business plan which will take the idea even further.
Eduardo Morales	• Organized • Prompt • Good Presentation Skills • Team Player	• Business Writing • Have the "my idea is the best" effect	• Get more experience in marketing • Practice the real-world simulation of a group project
Jeremy Geelen	• Logical thinker • Quick thinker • Efficient worker • Interested in the project	• Better time management • Learn from other disciplines • Enhance communication skills	• To create a valuable product with the potential to be marketable

iii. Team identity

b. Team Purpose and Objectives

i. Team purpose

The purpose of IPRO 351 is to research and develop a device that will be a non- invasive blood alcohol concentration (BAC) meter. Our mission is to provide a safe and accurate BAC device that will help reduce the amount of people who drive while impaired. IPRO 351 has a vision of having a non-invasive biometric blood alcohol ignition interlock device (BBAIID) that can be installed on any vehicle.

ii. Team objectives

IPRO 351 has a very ambitious set of goals to be completed by the end of the fall semester. The objectives that IPRO 351 includes and is not limited to:

- Integrate current technology that is available into our device
- Build a prototype
- Engage the marketplace and conduct feasibility study
- Prepare a professional caliber opportunity assessment
- Create a viable business plan
- Investigate project path options for final prototype design

c. Background

A. Alcometre does not have any current sponsors but is open to sponsorship; however the group hopes to work with the Department of Transportation - National Highway Traffic Safety Administration. Drunk driving may lead to impulse actions that are rarely thought over such as street racing, speeding, aggressive driving, driving with a suspended or revoked license and hit-and-run crashes.

B. Any human being can be under the influence of alcohol and the problem is non-discriminatory of age, gender or race. Drunk driving is referred to as operating a motor vehicle while one's blood alcohol content is above the legal limit set by statute, which supposedly is the level at which a person cannot drive safely. State statutes vary as to what that level is, but it ranges from .08 to .10. Driving while either intoxicated or drunk is dangerous and drivers with high blood alcohol content or concentration (BAC) are at greatly increased risk of car accidents, highway injuries and vehicular deaths.

C. The technology behind this is using low power light into the skin of the finger, censors and fingerprint identification systems. The fingerprint reader acts as a security measure to identify the driver of the vehicle. When that has been established, the driver will place any finger in a cylindrical hole located at the control hub of the car. The light waves pass through the skin and is reflected by tissues. The reflection results are measured and recorded by a detector in the car. The car does not start if the results exceed the legal limit level. The technology is a unique concept due to the fact that before now, Breathalyzers was used to measure the level of alcohol in the human body. The police only use Breathalyzers and the process is lengthy. The technology Alcometre provides is faster and the concept can be easily integrated into cars.

D. The first practical roadside breath-testing device intended for use by the police was the drunkometer. The drunkometer was developed by Professor Harger in 1938. The drunkometer collected a motorist's breath sample directly into a balloon inside the machine. The breath sample was then pumped through an acidified potassium permanganate solution. If there was alcohol in the breath sample, the solution changed color. The greater the color change, the more alcohol there was present in the breath. But the drunkometer was quite cumbersome and was approximately the size of a shoebox. It was more reminiscent of a portable laboratory. Though

technologies for detecting alcohol vary, it's widely accepted that Dr. Robert Borkenstein (1912–2002), a captain with the Indiana State Police and later a professor at Indiana University at Bloomington, is regarded as the first to create a device that measures a subject's blood alcohol level based on a breath sample. In 1954, Borkenstein invented his breathalyzer, which used chemical oxidation and photometry to determine alcohol concentration. Subsequent breathalyzers have converted primarily to infrared spectroscopy. The invention of the breathalyzers provided law enforcement with a non-invasive test providing immediate results to determine an individual's breath alcohol concentration at the time of testing. But the breath alcohol concentration test result itself can vary between individuals consuming identical amounts of alcohol due to gender, weight, and genetic pre-disposition, which means there is no ground zero that puts everyone on a level plain. There are other factors that add to the inadequacies of the breathalyzers such as bad calibrations, interfering compounds in the body, Homeostatic variables, mouth alcohol amongst many others.

E. There is huge amount of ethical issues that surround this issue. Some ethical issues include proposed interventions, which make it possible for victims to sue bar owners, whose customers get drunk and cause an accident on the way home, increase the possibilities for the victims to sue persons who have a party at their house, and whose guests get drunk and cause an accident on the way home, provide more government funds to set up treatment programs for people with alcohol problems, require all new cars to have an interlock system, requiring the driver to breathe into a machine that can tell if he or she has been drinking, require all new cars have driver and passenger air bags in the front seats, supply government money for television advertisements showing the dangers of driving while intoxicated, provide government money to anti-drug groups, require a speed limit of 55 mph on all highways, have a convicted driver's vehicle seized and impounded for one year and if a person is convicted of a second offense, have their vehicle seized and sold a public auction. But, non-criminal measures do not satisfy the public's outcry for retribution and secondly, the countermeasures will probably impose costs, inconvenience and increased prices on those that do not drink and drive but help keep those who do off the road. The ethical issues surrounding this problem swing both ways, having almost equal numbers of support and refusal.

F. Drunk driving has been a problem in the United States since the introduction of automobiles; however, it did not become an important social issue until the 1980's. At that time the political

atmosphere defined crime in terms of personal choice and individual responsibility. Driving under the influence of alcohol is considered the nation's most frequently committed violent crime, and in the 1980's the public supported a wider range of non-criminal countermeasures, as well as stricter legal measures, to govern DUI's. This movement against drunk driving was well reflected in the legislative arena. Between 1981 and 1987 some 934 new laws dealing with drunk driving were passed by state legislatures. Legal measures focus on deterring drunken drivers by providing stricter laws and punishment. Mothers Against Drunk Driving (MADD) and Remove Intoxicated Drivers (RID) are the most influential grassroots groups; they lobby and provide needed help wherever they can. Grassroots organizations are responsible for many educational and treatment programs, as well as alternatives to driving while intoxicated. Such programs, initiated in 1989, are the Safe Ride Home program, which provides free cab rides to intoxicated people and a designated driver program. Public education campaigns have increased the public's knowledge by aiding in the distribution of information, increasing public awareness of new policies and programs, and encouraging public support for new laws, regulations, and programs. Public education campaigns often appeal to an individual's morality. Despite years of sanction, drunk driving continues to be a serious social problem. A sizable number of automobile accidents causing injury or death are alcohol related.

G. Our primary focus for the device developed will be targeted towards vehicle operated by human beings. Anyone can be susceptible to driving under the influence of alcohol and our first target is making sure that these people are off the road. Further proposed implementation of the device is to look into how it can be adapted by factory plants, airline companies, and commercial drivers amongst others. It would be used as a security device. No one wants the person in-charge of controlling valves in a nuclear plant to be drunk neither does the public want the commercial drivers such as bus drivers, train conductors or airline pilots under the influence of alcohol. The device may also be used within the medical facilities as a way to measure blood alcohol concentration in a patient who does not have the strength to blow into a breathalyzer. There are several other further applications that the device can be used for that have not yet been fully discovered but the prospects look favorable.

H. The practical solution for Alcometre is to tackle the problem of drunk driving once and for all. Also, extending such services to other modes of transportation and possibly installing the

product into factory plants as safety requirements. There is still a silent race within the world to come up with a product that can help eliminate this problem. Nissan, a Japanese Car Company, is currently working on three methods to help solve the problem. First, they put sensor on the gear shift-lever that sensor detect alcohol in the sweat. Secondly, the driver's seat has sensors that detect alcohol and finally, they use camera to detect the human face to know its condition. Another Car company, Saab, also developed a product called 'Alco-Key'. Drivers blow into a small sensor and the sensor grades their alcohol level. If they do not blow, they cannot use car.

I. Attach any critical documents that provide a particularly useful framework or context for the problem(s).

1. Example breathalyzer that we can be refers to convert to be blood alcohol concentration test.
2. http://www.breathalyzer.net/bactrack-select-s80.html
3. http://lib.store.yahoo.net/lib/breathalyzer-net/bactrack2007.pdf
4. http://lib.store.yahoo.net/lib/breathalyzer-net/b70-ownersmanual.pdf
5. Law related to the drunk driver impaired in America.
6. Sources: Prevention Resource Guide: Impaired Driving (1991) MS434 Safer Streets Ahead (1990) PH292. Serving it right http://www.servingitright.com/jsp-public/licensee/2_the_effects_of_alcohol.htm
7. University of Indiana http://www.indiana.edu/~adic/effects.html
8. http://www.dot.wisconsin.gov/safety/motorist/drunkdriving/law.htm
9. http://www.ilga.gov/legislation/ilcs/ilcs4.asp?DocName=062500050HCh.+11+Art.+V&ActID=1815&ChapAct=625%26nbsp;ILCS%26nbsp;5/&ChapterID=49&ChapterName=VEHICLES&SectionID=59643&SeqStart=105500000&SeqEnd=107300000&ActName=Illinois+Vehicle+Code.
10. http://www.alcoholtest.org/dui_laws.php?state=Illinois
11. Legal limit level of BAC each country in the world. In some country, BAC is difference.
12. http://en.wikipedia.org/wiki/Blood_alcohol_content#Legal_limits
13. Calculation how BAC and BrAC taken in the device. Maybe this device are difference with our product cause by we use light wave to detect concentration of alcohol in blood.
14. http://en.wikipedia.org/wiki/Blood_alcohol_content#Units_of_measurement
15. http://en.wikipedia.org/wiki/Blood_alcohol_content#Blood_alcohol_content_calculation

d. Team Values Statement

Each member of the team has agreed to confine the values of the team to the values below. We are all in agreement to the terms, with the extremities defined below. Each member shall evaluate the other members based on the values defined, to the discretion of the evaluating member.

Problems within the team will be solved on case by case bases. The involvement of other members from the team will be required on any escalated case, and complete honesty is expected.

Problems with the project will be evaluated by the team as a whole. Assignment into further research may be necessary. Action and direction to be taken with respect to the problem will be decided by the team.

Participation/Contribution-

The team is expected to hold themselves and each other to participate and contribute appropriately. Categorizing each member's individual level of achievement in this aspect is as follows:

Role Model – Member misses limited meetings, and only for legitimate reasons. Member always puts forth their best effort, regardless of prior knowledge or motivation. Each task the member is assigned is performed in a timely fashion without need for continual reminders. Member comes to class always prepared. The needs of the team are always put before the agenda of the member, and positive feedback is always available from this member.

Unacceptable – Member has several unexcused absences. Tasks performed by this member are lacking and late. Member is consistently late to class. Member is unnecessarily harsh in their feedback of others. Member is uninterested in the overall goal of the team.

Attitude/Behavior-

Each member of the team is expected to behave properly at all times. Attitude should always be positive unless there is reason for disappointment. Categorizing each member's individual level of achievement in this aspect is as follows:

Role Model – Member shows highest respect for other team members consistently. Member greets others in passing and is a good listener when others are speaking. Differing opinions are expressed politely and reactions are noticed by this member. Member is patient and understanding and works with the group to maximize group benefit rather than personal ones.

Unacceptable – Member is rude and acts inappropriately. Member uses profanity when speaking and tries to draw attention to him or herself in an unappealing manner.

Dedication-

The members of the team are expected to show dedication to the project and overall goal. Categorizing each member's individual level of achievement in this aspect is as follows:

Role Model – Member understands all aspects of the project and could adequately explain the project in whole. Member shows initiative in research and excitement for new opportunities for the project. Member is willing to help out where necessary and presents information in an organized and structured manner.

Unacceptable – The project is obviously not a priority for this member. Member is always complaining about the work and is not willing to help out. Member's work is finished halfheartedly and shows little to no initiative.

Communication-

Communication is key to the success of any project, and this project is no exception. Categorizing each member's individual level of achievement in this aspect is as follows:

Role Model – Member is an active contributor in most, if not all, discussions. Member keeps the team up to date on individual tasks and communicates any need for help. Member encourages others to communicate and does not dominate any conversation. Electronic communication is responded to in a timely fashion.

Unacceptable – Member must be prompted to contribute, if he or she does, to conversations. Member does not respond to electronic communication. Member dominates of withdraws from any or all conversations.

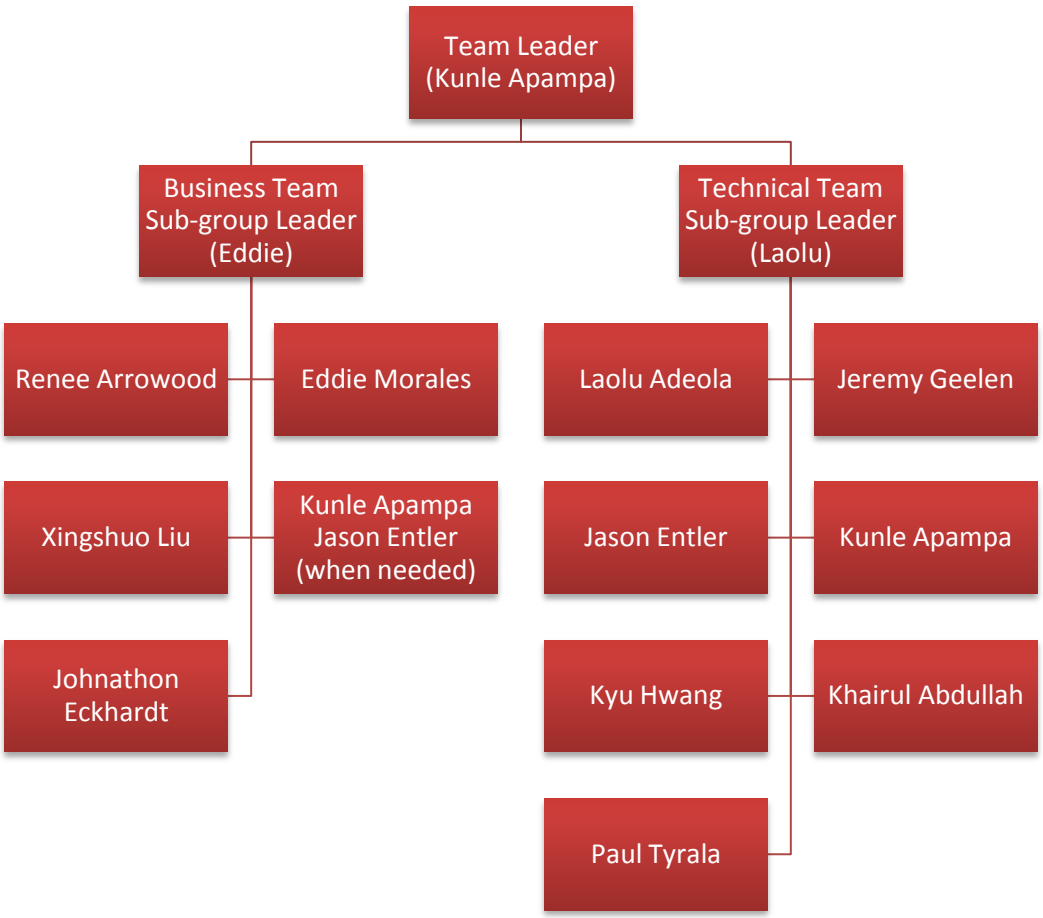
2. Project Methodology

a. Work Breakdown Structure

i. Solve problems

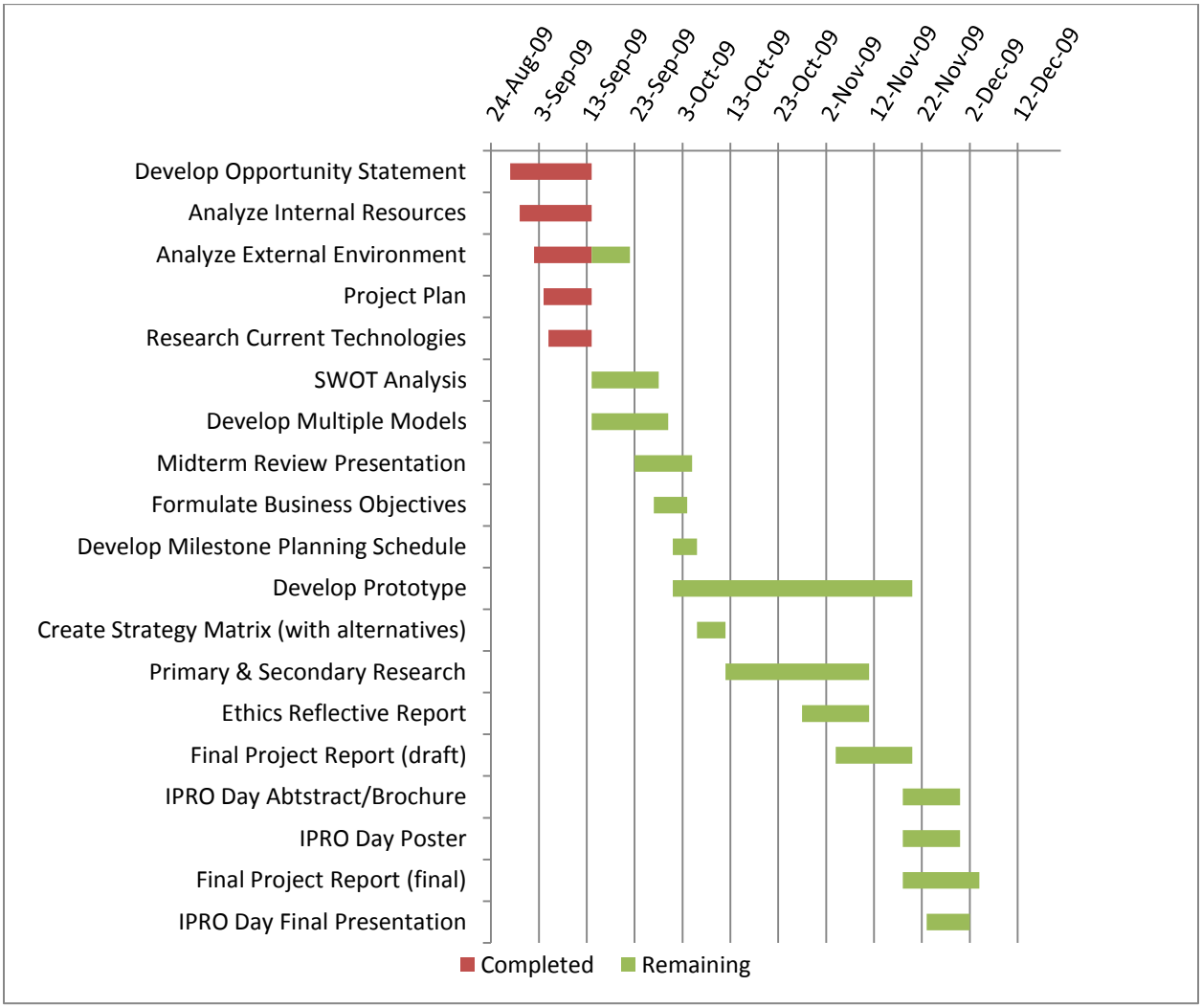
Alcometre has already identified a major problem for this project. Research conducted by the team uncovered a patent that utilized much of the technology for the sensor the team wanted to use. As a team, Alcometre is determined to research and uncover many potential problems or issues and confront them head-on. We have determined that the proper course of action is to include our resources from the Kent Law School to help us research this patent and its patent holder. We are looking into options of leasing, or otherwise utilizing the technology outlined in the patent to further our idea. The team's goal is to have a prototype built by the semester's end and if it is concluded that we can use some or all of the technology outlined in the patent that was found, this goal is very feasible.

ii. Team Structure



The business sub-team is responsible for drafting a business plan and conducting market research for the Alcometre idea. The Technical sub-team's responsibilities include researching sensor technologies, designing and building a prototype for Alcometre.

iii. Work Breakdown Structure or Gantt Chart



Business Team Tasks	Technical Team Tasks	Overall Team Tasks
Develop Opportunity Statement	Research Current Technologies	Project Plan
Analyze Internal Resources	Develop Multiple Models	Midterm Review Presentation
Analyze External Environment	Develop Prototype	Ethics Reflective Report
SWOT Analysis		Final Project Report (draft)
Formulate Business Objectives		IPRO Day Abstract/Brochure
Develop Milestone Planning Schedule		IPRO Day Poster
Create Strategy Matrix (with alt.)		Final Project Report (final)
Primary & Secondary Research		IPRO Day Final Presentation

b. Expected Results

A. This project is still in the developing stage. We expect the basic system model ready to run. The first step would be constructing a basic model of this system. The second activity would be to write a business plan for the product. It should include all the elements of a comprehensive business plan and be ready to present at formal occasions.

B. First, data of finger scanner will be gathered by expecting driver. We can make database by using this data. Also, the information about alcohol sensor will be useful when we initialize sensor`s setting.

C. The final product will be the machine including in the car which contain alcohol sensors, finger scanner and some circuit to prevent drunken driver. The model would show that when the system is installed in the car, it would be able to firstly check the driver`s identity by using finger scanner. Then analyze the driver`s blood alcohol level using infrared alcohol sensor. After the test result, the system would stop the car from starting if the blood alcohol level was over legal limit.

D. The data we collect would be used in the basic model of the system. The potential outputs would be the identification of the driver and the test results of blood alcohol level.

E. The preventing drunken driver prototype will be the combine of sensor and scanner. Moreover, this prototype will be in the car.

F. The main challenges are cost and quality. Commonly, expensive sensors are more sensitive than cheap ones. We are not sure if the alcohol sensor would operate correctly in several conditions. Also, the running time of finger print and blood alcohol level will be longer than our expectation.

G. There would be unexpected results and we would try to solve it by going through the technologies over and over again in order for the sensor to work the way we wanted it to. We might have to change the product design if necessary.

c. Project Budget

Item	**Cost**
Area Capacitive Fingerprint Scanner	$200
Infrared Emitter	$10
Infrared Receptor	$20
Circuitry (for Alcohol Sensor)	$100
4 LED Segment Displays	$1
Circuitry for device	$100
Incentives for survey participants	$75
Budget Total	**$506**

d. Designation of Roles

Role	**Name**
Minute Taker	Renee Arrowood
Agenda Maker	Kunle Apampa
Time Keeper	Jason Entler
iGroups Moderator	Eddie Morales