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Engineering Technical Report

Workshop and Practice (ACHA4011)

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1. Introduction

This report is an overview of many of the parts of engineering that are often overlooked in favour of the more technical aspects. While the technical aspects engineering is vastly important, there are many other aspects that must be considered when undertaking an engineering project. These include, but are not limited to, Health and Safety, the role of engineers in society, Problem Solving, Teamwork and the personal development of all members of a team involved in a project.

All these additional components of engineering are just as important, if not more so than the designing, testing and production of products. This is because without these elements an engineer, or engineering team, would not be able to move forward successfully and efficiently and innovate.

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2. Health and Safety Risk Assessment

A common activity undertaken within the university is the use of large machines such as lathes and mills for creating metal components. These machines come with an inherent risk while using them, but steps can be taken to mitigate this risk. Some of the risks of using a lathe include loose hair or clothing becoming entangled in the machine, Work pieces and tools being broken and ejected from machines^{2.1}, and Pieces of Swarf being ejected towards the users' eyes.^{2.2}

Health and Safety in the workplace in the UK is covered by: 'The Management of Health and Safety at Work Regulations 1992'^{2.3} which lays out rules for Employers and Employees to ensure Health and safety within the workplace. This is vital to ensure no unnecessary injuries or death occur due to negligence or cost cutting as it lays out a minimum that all people must follow.

To minimize the risks from using a lathe, certain steps can be taken to ensure there are no injuries. The first step is to wear appropriate PPE. This should Include safety glasses and steel toe boots^{2.2}. It is also advised for users to wear some kind of overcoat to protect their arms and torso from hot swarf while using the machine.

Another Important step is for the user to be aware of all the emergency stop buttons and features both on the machine and around the workshop. These usually include a large mushroom headed emergency stop button near where the operator will typically stand. There will also be isolation switches around the workshop which will also cut power to the machine.

It is also essential for other people around the workshop to be aware of their surroundings as they should also keep an eye out for someone who is in danger and cannot reach the emergency stop themselves. This could be caused by someone's arm being dragged into a machine and them being unable to reach the emergency stop button themselves.

Health and safety regulations in the UK are also broadly Covered by The Health and Safety Executive (HSE) who also publish guidelines specifically for engineering and workshop safety, such as articles specifically about the dangers of Lathes and the cleaning of them.^{2.4}

Risk assessment Matrices can be used to evaluate the potential hazards of any given process, weighing the likelihood of an incident taking place against the potential damage such an incident could cause. These can then be used to establish Health and Safety Practices within the workplace. An Example of a Risk assessment Matrix is shown in figure 2.1.

Description of procedure	Lathe
Location of procedure	Machine work shop building 301
Persons who may be affected by the procedure	Anyone who uses the machine or is in the workshop close to the machine

Section A- Mechanical Hazards														
1	Entanglement	Y	6	Impact	N	11	Electricity	Y	16	Substances	Y	21	Control System	N
2	Friction / Abrasion	N	7	Stabbing / puncture	Y	12	Noise	Y	17	Lighting	Y	22	Ergonomic	N
3	Cutting	Y	8	Ejection of material	Y	13	Hot / Cold Surfaces	Y	18	Stability	N	23	Human error	Y
4	Drawing-in/ Trap	Y	9	High Pressure	N	14	Vibration	N	19	Slip / Trip	Y	24	Crushing	Y
5	Shear	N	10	Other		15	Radiation	N	20	Controls	N	25	Collision	N
SECTION B : Second Stage Assessment For each hazard identified in Section A, complete Section B							S = Severity L = Likelihood Risk rating h = high(3) m = medium (2) l = low (1) Severity X Likelihood = Residual Risk							
1= low risk; 2, 3, 4,= medium risk- control measures required; 6, 9=high risk- only undertaken with consent.														

Hazard No.	Hazard Description	Existing Control Measures	S	L	Residual Risk
1	Rotating chuck/work piece could catch long sleeves, long hair, chains, jewelry;	All sleeves to be pulled up, hair to be tied back or under a hat, anything dangling must be removed like jewelry, ties, chains.	3	1	3
3	All materials or swarf to be disposed of safely All materials could have sharp edges Cutter could have sharp edges	Swarf to be cleaned down using a brush not your hand All materials deburred Cutters to be held by the non-sharp end	2	2	4
6	The chuck could pull you in and trap	Guards to be provided students not to place hands anywhere near the moving chuck	3	2	6
7	Sharp or pointed tools, material could stab or cut someone, drills or steadies can cut	All tools to be placed securely or carried in a safe manner with the sharp end pointing down not do not leave drills in the tailstock	2	2	4

Fig 2.1 – Example of a Risk Assessment Matrix^{2,5}

3. Engineers Role in Society

Whilst the title of 'Engineer' isn't a protected title in the UK, unlike other countries, the Title of 'Chartered Engineer' is. Because of this, Chartered Engineers are held to a much higher standard.^{3.1} One example of this is The Institution of Mechanical Engineers, and more specifically, their automobile division. The Institute of Mechanical Engineers offers multiple levels of accreditation to its members, Starting with Student Affiliates, then moving up to Associate Members, Members and Fellows^{3.2}.

They also offer the option to become an Engineering Technician with a Level 3 equivalent award in an engineering field, an Incorporated Engineer with a bachelor's level degree, or a chartered engineer with a master's degree.^{3.3} Getting chartered is important for engineers as it proves that they are a competent engineer, as well as improving long-term earning potential and opening new career opportunities. On top of this, IMechE certification is internationally recognised.^{3.4}

The National Society of Professional Engineers publishes a code of ethics that covers many subjects including honesty and integrity, as well as their professional obligations.^{3.5} This code of ethics is essential as it ensures that all engineers are held to the same standard of professionalism, as well as ensuring no harm is caused to the public who may be less informed to dangers than engineers and designers may be.

Another key role of engineers in society is ensuring that all activities are as environmentally sustainable as possible. This includes minimising waste, using energy from renewable sources, and reducing pollution output. An overview of this is given by The University of Strathclyde.^{3.6} This includes sections on sustainable materials, waste management and Corporate social responsibility.

4. Problem Solving

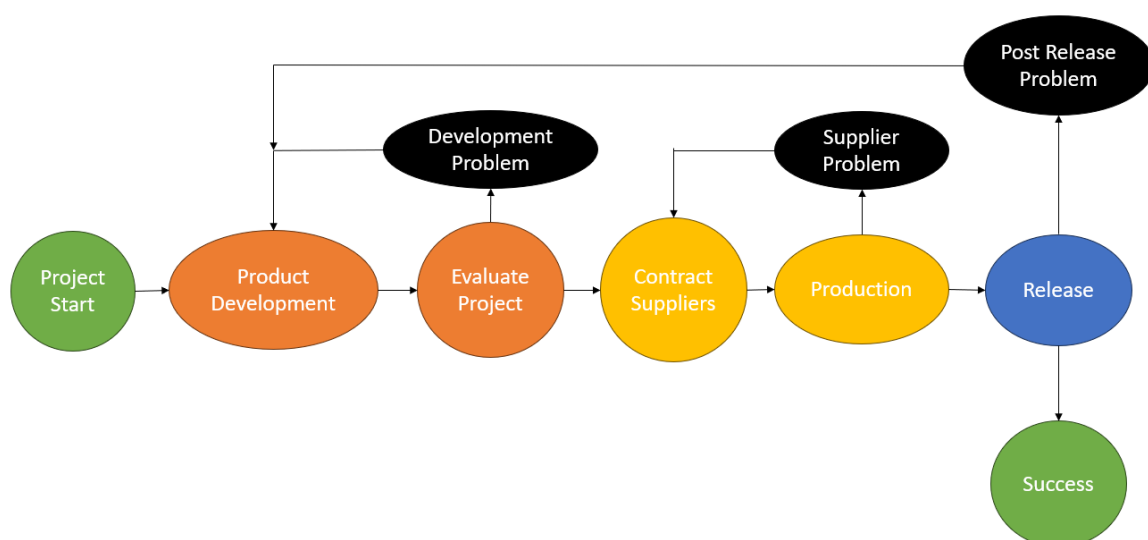
A key part of an engineer's job is solving unforeseen problems as they arise. There are multiple different stages where a problem could arise, ranging all throughout the design and life cycle of a product.

The first place a problem could arise is during the development of the product. An easy way to solve this issue is to first find out if this problem has been encountered before. If it has, this makes it relatively easy to solve as it may be possible to implement this solution into the current problem. If this isn't possible, or if the problem hasn't been solved before, then the best option is to identify the problem and break it down into its core parts. This leads to a lower workload and allows better understanding of the issue.^{4.1}

Another place a problem could be found is after a product has already been taken to market. This is more difficult to solve as the customer also needs to be considered. The main option for companies when a serious issue is found after it has been released is to issue a recall. This can be problematic as it can prove to be very costly for a company to recall a product as they also must refund the customer. A recall can also affect consumers trust in a company as they may see the company as unreliable.^{4.2}

A final place an issue could occur is when dealing with suppliers. If this issue arrives before an agreement is reached, it is easy to find a different supplier. However, if this issue arises with an existing supplier, then options are more limited. To solve this problem a company will have to negotiate with the supplier to come to a better agreement.^{4.3}

Fig 4.1 Flow chart of problem solving.



5. Team Structure

Teamwork is an important part of any project that requires more than one person. In this section I will be discussing a previous experience of when I have worked in a team and evaluating it. For this report I will be discussing my time working as a bartender at a cocktail bar. Whilst I worked there was a rigid structure of management, starting at the top with the corporate managers, which I will not be covering in detail as I do not have much experience in that area. For my report I will be discussing roles from the General Manager down to bartenders and floor staff.^{5.1}

The general manager oversaw all operations of the bar and would typically not get involved in much of the day-to-day activity of the bar, instead focusing on more long-term goals. Under the general manager there was an assistant general manager who covered some of the General managers duties on their day off, as well as overseeing the hiring of new staff.

Under these two roles was the role of Kitchen Manager and Bar Manager. These roles oversaw their individual departments and were much more involved in the day-to-day activities of the bar but were less likely to directly manage the staff. Their duties typically include ordering stock, managing inventory, and deciding the menus.^{5.2}

Below this the bar had supervisors who more directly instructed staff. There were many more supervisors than managers, and these were organised into either general supervisor, floor supervisors, bar supervisors or kitchen supervisors. This level of management mostly dealt with day-to-day issues with staff as well as directing the staff and setting targets for them.^{5.3}

Finally, the lowest tier of this structure was the regular staff. This included Floor staff, Kitchen staff, receptionists, game hosts and bartenders, as well as occasionally cleaners. This level of the structure completed the tasks set by management and had no one to direct of their own. They also were responsible for the customer experience as management would interact with customers less often.

Overall, this structure was quite effective as it allowed relatively inexperienced people to be able to effectively complete their tasks under the supervision of the more experience managers. However, there could often be confusion as to who to consult in the event of a problem, as the multiple layers of management and responsibility could make it difficult to determine who was responsible for the problem that was being encountered.

6. Personal Development Plan

fig 6.1 – Personal Development Plan

Long Term Goals (5 to 10 years)				
Working as a Motorcycle Engineer a at large company.				
Short Term Goals (0 to 5 years)				
Achieving Degree in Motorcycle Engineering.				
Goal	Objective	Resources Required	Measurement	Target Date
Obtain Degree	Pass all modules	Studying and focus	Degree obtained	July 2026
Find Part time work	Get a job to cover student expenses	Applications to jobs	Working a part time job	March 2024
Gain Experience in Engineering	Do work experience/ Placement	Career Fair/ Careers Department at university	Experience gained	End of 2025

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