



University of Wales Trinity Saint David
Wales Institute of Science and Art

Engineering Technical Report
ACHA 4011

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1 Introduction

This report will cover 5 different topics that are important in engineering. Each topic will be specific and have relevant research to clearly evaluate what it is and its role inside of engineering. The topics you can expect to find this this report will be:

2) Health and safety, the focus for this topic will be the effectiveness of different safety methods and how they used to be compared to the set standard requirements in the modern day.

3) Engineering roles in society, this topic will talk about how engineers must take society's thoughts and ideas of what they want and convert those into realistic possibilities to aid and improve life.

4) Problem solving, this will show how a team of engineers can work together and overcome various amounts of different problems to have a strong concept design for the final product.

5) Team structure, this will talk about how to structure a team of engineers based on various strengths and weaknesses to put the team in the best position to achieve a common goal. This will be a major factor to problem solving success, it will also show the comparison of different types of team structure and how they would work.

6) Personal development plan. This is a plan for short- and long-term goals I would like to achieve in my career of engineering.

Each of these topics will have further analysis to give further discussion points. All specific factors for each topic will be covered to ensure that there is enough relevant information found via research. A conclusion of these 5 topics will be at the end of the report to summarise the findings and give a final clear overview of the report.

2 Health and Safety

The Health and Safety Assessment are being done on the task of using the lathe (Lathe: *machine used for cutting and shaping metal*), typical accidents from the lathe manually operated machine had a 72% rate of accidents found in a safety check assessment in mid-1982: but was reduced to 55% 4 years later in the second safety study which happened for the whole year of 1986 (1). The use of goggles and face shields (1) was implemented in 1984 to reduce the risk of injury from chips of metal. A chuck guard became necessary for the machines which further reduced the accident rate as it guarded you from the spinning chuck and potentially getting your hair, long sleeves trapped in the machine (1). Gloves were not allowed on lathes either as when placing the piece of metal into the chuck, gloves can get tied up and trapped in the lathe. Brakes were another safety feature implemented to reduce the run-down time, so if someone did get stuck into the spinning chuck it would reduce the severity of the injury. Lighting around the lathe had to be good to ensure that the user had good vision of what they were doing, this reduced injury risk as users of lathes could see better and wouldn't misplace their hand and could see the metal work was secure inside the chuck. An Emergency stop button was also implemented into the machines for if the user found themselves entangled in the equipment.

2.1 Required PPE

Required PPE for a lathe is steel toe capped boots (2) to protect the user from dropping heavy metal onto their feet and injuring their feet. Protective glasses are required to massively reduce the risk of having metal chips hit you in the eyes, risking damage, blindness. A dust coat or appropriate attire for metal work machining is also required, to reduce metal chips from cutting the skin and causing infection.

		Severity			
		NEGLECTIBLE small/unimportant; not likely to have a major effect on the operation of the event / no bodily injury to requiring minor first aid injury	MARGINAL minimal importance; has an effect on the operation of event but will not affect the event outcome / requires medical treatment	CRITICAL serious/important; will affect the operation of the event in a negative way / suffers serious injuries or medical treatment of minors	CATASTROPHIC maximum importance; could result in disaster/death; WILL affect the operation of the event in a negative way / death, dismemberment or serious injury to minors
Probability	LOW This risk has rarely been a problem and never occurred at a college event of this nature	LOW (1)	MEDIUM (4)	MEDIUM (6)	HIGH (10)
	MEDIUM This risk will MOST LIKELY occur at this event	LOW (2)	MEDIUM (5)	HIGH (8)	EXTREME (11)
	HIGH This risk WILL occur at this event, possibly multiple times, and has occurred in the past	MEDIUM (3)	HIGH (7)	HIGH (9)	EXTREME (12)

Explanation of Risk Ranking		
LOW	MEDIUM	If the consequences to this event/activity are LOW / MEDIUM, your group should be OK to proceed with this event/activity. It is advised that if the activity is MEDIUM, risk mitigation efforts should be made.
HIGH		If the consequences to this event/activity are HIGH, it is advised that you seek additional event planning support.
EXTREME		If the consequences to this event/activity are EXTREME, it is advised that you do not hold this event without prior consultation with Risk Management.

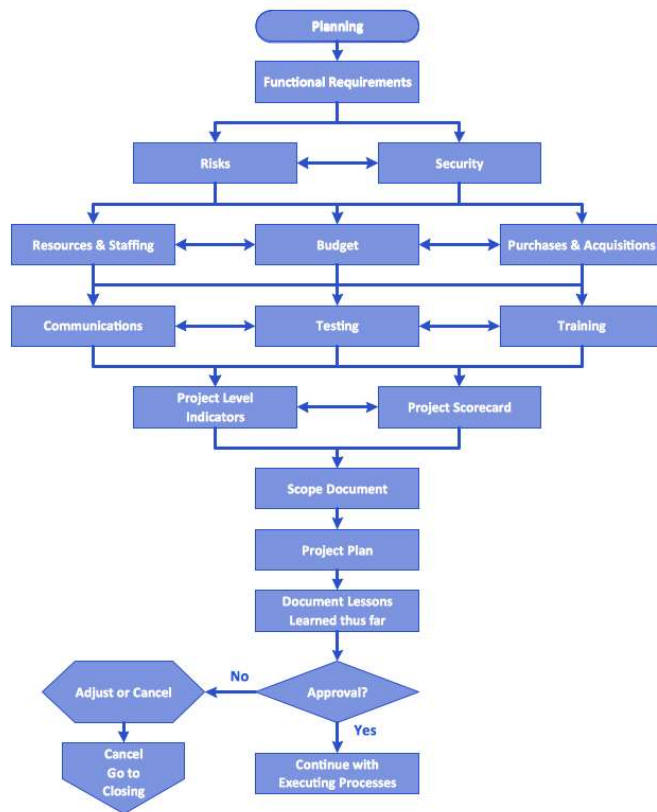
(Figure 1) (3)

Using this risk assessment matrix, this task is deemed to be medium to high-risk activity as none of the injuries will be fatal but can be very severe ie. Getting trapped in the machine. On the other hand, they can also be negligible and do very little harm ie. Cutting a finger on a metal chip.

3 Engineers Role in Society

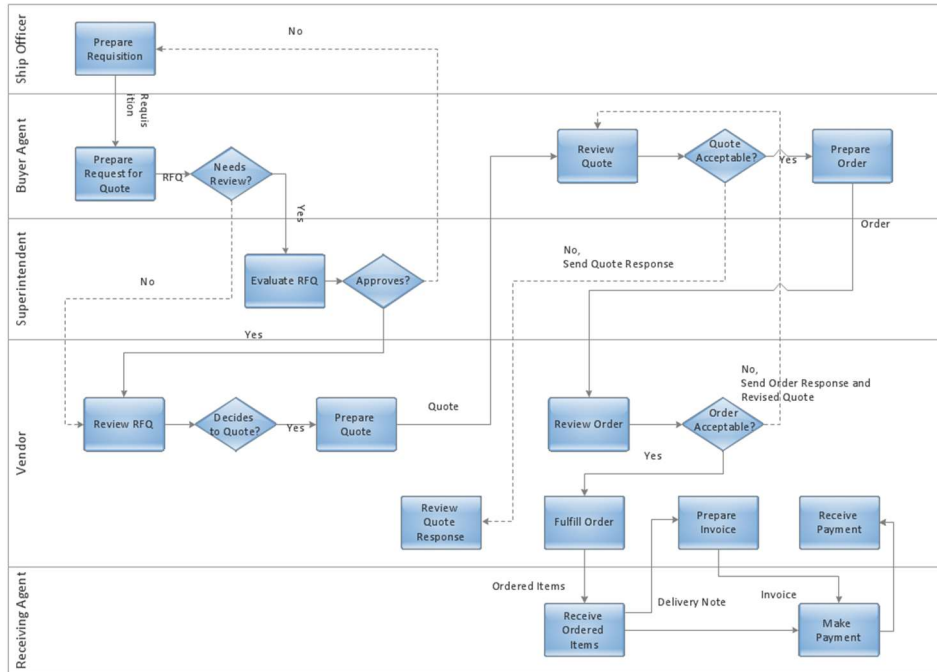
Engineers role in society is important as they use scientific and mathematical principals to fulfil the societal interests. Engineers are professionals that use the skills they learnt through education to find solutions for society to make major life improvements and to make processes as efficient as possible (4). The national society of professional Engineers have released a statement of the code of ethical conduct including Hold Paramount safety to the public, perform services only in areas of competence and conduct themselves honourably, responsibly, and ethically. Holding paramount safety to the public is a conduct when engineers find solutions to problems that are not only low risk to the public but also solve the problem most efficiently. Engineers also must be creative minds to find new technologies to accommodate for the demands of society, this links to NSPE's code of conduct performing services in their areas of competence (5)(9). This can be difficult as for example, making a new phone must have enough increase in advancement for people to want to buy it but also must be at an affordable price, so engineers are useful to find the best medium for this criterion. Environmental effect for engineers is a big topic because they cannot make anything that is worse for the environment because as a society, they are already working to reduce co2 emissions as an entirety "conduct themselves honourably and ethically" (8)(9). Cars and Engines is still an ongoing issue for engineers as they are trying to find a way to make 0% emissions, so we don't have to go to completely electric vehicles (8). Engineers adhere to all the principles stated above as per the engineering councils statement of ethical principles (10)

4 Problem solving



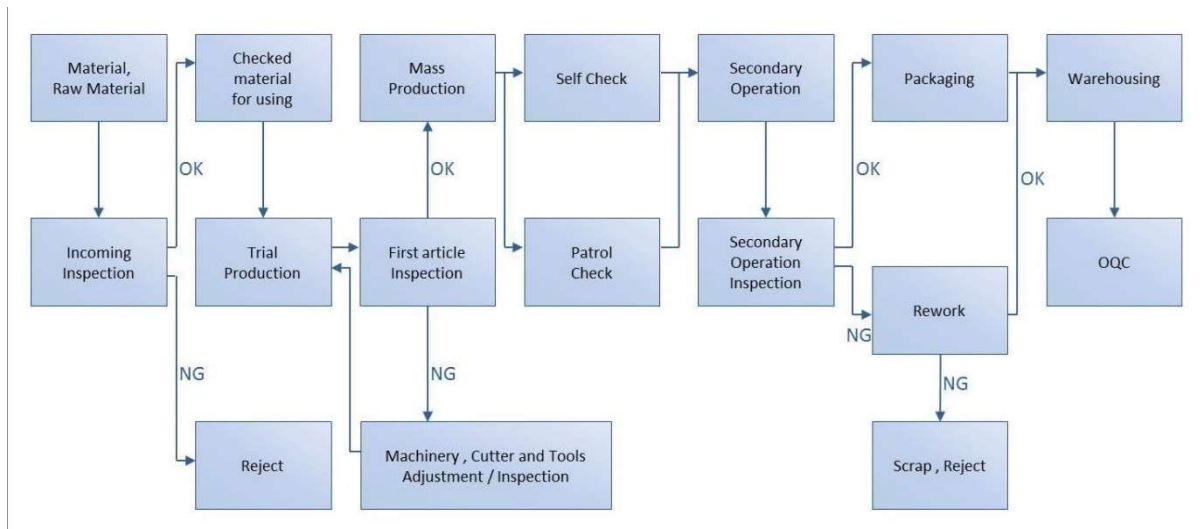
(Figure 2)

a) This is a flow chart based on the development process and it shows how to solve problems at different stages of the development period. For example, you need to evaluate whether to take risks or go for complete security, then the next step would be to figure out the resources required, the number of staff needed, budget, and what purchases to be made early. All these aspects have major tendencies to affect the budget so this should be the first decision to be made on how big the budget is. The next issue that can happen is having under trained staff, testing of the product and communications within the team. If communications are the problem, then the team structure should be re-evaluated so that it is clear who the team leader is and that the staff know who to talk too, also that the team leader is adequate for the position and is conveying his ideas to the rest of the team efficiently.



(Figure 3)

b) When the product is on the market there can be multiple problems with getting reviews, preparing invoices for customers, and creating quotes for the customers and judging if it is acceptable. This flow chart shows how to overcome those issues and what protocols to use to find common solutions.



(Figure 4)

c) This is a Flow chart for the production process in a manufacturing business and it shows how it all happens and how to fix certain problems. For example, checking material conditions for usage, if the materials are in good condition, they can be set for a trial production and if they are in poor condition then they must be put separate for waste. This is bad because wasted materials are wasted money which the budget has been spent on. Another example could be the secondary operation inspection, this could cause a big problem for profit as a lot of money is usually already spent to get to this step of production, so if the operation has malfunctioned and ruined the product there is even further waste of money, this could further lead to a machine breakage to severe condition. This means that deadlines for complete production would be missed affecting the whole process.

These 3 flow charts that engineers need to have the ability to adapt to different situations effectively and quickly to ensure that the process isn't affected. Engineers are also expected to have subject matter of expertise but also an advanced knowledge of strategy (7). Combining both attributes ensures that the problems can be attacked efficiently (7).

5 Team Structure

I've had to use team structure for a long period of my life as I played rugby for 5 years, and team structure in rugby is very important because you must work together to overcome the opponent and win the game. This involved communication between the captain of the team and the rest of the players, a positive of this is that everyone will understand the common goal and how to execute the plan to succeed: but a negative of this is that people use communication to express emotions which can lead to arguments if some players were aggravated. In rugby everybody is assigned a position and a role within the team, this is useful because everyone will know how to do their individual role to work as a team and achieve the desired goal. Team cooperation is a big part of rugby as sometimes you need to be selfless to help everybody out instead of just thinking about yourself, as in a team sport everyone needs to play a part to succeed. This type of team structure is called centralised, as there is a clear central line of communication via the team captain and each role has well defined responsibilities (6).

An opposing style of team structure could be that everybody is an equal role and trained the same so that instead of all players having different roles within the team they all have the same and just play to what the team needs at the specific moment. A negative to this is that having a team captain can create jealousy leading to conflict between players where in this type of team structure everyone is equal. A negative to this is that it can easily create confusion and lack of direction if people aren't sure of what they are needed for as some players could be better at thinking of their feet than others. This type of team structure is called decentralized as there is cross collaboration between roles, this is an advantage as it keeps the team very agile and adaptive (6).

6 Personal Development

Name – Jake Davies

Degree – Motorcycle Engineering

Previous Qualifications – A Levels, GCSE's

Previous Experience -

Long Term Goals (5 to 10 years)

In 5 – 10 years I would like to be working in the paddock of MotoGP as a team engineer preferably as a crew chief for the rider. A team engineer adjusts the bikes settings due to how the rider conveys his feelings after riding on track. A crew chief talks to the rider personally and gathers the information and then tells the rest of the team how he is feeling and what to do with the settings of the bike.

Short Term Goals (0 to 5 years)

I would like to complete my degree in motorcycle engineering and get a job inside the motorcycle racing world to gain experience on my way to work for MotoGP. This means that I would like to get a job in Moto3, Wsbk and Moto2. If this doesn't happen I would like to work in a motorcycle mechanics workshop.

Goal	Objective	Resources Required	Measurement	Target Date
Complete my degree in motorcycle engineering.		Passing 1 st , 2 nd , 3 rd year of university	Getting the certificate on graduation day	2026
Work for MotoGP as a race engineer		Race engineer experience	Signing a job contract with a MotoGP team	2030

		Motorcycle engineering degree		
Get a part time job	To further develop Interpersonal skills	I will need to write a cv and a cover letter	Being able to add this experience onto my personal cv	May 2024
Improve my mechanical skills.	Modify my car	Vehicle, tools, new parts	The Parts are fitted correctly and the car runs properly	Summer 2024
Improve my physical health.	Attend the gym 4 times a week for 6 months	Gym membership, motivation, dedication	Completing a fitness journal to record my progress	June 2024

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