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Abstract

Project by ColourTECH on the development of the Computerised Accelerator Safety Device (CASD) to improve vehicle safety by limiting the speed of the vehicle to the posted speed limit

Assessment 3: Our IT Project

ColourTech Computerised Accelerator Safety Device

*2020*

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# Team Profile

## Team Name

**ColourTECH**

## Personal Information

### Joshua

My name is Joshua Lishman, I am 21 years old and my student number is s3829198. I am half British, on my father’s side and half Australian, on my mother’s side. My highest level of completed education is Year 12 but I also have completed a Certificate III in Information Technology and one and a half years of a Bachelor of Business before moving into my current study of IT. I can speak some Indonesian from multiple years of study through primary and into high school. I played rugby league for many years, from under 7s all the way to under 15s where I had my leg broken in a tackle and couldn’t play again, but I still follow it closely when I can and still to this day wish I could get back out on that field for another game.

#### My Personal Profile

<https://joshualishman.github.io/My-Profile/>

### Kevin

My name is Kevin Brown, I am 49 years old and my student ID s3831353. I am a qualified baker by trade however I developed an allergy to flour later in life. I started managing small retail chains and developing my career in management. I have three beautiful kids, and when my son was born, I had to take a break from my career and look after him as he used to wake 30 times a night. Finally, when he was one and a half years old, I was able to land a job as a casual orderly, and I have worked my way up to a senior orderly. As a senior orderly I meet a lot of people at the worst time of their lives and some of the best times of their lives, and it makes you look at your life in a whole new light. From a young age I have been interested in computers and have built a few of my own and helped out family and friends, I am a pc gamer and my first computer was an IBM and ever since have been interested in learning to program but never had the courage to pursue a career in IT till now.

#### My Personal Profile

<https://chillie1970.github.io/Assessment1/>

### Lori

Hi there, my name is Lori and I’m 22, Student ID s3824209. I worked at a telco in the small but closely-knit team of the billing department. I would get called upon sometimes by others for any IT issues as our main IT department was moved off-site. Hoping to complete this bridging course and degree so I can move into a career centred around cyber security. My hobbies include videogames, reading, Diamond Paint art, music, Formula 1 and working on my make-up skills.

#### My Personal Profile

<https://gopnikqueen.github.io/ITT-Assignment-1/>

### Lynette

S3728067

I have a background in accounting, finance and retail management, but have always been the one to fix any IT problems at work and for friends. I did a small amount of IT studies 20 years ago and have since studied in the accounting/finance area but after doing half a Bachelor of Accounting have decided that my interest in IT is where my future lies so I am in the process of changing degrees. Some of my hobbies include Netball, Basketball, Hiking and gaming on the Xbox, having hobbies my children are also involved in makes it easier to spend time together.

#### My Personal Profile

<https://lynetteSofs8.github.io/IntroIT/>

### Tegan

Name: Tegan, student number: S3831038. I was born in Australia to Australian parents and have completed certificates II to IV in Information Technology. Due to my health, I enjoy low impact activities with my hobbies including sewing and PC gaming. My health is also the reason I changed career paths from hospitality to IT. I have worked as in-house IT at a local not-for-profit with my key roles including network admin, end-user support and IT maintenance.

#### My Personal Profile

<https://tegano-au.github.io/IIT_A1/>

### William

William has not made any contact with the team since before the submission of our previous assessment, so we have worked without his input this time.

## Group Processes

While our group is largely introverted with vastly different personalities, the team worked very well together. We separated the assignment into individual tasks as equally as possible. While each of the tasks were done excellently and on time, there was an issue with the natural disaster occurring during the assignment which caused a small delay with a task being submitted that ultimately lost marks as we only had time to ask the questions that was in the assignment instead of being able to add our own to the mix. Overall, the team was very happy with the results as we were able to walk away with a High Distinction, even with the issues that occurred partway through. We will take this confidence in stride through to the next assignments to come.

We also lost contact with William a few weeks into the previous assignment and have not heard from him at all since. We therefore have had to do this assignment without him. It is disappointing to be without one of our team, and the rest of the group have banded together to pick up the tasks that were initially selected for William to complete.

## Career Plans

Since assignment 1 and 2, there hasn’t been a massive change in ideal jobs and career paths. There are still a lot of similarities in our ideal jobs especially Data Engineer, Software Engineer and Full Stack Web Developer; These positions require the principles of computer software to design and develop computer software, with a full stack developer also needing to know more front-end technology. A Cyber Security (Malware) Analysist also needs to know C & C++ like the above position to provide access to IT infrastructure such as system processes. The big difference in Cyber Security to other positions is that it is more about monitoring and analysing existing systems and protection of sensitive information.

The position of Systems Assembler is the only position within the group that revolves around the hardware of a computer rather than the software, with a thorough understanding of how the different hardware components will meet a customer's needs. This position does require good problem-solving skills which is also required for the other positions.

We all seem to have the analytical, logical parts of the industry at the forefront of our aspirations, though this appears to come with the territory, as people with our personality types (introverted, thinking, neurotic types) seem to be drawn to an industry where it is possible to spend a lot of your time in a room making things work without speaking face-to-face with actual human beings.

# Tools

## Group Website

<https://tegano-au.github.io/IIT-A2/>

## Group Git Repository

<https://github.com/TeganO-au/IIT-A3>

\*\*\*\* [Everyone??]

Your comments on how well the audit trail on the Git repository reflects your group’s work. You will

presumably only be able to do this close to the time of submission.

# Project Plan

## Overview

### Topic

We are developing a device called the computer acceleration safety device (CASD), which is designed to aid the driver of a vehicle in remaining under the posted speed limit by limiting the vehicle’s speed based on geolocation and/or localised transmitters. It will also be able to adjust the limit according to road conditions such as accidents or road works notifying the driver of the change.

Potential outcomes for the population are a decrease in the number of deaths on our roads which will mean decreased costs in areas such as emergency services, insurance, road maintenance and vehicle maintenance. Further, costs to society itself will be reduced as services such as ambulance, police, hospital staff, clean-up crews and maintenance crews will be less stretched and therefore better able to direct their attentions.

### Motivation

In 1901 speed limits were introduced to Australia in an effort to increase safety on our roads and reduce crashes, then the speed camera was introduced in 1961 with a radar device used to catch people speeding (Davis, 2020) as you can see from table below in the last 24 months 2,431 people have been in crashes relating to speeding, and in 2019 there were 4.7% more deaths on Australia roads than the same period as 2018 (Roadsafety.transport.nsw.gov.au, 2020). The CASD is going to save lives, reduce the number of crashes on our roads and make a difference in people's lives.

#### Serious injuries crash data - June 2019 quarter

|  |  |  |
| --- | --- | --- |
| Behaviour Factors | 12 months ending June 2019 | 12 Months ending June 2018 |
| Alcohol involved in crash | 335 | 362 |
| Speeding involved in crash | 1179 | 1252 |
| Fatigue involved in crash | 629 | 644 |

Data sample from Roadsafety.transport.nsw.gov.au, 2020

Overall the CASD s will be controversial because it could potentially change laws for car owners and their rights and responsibilities regarding driving their cars. This system will also reduce the resources needed by the government to regulate drivers’ adherence to speed limits. I know firsthand from working in a hospital as an orderly than the devastation that high-speed crashes not only from the victims but the family themselves not only physically, but mentally.

The application of technologies for vehicle safety are increasing exponentially with devices such as lane keeping assist systems which can detect unintentional lane departure and guide the vehicle back into the correct lane (<https://www.drive.com.au/news/what-is-lane-keeping-assist--120965>), Forward Collision Avoidance Systems which detect and react to potential head-on collisions (<https://www.tmr.qld.gov.au/Safety/Vehicle-standards-and-modifications/Vehicle-standards/Forward-collision-avoidance-technology.aspx>) and car breathalysers which prevent driving under the influence of alcohol. The CASD is an opportunity to introduce another aspect of vehicle safety to our roads and could be developed as an IoT device connecting you with the surrounding road conditions to optimise speed and safety.

Over the course of the next couple of years, our team would like to have gained the knowledge and experience to have least created and designed a working prototype of our device, along with the skills and team behind us to make it become a reality. This will demonstrate that our team has a vision and a passion for what we do. The group will demonstrate initiative, teamwork, vision, safety consciousness and of course a wealth of IT skills.

### Landscape

There are speed limiters out there that reduce the car overall speed of the motor vehicle example of this are Australia trucks are limited to 100kms an hour, these are call governors. There are different types our there such as mechanical, pneumatic and hydraulic governors (The Engineers Post, 2020). Also, the Electronic Speed Governor which is micro-control base (I diagnosis.in, 2020) but these governors don’t take into consideration the variety of speed limits changes. Self-driving cars use radar, sensors, GPS, sonar and lidar to take in their surroundings to ensure they keep in the guidelines of the road rules (Jameco.com, 2020).

Competition in this field are companies and organisations such as Tesla, Wymo, GM Cruise, Argo Ai, Mercedes-Benz, General Motors, Continental Automotive Systems, Autoliv Inc., Bosch, Nissan, Toyota, Audi, Volvo, Vislab from University of Parma, Oxford University and Google. But what these companies all have in common is their focus on driverless cars; the CASD is designed for vehicles with drivers, assisting them to maintain safety by adhering to the posted speed limit.

## Detailed Description

### Aims

#### Aim

Develop a device which limits the speed of a vehicle based on transmissions and/or geolocation

#### Goals

1. Produce devices that can transmit and receive a speed limit value for a location/area
   1. Develop transmitter
   2. Develop receiving device
2. Develop area speed limits (access accurate maps with speed limits??)
   1. Within city limits
   2. Outside city limits
   3. School zones
   4. Residential areas
3. Develop systems to communicate speed limits to vehicles
4. Interface with vehicles
5. Testing
6. Roll out

### Plans and progress

\*\*\*\*

### Roles

#### Program Developer

The person responsible for developing the software that will determine the speed limit on the current road and indicate this speed limit to the vehicle

#### Vehicle Interface Designer

This person will be responsible for developing the interface designs for the CASDs connections to different vehicles

#### Hardware designer

This person will be responsible for designing the hardware of the CASD working with the Program developer and Vehicle interface designer to produce the device

#### Project manager

The project manager will be responsible for coordinating personnel, managing the budget and funding, handling project creep to make sure milestones are met on time, and much more.

#### Research Leader

This person is responsible for obtaining information and data pertinent to the project. Safety information, laws and regulations, patents and copyright and so much more are needed to produce a device such as the CASD to the highest standard without infringing upon any legal element.

### Scope and limits

Time being the biggest limiting factor for this project, an ideal deliverable would be a prototype of the CASD that can demonstrate its determining and outputting of the speed limit in the area. Development of interfacing with key vehicle models (3 at most in the existing scope), along with the collection of data including laws and regulations around modifying vehicles in such a way would also be necessary for the future of the endeavour.

### Tools and technologies

There are several things to consider when determining the required tools and technologies, from the native language of vehicles’ Engine Control Units (ECUs), to the hardware for prototyping the CASD and the programming language used there. The product will need to be planed before specific components are purchased, so a virtual version of the hardware should be used.

Vehicles’ ECUs (Engine Control Units) are predominantly programmed in the C language, specifically using MISRA C, guidelines named for the Motor Industry Software Reliability Association who have developed them to prevent "bad" code and to facilitate compatibility, performance and reliability in safety-critical systems (<https://www.embedded.com/introduction-to-misra-c/>).

The hardware in the project will be Arduino technology for prototyping. These can be purchased from electronic shops like Jaycar or the Arduino product page (https://www.arduino.cc/). The usage of this hardware will not need any licences as the developers of Arduino promote open source development and usage. Arduino has its own IDE, currently ARDUINO 1.8.11 (https://www.arduino.cc/en/Main/Software) and uses a set of C/C++ functions which can be called to direct the hardware. Once the device is prototyped using Arduino, we will be able to submit the design to an electronics manufacturer for production. Arduino can be simulated in a variety of ways including Autodesk Tinkercad, Virtonics Simulator for Arduino v1.11 (<http://virtronics.com.au/Simulator-for-Arduino.html>) or Proteus (<https://www.labcenter.com/visualdesigner/arduino/>). Simulation is the ideal way to test and adjust designs without spending time and money putting together different physical components.

The program needs to be written in an IDE (Integrated Development Environment) and in this case the current version of Microsoft Visual Studio 2019, being v16.4.3, would be optimal for its added support and flexibility.

Familiarity with the components and the Arduino functions and other language specifics will take roughly a month. This can be made easier with the use of the multiple tutorials available on YouTube and Arduinos website making it very possible to become familiar and functional with Arduinos in a matter of a couple of weeks meaning a basic prototype would be possible by the very end of this project timeline.

https://www.arduino.cc/reference/en/

### Testing

There will be several stages of testing involved in this project with various adjustments in between. The first stage will be using the simulator testing to see the device can input the geolocation and output the correct speed limit. Next, we will need to put together a prototype using Arduino components and test similarly to the simulation. Meanwhile we will need to test different interfacing devices which can communicate input the speed limit and prevent the vehicle from going over this limit. This will be the most complex as there will need to be many different interfaces for all the different vehicle models, although this will be done in stages.

### Timeframe

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Week | Programmer | Hardware Developer | Interface Developer | Researcher | Project Manager |
| Week 1 | Project overview, familiarisation, discussion, etc. | | | | |
| Week 2 |
| Week 3 | Familiarisation with simulation software and Arduino Programming | Familiarisation with simulation software and Arduino components | Research and determine most appropriate vehicles for proof of concept | | |
| Week 4 | Familiarisation with Arduino programming | Familiarisation with Arduino components | determine most appropriate vehicles for proof of concept | | |
| Week 5 | Design device MVP | | Familiarisation with the ECUs of the selected vehicles | Work with the rest of the team as needed collecting and compiling information | Develop documentation and manage timeframe and other project risks |
| Week 6 | produce and test device simulation | | Familiarisation with simulation software |
| Week 7 | Familiarisation with the ECUs of the selected vehicles |
| Week 8 | Produce and test device prototype | |
| Week 9 | Begin wireframe of interface unit |
| Week 10 | Develop MVP for interface unit | | |
| Week 11 |
| Week 12 | Produce and test simulation | | |
| Week 13 |
| Week 14 | Produce and test prototype | | |
| Week 15 |
| Week 16 | Prepare for Demonstration | | | | |

### Risks

As with any project, there are going to be a few risks. In the case of this project, a few of the risks are going to be significant and others, far more manageable.

#### Skills

There are some very specific skills and knowledge needed for this project to be completed including auto-electrical engineering, mechanical engineering, electronics production, programming, public relations and law. These skills are not insignificant, and we will need to seek experienced people to join our team and meet the needs of the project and allow time and resources for the other team members to learn enough to work productively.

#### Tools

Each programmer has their preferred tools to use when working and it is important that we allow as much as possible for people to work with tools with which they are comfortable, but we must make sure that the tools used meet the needs of the project, and are compatible with the other tools being used.

#### Technologies

There will be a few technologies such as GPS and cellular interfaces, that already exist and are able to be utilised and adapted in the development of the CASD, however some components especially in the interface unit with need to be developed specifically for the device.

Other risks related to the future implementation of the device include not getting authorized for use, tampering, cast to the driver and incidents involving driver safety.

### Group processes and communications

Our group primarily uses Microsoft Teams for all communication which includes meetings that occur every Thursday and Sunday at 8pm AEDT, any small or large updates, issues etc. We also use discord as a backup in case MS Teams is down or a teammate is not responding. For any formal communication, generally the whole team and teacher are notified, is done via Microsoft Outlook email. There have been a few times where the team has been involved in an email to the teacher regarding a teammate not responding and regarding assignments where a teammate cannot participate fully due to personal reasons/safety concerns due to natural disasters. Sadly, we’ve had to conclude to remove a teammate from our team due to lack of any communication despite numerous attempts to reach him.

# Skills and Jobs

#### JOB DESCRIPTION 1

TITLE: Public Relations Manager

TEAM: Public Relations

REPORTS TO: Project Manager

##### OVERVIEW:

At ColourTech, we are looking at making the roads of Australia a safer place for both motorists and pedestrians with our new speed limiting technology. With the lives of loved ones and friends of all Australians at the forefront of our minds, we aim to deliver a well optimised, public supported and government trusted product to be adopted by Australia and aims for the global market.

##### OBJECTIVE:

The purpose of this position is to bridge the gap between the public and our company, creating a synergy for our company to grow, listen to and possibly implement new ideas given to us by the public. We also want to this position to be accepting and understanding of public criticism as we understand the safety of loved ones and friends is a very important topic in which we are more than willing to listen to.

The Public Relations Manager will be responsible for facilitating the company’s goals. This will be achieved by –

* Regularly reaching out to the public for feedback
* Overseeing any further public relation employees
* Notifying superiors of any plausible ideas or heavy criticism
* Keeping a strong business government relationship
* Updating superiors on law changes or any other relevant information

##### RESPONSIBILITIES AND DUTIES:

* Managing a positive and effective public relations team
  + Training, mentoring, positively reinforce, assist and guide public relation employees
  + Keep a motivated and diverse team
  + Making other voices heard
* Keeping public, business and government in the loop
  + Develop relevant public relation communication plans
  + Reach out to different members for growth ideas
  + Effectively communicating company growth and future goals
* Attempt to gain government support where possible
  + Identifying current market situation with public opinion
  + Finding gaps or developments in the relevant market
  + Exploiting these gaps with evolving public relation communication plans

##### QUALIFICATIONS:

###### Level of Education

* University degree in public relations or similar equivalent qualification

###### Knowledge/Skills

* Fluent in the English language
* Previous job placement or internship in similar or lower public relation position
* High level communication skills
* Knowledge of social media communication and implementation of this fact
* Appropriate plan development skills
* Team leadership skills

###### Personal Qualities

* Understanding and patience with others
* One to take initiative
* Willingness to teach and positively reinforce subordinates
* Positive and outgoing personality
* Accepting of all others with extremely high professionalism
* Wanting to be a part of something bigger

#### JOB DESCRIPTION 2

JOB TITLE: Development and Documentation Officer

JOB TYPE: Full-Time

OVERVIEW

At ColourTech, we are looking at making the roads of Australia a safer place for both motorists and pedestrians with our new speed limiting technology. With the lives of loved ones and friends of all Australians at the forefront of our minds, we aim to deliver a well optimised, public supported and government trusted product to be adopted by Australia and aims for the global market.

OBJECTIVE

The purpose of this position is to produce documentation for the CASD in usage, installation, maintenance and troubleshooting. It is important that products produced by ColourTech are of the highest standard which include professional user-friendly documentation. In order to meet this need, the team member will need to be involved in the development of the device in order to gain the best understanding of how it works.

The Development and Documentation Officer will be responsible for facilitating the company’s goals. This will be achieved by:

* Working closely with other members of staff to ensure the project stays on track and systems flawlessly integrated.
* Dealing with clients, suppliers and other employees professionally at all times
* Ensuring their workspace is always clean and presentable

REPORTS TO: Lead Developer

##### MAIN DUTIES/RESPONSIBILITIES:

* Ongoing improvement to systems by addressing feedback and problem solving any issues.
* Provide written guides for installation and usage
* Installing and developing updates where required

##### SKILLS & EXPERIENCE

###### Qualifications:

* Qualifications in Computer Science or relevant technical discipline or equivalent practical experience

###### Experience:

* At least 3 years programming experience in C++, working with opensource hardware devices
* Some experience in the motor vehicle industry
* Job placement of internship in similar or lower engineering position

###### Skills:

* Genuine interest in solving complex problems and providing workable solutions
* Ability to visualize processes
* Excellent verbal and written communication
* Strong project management skills
* A high-level of teamwork and communications skills.

#### JOB DESCRIPTION 3

JOB TITLE: Product Engineer

JOB TYPE: Full-Time

REPORTS TO: Any of the 6 founding members

OVERVIEW

At ColourTech, we are looking at making the roads of Australia a safer place for both motorists and pedestrians with our new speed limiting technology. With the lives of loved ones and friends of all Australians at the forefront of our minds, we aim to deliver a well optimised, public supported and government trusted product to be adopted by Australia and aims for the global market.

OBJECTIVE

The purpose of this position is to develop and produce high quality hardware for the Computerised Accelerator Safety Device which is designed by ColourTECH. This position must be able to work well withing the team to continuously improve the product and maintain the standards expected of a ColourTech product.

The Product Engineer will be responsible for facilitating the company’s goals. This will be achieved by:

* Working closely with other members of staff to ensure the project stays on track and systems flawlessly integrated
* Working with clients, suppliers and other employees professionally at all times
* Ensuring their workspace is always clean and presentable

##### MAIN DUTIES/RESPONSIBILITIES:

* Lead and develop plans and production of design for new product
* Review production process to ensure feasibility.
* Coordinate project to ensure deadlines are met
* Liaise with other members of production team to ensure company goals are met

SKILLS & EXPERIENCE

###### Qualifications:

* Bachelor of Engineering (Mechanical and/or Manufacturing)

###### Experience:

* Experience in the automotive industry will be an advantage
* Any previous usage of OBD2 Scanner
* Job placement or relevant internship in a similar or lesser position

###### Skills:

* Genuine interest in solving complex problems and providing workable solutions
* High level computer skills
* Ability to visualize processes
* Excellent verbal and written communication
* Strong project management skills
* Strong teamwork and communications skills.

#### JOB DESCRIPTION 4

TITLE: Product Tester

TEAM: Development

REPORTS TO: Lead Developer

##### OVERVIEW:

At ColourTech, we are looking at making the roads of Australia a safer place for both motorists and pedestrians with our new speed limiting technology. With the lives of loved ones and friends of all Australians at the forefront of our minds, we aim to deliver a well optimised, public supported and government trusted product to be adopted by Australia and aims for the global market.

##### OBJECTIVE:

The purpose of this position is to ensure the integrity of the Computerised Accelerator Safety Device before it is manufactured and distributed and to recommend improvements to the rest of the development team At ColourTech, we need our products to work exceptionally well and be completely safe before they are installed; these products are designed to save lives.

The Product Tester will be responsible for facilitating the company’s goals. This will be achieved by –

* Deiligently testing products for safet and effectiveness
* Documenting and reporting all work
* Communicating findings and recommendations
* Maintain an organised and tidy workspace

##### RESPONSIBILITIES AND DUTIES:

* Testing products
  + Testing that products meet safety standards
  + Ensuring devices function as they should
  + Noting any issues found
* Documenting and recording work
  + Document all tests performed
  + Identify and record findings objectively
  + Report any improvement opportunities
* Communicate with the development team
  + Maintain open communication with the rest of the team
  + Ensure safety concerns are reported at the first opportunity
  + Take onboard any specific tests requested by the lead developer

##### QUALIFICATIONS:

###### Level of Education

* University degree in engineering (mechanical or electrical) or similar equivalent qualification

###### Knowledge/Skills

* Fluent in the English language
* Previous job placement or internship in similar product testing or development position
* High level communication skills
* Knowledge of development practices

###### Personal Qualities

* Understanding and patience with others
* One to take initiative
* Willingness to learn
* Positive and outgoing personality
* Accepting of all others with extremely high professionalism
* Wanting to be a part of something bigger

# Group Reflection

## Tegan

The group worked exceptionally well together for this assessment. We obviously had to work through losing one of our team members without any notice, but most if not all of the group had personal issues going on in their own lives interfering with their capacity to attend meetings or do work assigned to them, but we all seemed to pull together, reassign tasks and use whatever means we were able to communicate issues and complications. We did find it difficult to develop the device itself as we just didn’t have the skills and experience required for the task, but we put a lot of effort into the planning and design work so that with the addition of maybe an engineer or two, we would be able to progress much further. Overall, I am very happy with how we worked for this task.

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