

UWTSD

WISA



Engineering Technical Report.

Workshop and Practice ACHA4011

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1 Introduction

The purpose of this report is to explore what it means to be an engineer. What rules and regulations they must follow, not only for their own safety but for the safety of those around them, moreover, to delve into how they can optimise working within a team. What laws they must abide by and their importance. To understand an engineer's responsibility in the sustainability of their work, how they impact the environment and how important it is for them to reduce their negative impact on it. Furthermore, investigating some issues that engineers may encounter and how they navigate these issues and overcome them.

2 Health & Safety with Risk Assessments

One of the activities to participate in on a motorsport engineering degree involves working in the machine shop. Therefore, students are required to work closely with machines such as the Lathe, the Mill and pillar drills, along with instruments such as hacksaws. These machines contain heavy, fast moving, and sharp components which can lead to potentially horrific incidents, so it is vitally important that these machines are, not only, operated correctly but also all procedures regarding health and safety are followed.

Firstly, as explained on app.croneri.co.uk. (n.d.), to utilise these machines, it is the responsibility of the establishment in which you are using these machines under to ensure your safety by honouring acts such as the Health and Safety at work, etc Act 1974. This act entails the establishments requirements to ensure the welfare, health and safety of those that are undertaking or affected by work operations, requirements include providing safe equipment, safety systems and safe places for work. Furthermore, under the Provision and Use of Work Equipment Regulations 1998 (PUWER), organisations are required to ensure that the correct training is implemented, all users are over 18, regular maintenance and inspections are carried out on machinery, along with consistent checks no later than four hours after use, and many more. In addition, the Personal Protective Equipment Regulations 1992, declares that the applicable personal protective equipment (PPE) must be supplied, training must also be provided to ensure the correct use of PPE, all PPE must be well maintained and in efficient working order, and replaced if this is not the case. Although the required PPE may vary from machine to machine, in this point of interest in the university, the PPE required is, safety glasses, steel-toe boots and protective clothing in the form of overalls or protective jackets.

On the other hand, following the information provided by app.croneri.co.uk. (n.d.), individual's operating this machinery also have a duty to ensure the safety of themselves and those around them as they are working under the Health and Safety at Work, etc Act 1974. Furthermore, they must ensure they follow their training, comply with all rules that have been set and they must not tamper with any safety items or measures that have been put in place by the establishment, which falls under the Manual Handling Operations Regulations 1992. Additionally, individuals must abide to the Management of Health and Safety at Work Regulations 1999, which includes informing superiors of any dangers that would compromise the health and safety of those using the machinery, and of any violations in protection arrangements.

Risk Assessment Matrix of working with Lathe and Mill.

	Negligible	Minor	Moderate	Major	Severe
Almost Certain		. Hot swarf coming into contact with skin.			
Likely	. Could pinch skin while operating tools/ Machinery.		. Dropping heavy tools/items.		
Possible			. Accidentally cutting skin while using sharp tools.		. Getting caught in the machine.
Unlikely				. Machines malfunctioning/ breaking.	. Moving components come loose from machine.

Rare					. Electrical malfunction causing a fire.
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3 Engineers Role in Society

The Engineering Council (2017) explains how in 2005 a statement was produced by both the Royal Academy of Engineering and the Engineering council of ethical principles to guide the practice and behaviour of engineers. A revised statement was produced in 2017. This statement created four fundamental principles to create the core of codes of conduct within engineering institutions. This statement requires all registered engineers to comply with their institution's code of conduct, to work in a responsible and ethical manner, with the aim for engineering to be seen as a trustworthy and ethical profession.

The four principles consist of honesty and integrity, respect for life, law, the environment and public good, accuracy and rigour and lastly, leadership and communication. As stated by the Institution of Mechanical Engineers (2023), these principles require engineers to be transparent with others, especially on their abilities and limitations, they must act without bias and act against malpractice or risks. They have a duty to ensure the safety of others in their work and they must not mislead or allow others to be misled. They must maintain and improve their professional knowledge and contribute to public discussions regarding their field within their own competence, they must respect the rights and reputation of others and strive to support and encourage diversity within the industry. Furthermore, engineers are required to recognise the importance of environmental factors, they must never purposely exploit natural resources and must respect that they need to balance the present needs with those of future generations.

An example of these principles being used in motorsport, specifically in sustainability and environmental factors, is Formula 1's code of conduct. As seen in Formula 1 Supplier Sustainability Code of Conduct Code statement (n.d.), they aim to achieve Net Zero Carbon by 2030, they wish to make an impact by reducing greenhouse gas emissions. Formula 1 aims to achieve this by ensuring

suppliers have carbon reduction plans and are sourcing renewable energies for their operations along with energy management plans, they are expected to present their carbon footprint data on request that must be within standard. Furthermore, suppliers are required to actively contribute to the protection of ecosystems and biodiversity to preserve any environments that may be impacted by their operations.

4 Problem Solving

In an engineer's career there are a multitude of issues that they may encounter, especially when developing a product.

During development, engineers utilise many techniques and tools to reduce the chances of issues occurring, stated by Neuralconcept.com (2024), these tools include Computer aided design (CAD), Artificial Intelligence (AI), simulation and modelling tools and collaboration with other engineers. Therefore, if an issue is encountered within this stage, it can be less complicated to rectify. Due to all the processes that a product undergoes at this stage it can allow engineers to detect the issue with data sets, allowing them to make the required adjustments with minimum backlash.

However, if issues with their product occur whilst on the market and in use by the public, the process becomes complicated and detrimental. They typically follow a structured process, which first involves identifying the problem by gathering data, they can analyse failure reports, customer reviews and more. Once the cause of the issue is identified they can design a solution which ranges from issuing recalls, modifying the product, or software updates. Finally, they must test their solution prior to issuing it, they must also communicate with their distributors regarding the resolution to ensure that the fix is effective and safe for the market.

Furthermore, engineers may encounter issues out of their control and not necessarily due to their product, it's common to encounter issues with suppliers, but there are ways to prevent them. Haw, J (2024), shows some examples of potential issues, including, miscommunication which can be prevented by precise specifications, highlighting requirements such as dimensions and quality standards, alongside constant communication throughout the manufacturing process. Additionally, production delays can be fatal, so it is important to identify and qualify backup suppliers, however,

this can be prevented by setting realistic and achievable production timelines, accompanied by good communication.

5 Team Structure

Last year, during foundation level motorsport Engineering, I worked in a team of five people to produce a soapbox for soapbox racing. Unfortunately, we weren't well organised, we had no real team structure and instead treated each member as an equal to ensure everyone had a choice in what tasks they preferred to do, so we simply agreed on what tasks to split between each other.

The methodology of this structure worked well to keep everyone happy because we all had equal decisions in what tasks we chose and how we wanted our soapbox to develop. However, this had many complications, including an unequal workload amongst members and poor interaction and engagement from other members. Moreover, we encountered issues with planning and more organisation troubles because we struggled arranging dates for these meetings, it was challenging to find appropriate slots in everyone's schedules. In addition to poor planning, we struggled with clear communication and instructions, especially towards the end of our assignment, where we found ourselves racing the clock and rushing to finish our work by the deadline.

In conclusion, our team structure was ineffective and poorly communicated, however, a well-developed structure would have helped prevent many of these issues.

First and foremost, to deduce an appropriate team structure it is important to understand the necessary components that create a suitable structure and how this structure will allow us to achieve our goals. In an article produced by Bresman, H. and ZellmerBruhn, M. (2013), they discuss how good team structure is vital because it has a domino effect on the process and outcome, they also express that the features of this structure should match the given tasks or demands faced by the team. They acknowledge how choosing the correct structure is not as obvious as you would think and is instead a multilevel construct. Moving forward I have taken this into consideration while searching for an appropriate structure and have narrowed my choices down to three, Hierarchical structure, Functional structure and Circular structure.

Firstly, Hierarchical structure, explained by Team Asana (2021), is a widely utilized structure by organisations, it has a pyramid-like structure with multiple layers, shown in figure (1.1), the amount of which can vary depending on team size and complexity.

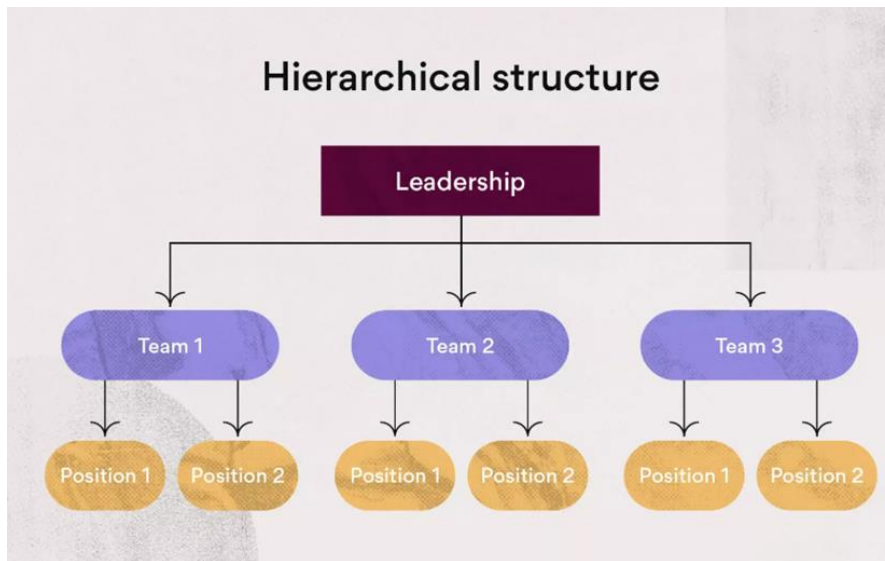


Figure 1.1: Diagram of Hierarchical structure (Team Asana (2021)).

Secondly, Functional Structure, again, explained by Team Asana (2021), is also widely used, however, it involves grouping people based on skills and knowledge, these groups are then structured vertically, similar to hierarchical structure, with each group having their own leader.

Lastly, Circular structure, although extremely similar to hierarchical structure, is visibly different with leaders in the centre of the circle, higher-level members positioned on the inner circle and lower-level members positioned on the outer circles, as shown in figure (1.2). Team Asana (2021) explains how this structure allows the leader to work closer with members and allows more fluid relationships between individuals. As a result, I came to the decision that this structure would be the most suitable for this task and would have helped conquer most of the issues that we encountered in this project.

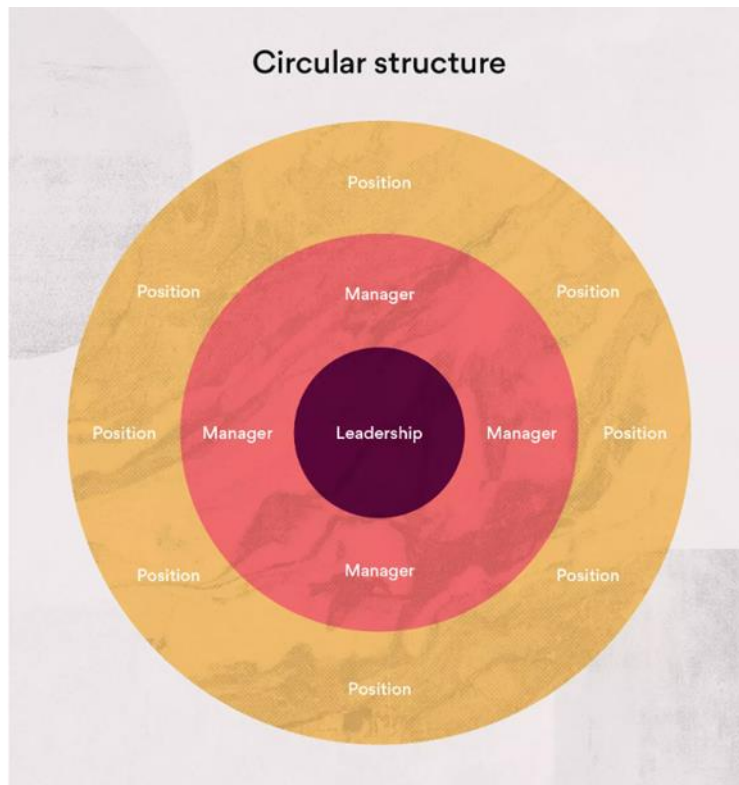


Figure 1.2: Diagram of Circular structure (Team Asana (2021)).

6 Personal Development Plan

Name –

Keira Phillips.

Degree –

BENG4F Motorsport Engineering.

Previous Qualifications –

. AS level Biology, Chemistry, English Literature.

. GCSE's.

Previous Experience –

. I spent 1 year doing a mechanical engineering course in college.

Long Term Goals (5 to 10 years)				
Qualify my degree and gain experience in my field whilst traveling.				
Short Term Goals (0 to 5 years)				
Complete my current course.				
Goal	Objective	Resources Required	Measurement	Target Date
Complete foundation level of my course.	To pass all exams and assessments.	. Time . Money . Discipline . Commitment . Educational resources	. To successfully pass exams, assessments and assignments. . To obtain a certificate of achievement.	2024
Complete my 1 st years of Motorsport engineering	To pass all exams and assessments.	. Time . Money . Discipline . Commitment . Educational resources	. To successfully pass exams, assessments and assignments. . To obtain a certificate of achievement.	2025
Complete my 2 nd year of Motorsport engineering	To pass all exams and assessments.	. Time . Money . Discipline . Commitment . Educational resources	. To successfully pass exams, assessments and assignments. . To obtain a certificate of achievement.	2026
Complete my 3 rd year of Motorsport engineering	To pass all exams and assessments.	. Time . Money . Discipline . Commitment . Educational resources	. To successfully pass exams, assessments and assignments. . To obtain a certificate of achievement.	2027

7 Conclusion

To conclude, this report has stressed multiple responsibilities that engineers take on in their role. How it is crucial that they follow company policies and abide by government implicated laws to ensure their safety and the safety of all those around them, including the consumers of their products. How good team structure and clear communication with members can make or break a project, how important good time management, planning, communication and organisation can be,

not only in teamwork but when preventing issues within their work, including when working with suppliers. In addition, how engineer's can overcome complications that they face, from development level to issues to issues with products already on the market and how to reassure the public and distributors that their products are safe once they have found a solution. Finally, this report has clarified an engineer's role in society, how they have a duty to be honourable, truthful and respectful to others, to take pride in the clarity of their work and to lookout for one another, including future generations by being responsible and caring for the environment and being ethical and sustainable in their work to ensure a brighter future for everyone.

8 Reference List

- 1) app.croneri.co.uk. (n.d.). Milling, Turning and Pressing: In-depth | Croner-i. [online] Available at: <https://app.croneri.co.uk/topics/milling-turning-and-pressing/indepth>
- 2) Bresman, H. and ZellmerBruhn, M. (2013). The Structural Context of Team Learning: Effects of Organizational and Team Structure on Internal and External Learning. Organization Science, [online] 24(4), pp.1120–1139. Available at: <https://www.jstor.org/stable/42002896>
- 3) Engineering Council (2017). Statement of Ethical Principles. [online] Engc.org.uk. Available at: <https://www.engc.org.uk/standards-guidance/guidance/statement-of-ethical-principles/>
- 4) Formula 1 Supplier Sustainability Code of Conduct Code statement. (n.d.). Available at: <https://media.formula1.com/image/upload/v1702650820/content/dam/fom-website/Sustainability/Formula1SustainabilityCodeOfConduct.pdf>
- 5) Haw, J. (2024). Top 5 Excuses Suppliers Make and How to Deal with Them - OpenBOM. [online] OpenBOM. Available at: <https://www.openbom.com/blog/top-5-excuses-suppliers-make-and-how-to-deal-with-them>
- 6) Institution of Mechanical Engineers (2023). Code of Conduct explained - IMechE. [online] www.imeche.org. Available at: <https://www.imeche.org/about-us/imeche-governance/governance-and-finance-reviews/code-of-conduct-explained>

- 7) Neuralconcept.com. (2024). A Comprehensive Guide to Engineering Product Development.
[online] Available at: <https://www.neuralconcept.com/post/a-comprehensive-guide-to-engineering-product-development>
- 8) Team Asana (2021). Team Structure: 10 Effective Ways to Organize Your Team • Asana.
[online] Asana. Available at: <https://asana.com/resources/team-structure>