

University of Wales Trinity St David

Institute of Science and Art



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Engineering Skills Technical Report

Engineering Skills (ACHA 4022A)

Gabriel Bromelow

2416907

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1 Introduction

This report will look at engineering, its role in society and the responsibilities it needs to maintain as the most fundamental industry on the planet. It will look at a few real-world examples of risk within the industry analysing some risks and potential solutions, as well as the more social aspects such as team structure.

2 Health, Safety and Risk Assessments

2.1 Risks within Engineering

The Lathe is a heavy piece of machinery that works by spinning a workpiece within a chuck and moving it against a cutting tool which removes material until the desired product is achieved. Though the lathe is useful to produce engineered items it is a dangerous machine that can injure if used without due caution.

The supply of machinery safety regulations, 2008 [1], outline the rules that must be followed when operating machinery, a few of them are as follows:

- Regular maintenance must be carried out on the machines to ensure proper working order and no 'Malfunctions'.
- Operators must wear suitable PPE (At UWTSD this includes, an issued button-down shirt, steel toe capped boots and when operating machinery one must be wearing the supplied safety goggles).
- Either competence with the machinery or being supervised by a competent party.
- Keeping the operating area clear of swarf and debris before and after operation.
- Maximum amount of time one can operate a machine.

Hazards	Associated Risks	Persons at risk	Steps to Avoid Risk	PPE	Likely Hood	Severity
Spinning machinery	Cuts, getting caught in machine,	Operator	Use correct PPE, no loose clothes/hair	Steel toe boots, goggles, protective shirt	Medium	High
Sharp Swarf	Metal splinters, cuts, getting caught in machine, Burns	Operator	Clear station at regular intervals	Steel toe boots, goggles, protective shirt	Low	Medium
Pieces Coming Loose	Blunt force impacts, cuts, damage to machine	Operator, persons nearby, collateral damage to environment	Correct checks before use	Steel toe boots, goggles, protective shirt	Medium	High

3 Security Risk Matrix

3.1 Modern Risks to the Automotive Industry

In today's society technology has become more prevalent in everything we do, especially in the cars we drive. Electric vehicles though having been around since the early 1800s are more developed and integrated than they ever have been, however, this comes with the guarantee of more risks.

Electric cars such as Tesla are well known for their automatic driving capabilities, despite not being advertised as a totally autonomous vehicle, one of the dangers they bring is people being "asleep" at the wheel. In August 2025 Tesla was found partially liable for a fatal car crash [2]

As cars become more advanced and reliant on technology they are opened up to more security leaks such as hacking which can expose hackers to customers private information [3]

In connection to cars becoming more autonomous they are also getting bigger, looking at the Ford Ram which is nearly two tonnes in weight has a bonnet. Height of about 45 inches, which proposes greater risks to children especially in residential areas [4]

A middling risk of electric cars are the ranges which causes 'range anxiety,' though many electric cars have a range of over 300 miles [5] the average is around 260, when electric cars run out of range it causes greater damage to the battery health and are a greater inconvenience to get moving again in comparison to combustion engine cars.

Consequence

Low > High

Medium	Medium	Very High	Very High	Very High	Likelihood
Low	Medium	Customer Information Leaks	Very High	Risk of High Bonnets	High
Low	Medium	Medium	Medium	Very High	^
Low	Low	Medium	Medium	Crash Due to Autopilot	Low
Low	Low	Low	Low	Medium	

3.2 Solution to Modern Risks

The dangers large cars with big blind spots, due to long and high bonnets, are not a product of need for bigger cars. Safer pickup trucks with better visibility have been around for years already such as the Suzuki carry which is half the weight of a Ram and maintains most of the rear bed space.

4 Engineers Role in Society

4.1 Code of Conduct between organisations

The Royal academy of engineering UK code of ethics is underpinned by four main beliefs [6]:

- **Honesty:** The responsibility to maintain high standards of process, where engineers must be open and fair to whom their work may affect by respecting confidentiality, declaring conflicts of interest and avoiding corrupt practices.
- **Interest in Public good:** Obeying all laws and regulations that apply to their work. Prioritising the safety of others and bringing hazards into the open whether that be physical or technological with the increase in need for cyber security. Where possible they should improve quality by regarding diminishing resources and maintaining the safety of natural environments.
- **Accuracy:** Acting with due care by providing services in which they are either competent or under the correct supervision. Its necessary for engineers to keep their knowledge and skills fresh and views unbiased by respecting objectivity and reasonable differing views.
- **Communication:** Being aware of others and listening to the concerns that may be raised due to the impacts engineering can have on society. Truthfulness in all professional statements and speaking out about injustices that may cause professional concern.

The American society of civil engineers US is similar in most of their core beliefs [7]:

- **Society:** Protecting public health and safety and enhancing humankind's quality of life.
- **Environment:** Following sustainable development guidelines and mitigating adverse effects to the environment like resource depletion.
- **Integrity:** Acting in a fair and legal way that upholds the dignity of the profession and promotes shared knowledge.

Between these two organisations which represent engineering in the UK vs the US it shows a standard of care that all engineers should uphold in their work.

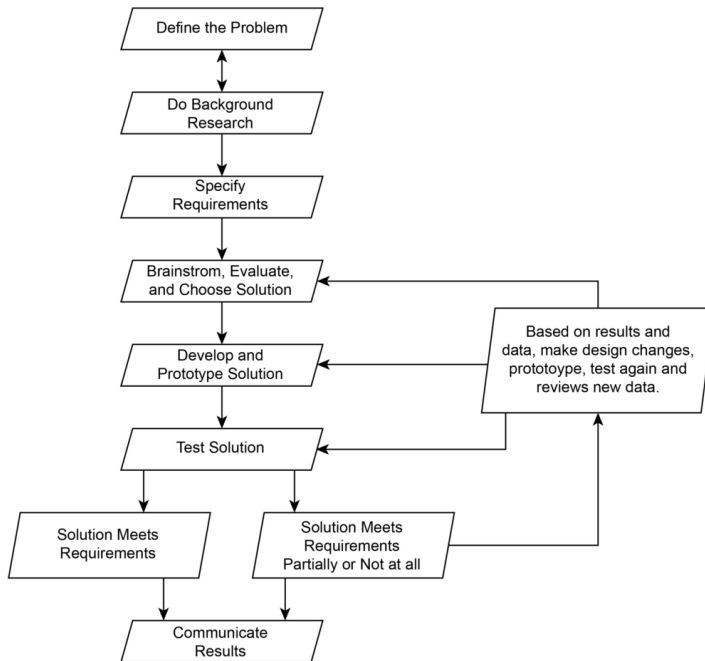
4.2 Engineering Ethics within Motorsport

Motorsport has a complex relationship with typical values because the whole practice is inherently quite un-environmental, however due to the popularity and hundreds of thousands of new fans every year they have the opportunity to become a louder spokesperson within motorsport.

In 2018 the FIA invested \$50 Billion into the clean air fund, aiming to achieve better fuel efficiency and maintain a goal of carbon neutrality by 2030. [8]

5 Problem Solving

During development of a new products engineers may run into issues where what they have created doesn't quite line up with the intended outcome. The recommended way of dealing with this situation is for the engineers to come use a simple flow chart process as pictured below:



This outlines the process of finding out what the problem is, defining the requirements that the product needs to fit in order to overcome the issue, developing a solution, potentially in a CAD software to reduce time and labour costs, testing the solution virtually, if the solution succeeds then making a prototype and continuing development, going through the same process when they run into another issue.

This problem solving is a good way of dealing with simple production mistakes because it narrow the view to the simples solution however for more complex engineering problems it becomes much less effective as there may be a single issue that changes with the solution, for example if a Formula 1 car is struggling with chassis strength the simple solution is strengthen the body with additional supports, however, that leads to increased weight and decreased acceleration.

6 Team Structure

6.1 Example of Working in a Team

In early December 2025 I conducted a team experiment where we had to place metal rods of different alloys into two holds and measure the degrees of twist as different amounts of weight were added to a lever. As displayed in the photo below.

During the execution of this experiment, the team took an approach where there wasn't a clear structure of tasks being delegated. As the experiment progressed, the roles each person took seemed to naturally come out.

Different roles:

- Adding the weights
- Measuring the thickness of the metal rod
- Reading the angle of torsion
- Recording the results
- Assembly and disassembly of the apparatus



6.1.1 Benefits and Drawbacks of an Unstructured Approach

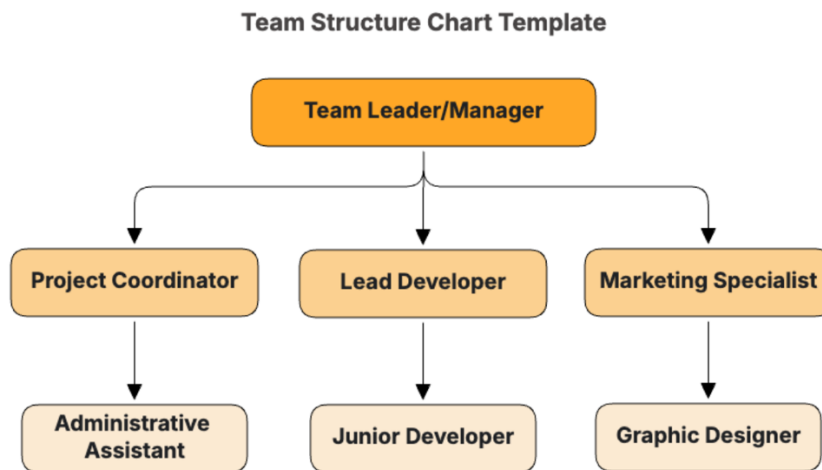
Some benefits of this laissez faire approach are that each person seemed to find the role which suited them best without any discourse between members. It led to a fundamental trust that we were all doing our job suitably which could potentially make working together easier in the future.

A problem with the approach is that the beginning of the experiment started off slowly as no one person knew which task to take up. This issue may have been avoided if one person took initiative as leader and designated roles to the other teammates, possibly leading to a more fluid start to the experiment.

6.2 Teamwork in a Professional Setting

The idea that a project should have a leader is prevalent through all aspects of society, their role is to plan and structure a process and delegate roles to team members which allows for seamless and fluid processes that guide a group to an end goal. Typically, the leader will have either experience in project management or a greater understanding of the project than their subordinates. [9]

The figure below shows an example of how this structure would look in a professional setting. Though it wouldn't be applied in the same way for the small-scale experiment I was included in; it shows how a leader would oversee a project, making sure it goes to plan.



6.2.1 Benefits and Drawbacks of a more structured approach

An official leader can act as a figurehead for the other members of the team, this benefits the group as it provides a clear point of contact if someone has a question about their task. [10]

However, if the team leader is unofficial and has only been established socially then it can lead to resentment between colleagues who are at the same level in the project but one is trying to give instructions to the other.

7 Conclusion

Over this report it has lightly touched on some structural parts of the engineering process and how it can impact the behaviour of working in a team, these include different structures and how each of them may work. It covers the different risks of operating metal lathes and how to avoid them by following the correct health and safety legislation, including a risk assessment that display the potential dangers and how to curb them.

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