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Engineering Technical Report

Workshop & Practice

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Abbreviations	Meaning
Rav	Average wheel Radius
EC	Engineering Council
CTC	Classroom Training Course
BRA	Basic Rider Assessment

Table 1 Abbreviations (Flye, 2024)

2. Introduction

This assignment contains the Health and Safety regulations and acts that are maintained across the country that are used to ensure our safety within the workplace. These are conducted with thorough risk assessments and without them any task cannot be completed. This leads to the topic of what an engineer's role in society consists of, showing how they are the Backbone to a Modern Society as they play a part in Humanities daily lives. Furthermore, this report will cover how engineer's face the problems that occur on a daily basis and what it takes to be able to solve these problems.

Below, you will find a personal development plan that conveys the goals that have been set that are aimed to completed within a specific time frame.

The lower portion of this report will focus on tasks that have been completed throughout the course within the university workshops. This section discusses how teamwork was an important factor and how it was handled both positively and negatively.

3. Health & Safety with Risk Assessments

Health and Safety is the cornerstone to any task that may have potential risks involved, 'Hazards must be identified, the risks that are assessed and documented, alongside the practical processes produced, so others are not affected by the work done (Green, 1998)' this conveys that every task cannot be completed without a thorough risk assessment to ensure the safety of all personnel. While in university there are a variety of machines that all have the possibly of a hazard occurring, especially when working alone.



Figure 3-1 Pillar Drill in Fabrication Workshop (Flye, 2024)

Within the fabrication workshop there are various, potentially dangerous machines. For example, the Pillar Drill, at just a glance many hazards can be identified as there is no guard for the user to protect themselves from swarf that could break off, which could cause cuts or potential burns. Another dangerous risk is the vice that holds the material not being clamped to the table enables the hazard of the work piece coming loose and causing the operator bodily harm. When working within the workshop the correct PPE should be worn at all times, these include the basic overalls to protect your body and skin when working with metals and machinery, Steel toe-capped shoes or boots to ensure the safety of your feet in case of materials or tools falling from the work bench. Finally, safety goggles must be worn and as stated by '(Tarlengco, 2024) They should meet the requirements of ANSI Z87.1 eye protection standards', ANSI Z87.1 standards state the minimum thickness the lens of safety goggles can be with that being no smaller than '2.00mm, with no maximum thickness (Vitale, 2015)'

When using the equipment found with the workshops at the university a qualitative risk assessment matrix was able to be conducted and documented, A risk assessment matrix conveys the likelihood against the severity of the consequences, this provides a clear and concise sheet of data that can be easily interpreted by any personnel within the workshop. There are many types of risk assessment matrix's, another matrix that could improve the efficiency is a quantitative assessment which 'uses numerical values to evaluate the likeliness and the impact (Sild, 2024)' this would create more precise probabilities for the hazards to occur. Furthermore, with the data collected from the workshop all the potential hazards that could occur on a daily basis to those that are very unlikely to occur however still having the slight possibility of occurring have been documented in the table below.

	Risk Assessment Matrix in the workshop				
	Insignificant	Minor	Moderate	Major	Severe
Very Likely	Pinched finger in the vice	Small cuts on the end of fingers due to the wire wheel	A piece of skin filed down with the grinder	A chunk of skin removed with the Grinder	Hair caught in the Pillar Drill
Likely	Bruises Caused by the wire wheel	Broken Guard	Overheated material, small blister	Hair caught by the wire wheel	loss of finger
Possible	Metal splinter	Drop material on foot	Machine breaks down	Lack of ventilation	Swarf caught in eyes
Unlikely	Wrong tools in place	Wet floors	Electrical fires	Live wires	3rd Degree burns
Very Unlikely	Clutter	Small shock	Metal thrown across the room at high speeds	Loss of a limb with the machines	Loss of Life

Figure 3-2 Risk Assessment Matrix of the Workshop (Flye, 2024)

4. Engineers Role in Society

What is an Engineer? What are their responsibilities within a society? As stated by '(Baillie, 2006) they have a responsibility to themselves, to the workplace and the society in which they reside' this leads to the code of conduct or ethics that are placed upon engineers from their employers of which they have to follow tightly. This led to the conduction of research upon two different companies those being IMechE and EC, they have a thorough code of conduct that all their employees have to uphold.

IMechE code of conduct states, 'our engineers must consider the needs of a diverse environment, while never exploiting its resources (IMechE team, 2024)' Which is an important factor when considering the development of future engineers as resources are finite, so all resources need to be documented to ensure there is a place for Motor vehicle's within the future. Especially with motorcycles as they are more sustainable in the long run as they require less fuel while still maintaining the power of a car.

EC code of conduct in regard to sustainability states ' that engineers should recognise even if their task is preformed local it may cause impacts globally or throughout supply chains (EC, 2023)' this conveys that no matter the task even when sourced locally which is sustainable within itself could impact the way companies run as a small change can affect the whole line, As the resources could diminish or the work ethic could be disrupted. Both companies have well established codes of conducts that their engineers must abide by to ensure the motor vehicle industry and environment doesn't collapse.

5. Team structure

Team Structure is a key factor that needs to be precise and cooperative, as ‘the success of a task depends on the team, a team that has commitment and desire to succeed (Smith, 2002)’ while at university I have experienced various task that involved that teamwork that depended entirely on each other. While attending my course in Motorcycle technology, we used a process-based structure as me and other team members were tasked to calculate the centre of gravity for three different Motorcycles that varied in size and weight. I was given the role of the rider that had to sit on the motorcycle and hold a certain position for both level and when the rear wheel was lifted, while my partner had to balance the bike with only one finger on each hand as to keep the bike straight and not to vary the results. The other team members were tasked with calculating the wheelbase, front and rear wheel radius and R_{av} .

This Team structure worked well overall as me and my partner have confidence in riding motorcycles so we able to hold the motorcycle straight and in the correction seating position in both situations, however as the motorcycles got heavier this became harder to maintain especially while the rear end was lifted. Prior to the weights being calculated the other team members worked out the other measurement’s required for the final calculations, although they were accurate they had never used any of the equipment, so the process was slowed.

Though, through research I have found that a horizontal team structure would be applicable to this type of task as ‘personnel have defined roles without any other member of the team being the leader, they all have equal status (Indeed Editorial Team, 2024)’ this type of structure would increase trust amongst the team, which would reduce the risk of injury when seated on the motorcycle this then increases the efficiency and accuracy of the calculations.

This is a Flow diagram that I have created to represent what a horizontal team structure would look like if used with the task that we were given. As shown below, the flow diagram shows that each individual team member under the lecturer is equal in status, while having their own personal task to complete, however once completed all members share the task of calculating the centre of gravity with the information recorded.

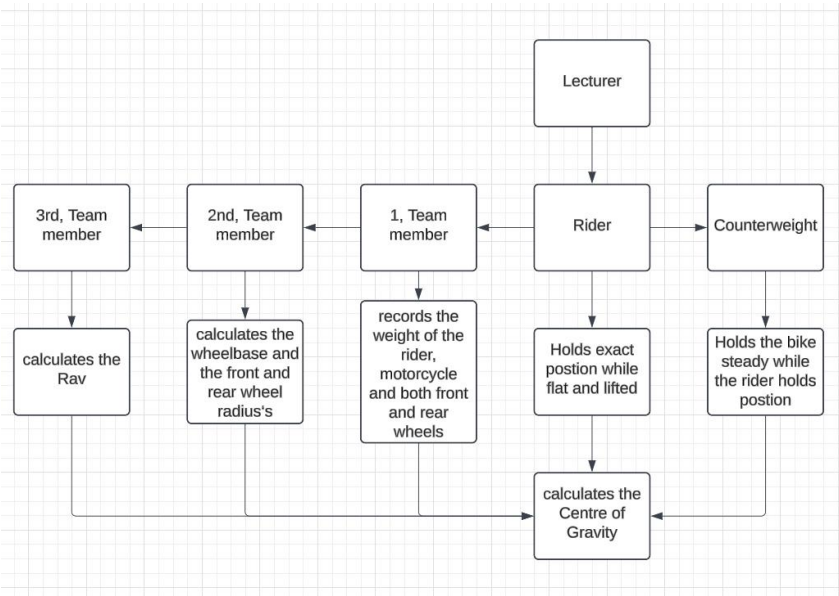


Figure 5-1 Flow Diagram Showing a Horizontal team Structure using the website Lucid (Flye, 2024)

6. Problem Solving

Engineers uphold a high standard when conducting task. However, they are still faced with issues that they have to overcome on a daily basis. There are many common problems that could occur such as design issue that occurs during development, which can be easily solved when found within early development.

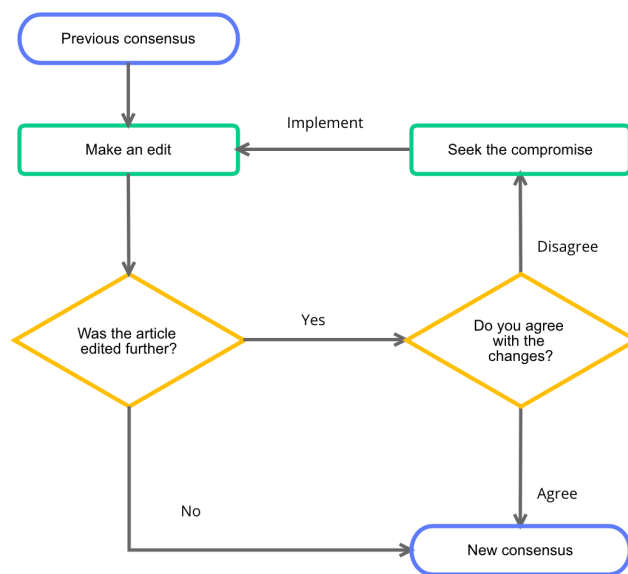


Figure 6-1 Flow Diagram that shows the process of altering a design (nulab, 2024)

This is a flow chart that similarly explains how this issue could be corrected as the initial design can be altered then processed through a floor manager or team leader that can swiftly sign the new design off and the production line can continue without a disastrous delay.

Another problem that could arise is after the product has left the factory and has been placed on the market, the flow diagram below shows the whole process of production, when the product has been sent to the market a negative response could occur which can be solved via stopping the production and recalling all the products. Once the products have been recalled a new design can be created, assessed and re-processed through the floor manager or team leader, and then tested in the market by sending out samples to engage with the target market.

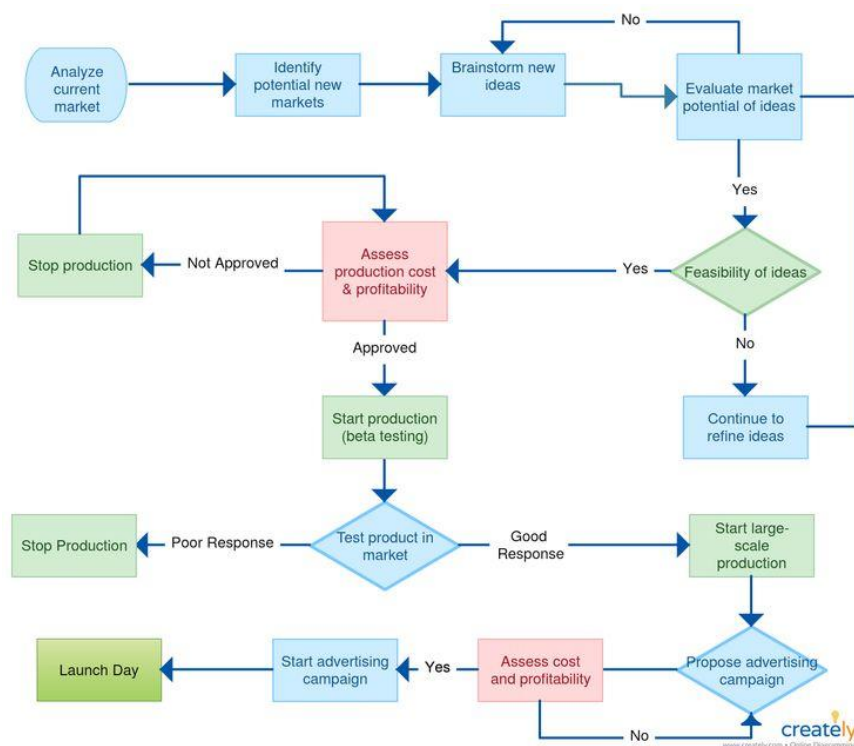


Figure 6-2 Flow Diagram showing the entire process of production (chamod, 2024)

Furthermore, a final issue that could occur is a problem with the supplier or the supply chain during the production of the product. Where either the supplier cannot supply the resources that were chosen, or the price margin has risen for the desired resource. The flow diagram below shows the supply chain for a manufacturing company and how each department is orchestrated. For the manufacturing company to solve these issues they would have to either redesign their product to suit a new material or increase the budget for their project so that they can use the current material. Although using a new supplier that could produce the resources would be more efficient, however this will affect the scheduled time frame for the product to be made.

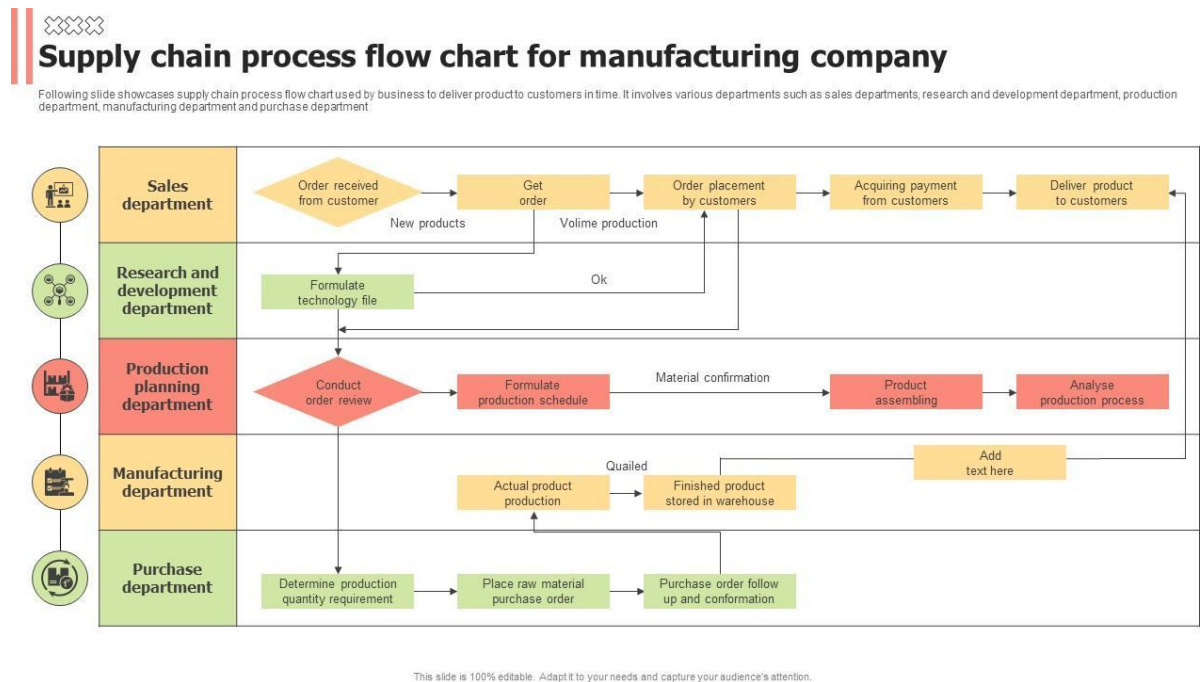


Figure 6-3 Flow Diagram showing the supply chain (SlideTeam, 2023)

7. Personal Development Plan

Below you will find the Personal Development Plan I have completed to show the goals I have set myself for the years to come after I have finished my time at university, with experience I have gained prior to university, it will enable me to start these goals as soon as possible.

Long Term Goals (5 to 10 years)

In the long term I hope that my previous endeavours within the manufacturing industry would lead me to MotorGP or Motor-cross World Championship as I would hope to work within the pit as it is fast paced and competitive with the skills I will gain throughout the years this would be feasible with the correct connections. However, after I plan to own my own business within the motorcycle world either creating motorcycles for racing purposes or for everyday riding with new designs that have both performance and luxury.

Short Term Goals (0 to 5 years)

For the short term I hope to be working under someone with the motorcycle industry, mainly in the manufacturing sector, where I can design motorcycles or re-design previous motorcycles for bigger corporations to be used within the racing industry or just for commercial use. As I have a compelling passion for working with machinery and motorcycle bodies themselves.

Goal	Objective	Resources Required	Measurement	Target Date
Work in a repair garage tailored to motorcycles	Gain Knowledge and experience around how a motorcycle works	Have previous experiences and a full CV	Getting references and feedback from employers	Within the year (2027)
Learn how to compete in Racing Motorcycles	Learn the basics and fully understand how a Motorcycle operates when driven under high speeds.	Obtain a Road racing license Complete the CTC course and BRA course	Complete a racing course/track day, Pass the CTC and BRA	Within the year to next year (2027-2028)
Work underneath a manufacturer for motorcycles	Further my knowledge within the industry,, understand complex machinery and programming to be able to create designs.	Obtain university degree. Previous experiences within the industry	Passing the probation period and any assessments. Getting references from previous employers	Within the next 3-5 years (2030-2032)
Work For MotorGp	To work within the pit to experience the fast paced and competitive work style and work first hand on the racing strip.	Obtain University Degree, make connections through university and companies	Have previously worked on motorcycles during track days, and gaining references from them, keeping in contact with connections	Within the next 6-9 years (2033-2036)

Start my own business in the Motorcycle industry	To start my own business, creating, repairing and modifying Motorcycles in both the race industry and the commercial industry.	Have prior connections to investors or possible partners. A full knowledge of the business itself	Finding premises, obtaining a loan if needed. Finding employees, advertisement, investments	Within the next 9-10 years (2036-2037)
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Table 2 Personal Development Plan (K.Tudor, 2024)

8. Conclusion

To conclude Health and Safety is essential within the workplace, as it is a factor in every task that is completed, especially in teamwork and problem solving as that is when problems can occur often. In regard to engineers across the spectrum they should all follow the guidelines and code's of conducts that have been set in place to ensure the safety of themselves and others, while also protecting the environment around them no matter how insignificant.

Team structure and problem solving are where engineers are at their best as there are many minds are able to collaborate to solve any issue that could arise while working on a project, while maintaining a strict health and safety regulation.

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