

Assessing the Characteristics and Roles of an Engineer

Workshop and Practice (ACHA4011)

Harry Walters

2137556

University Of Wales Trinity St David

School of Engineering

Automotive Engineering HND

3/12/2023

Contents

Introduction	3
1. Health and Safety with Risk assessments	4
1.1 Health and Safety legislation.....	4
1.2 Risk Assessment and Risk Assessment Matrixes	4
2. Engineers Role in Society	6
3. Problem Solving.....	7
4. Team Structure	8
4.1 Hierarchical	8
4.2 Functional	8
4.3 Matrix	8
4.4 Process-based structure.....	8
4.5 Circular structure	9
4.6 Flat.....	9
4.7 Personal experience within university	10
5. Personal Development Plan.....	11
Conclusion	12
References	12

Introduction

This report consists of an analysis of the various roles and characteristics of an engineer and where engineers belong in society and what an engineer does. The reasoning for this report is to gain a more thorough understanding of what an engineer does as well as the characteristics engineers need. This includes health and safety as well as risk assessments, engineer's roles in society, problem solving and the typical issues faced, team structure and including personal experiences of when I have worked in a team and a personal development plan to show my desired goals and some objectives in a relevant timespan. The various points will then be touched upon in a conclusion and briefly highlight the importance of each other the topics mentioned in the report.

1. Health and Safety with Risk assessments

To gain a more cohesive understanding of health and safety two examples of activities will be used and referenced to provide a better context on the topics detailed. Firstly however, the understanding of basic health and safety legislation needs to be understood. This is usually dictated through personal protective equipment (PPE) as well as risk assessment matrixes. After gaining understanding what health and safety legislation and risk assessments matrixes we can reinforce our understanding through the use of a practical example.

1.1 Health and Safety legislation

As the industry changes overtime health and safety must also change the main foundation however still remains the same but is updated the main legislations followed are.

Health and safety legislation are the main to a set of rules and guidelines that are enforced in the workplace to prevent employees from injuring themselves or inflicting injury on others. The standard followed across the industry in the UK is overseen by the Health and Safety at Work etc. Act 1974. Also known as HSW, HSWA, HASAW 1974 or HASAWA. HSWA “is an Act of Parliament that sets out a framework for managing workplace health and safety in the UK.” (British Safety Council, 2023)

In conjunction to HASAW 1974 another consideration is Personal Protective Equipment (PPE). Personal Protective Equipment Regulations (PPE) 2018 refers to any additional equipment an employer can provide to its workers to reduce the potential risk of harm, where it cannot be reduced by any other means by using a “last resort” principle. The key factors of PPE regulation are *suitable provision, Compatibility and Effectiveness, Maintenance and Storage, Use and training* as well as *Employee Responsibility*.

Within the university PPE is used when in any of the workshops the standard across the workshops at university are steel toed boots, lab coat as well as eye protection. Some workshops may require additional PPE such as ear protection or latex gloves.

1.2 Risk Assessment and Risk Assessment Matrixes

Risk assessment refers to the process of identifying a hazard and any associated risks within the workplace. To do this control measures are set in place to remove any risks. To do this some keywords are defined (Figure 1). Risk assessments are often carried out before a task is carried out before a task is to reduce any associated risk that may be involved with the task at hand.

- An **accident** is ‘an unplanned event that results in loss’
- A **hazard** is ‘something that has the potential to cause harm’
- A **risk** is ‘the likelihood and the severity of a negative occurrence (injury, ill-health, damage, loss) resulting from a hazard.’

Figure 1, keywords associated with risk assessment, British Safety Council, 2023

Other risk assessments that are commonly found within the workplace are *Fire, Manual handling, Display screen equipment (DPE)* as well as *Control of Substances Hazard to Health (COSHH) risk assessments*.

Alongside risk assessments, risk assessment matrixes are used to assess the worst and most likely risks involved. This is based off the likelihood of something happening and the severity it causes. An example risk matrix template (figure 2). An example of possible minor risk could be someone grazing their hand on the edge of the engine block while doing an engine rebuild. An unlikely significant risk could be someone dropping a heavy object on someone hand or fingers.

		Severity →				
		Negligible	Minor	Moderate	Significant	Severe
Likelihood ↑	Very Likely	Low Med	Medium	Med Hi	High	High
	Likely	Low	Low Med	Medium	Med Hi	High
	Possible	Low	Low Med	Medium	Med Hi	Med Hi
	Unlikely	Low	Low Med	Low Med	Medium	Med Hi
	Very Unlikely	Low	Low	Low Med	Medium	Medium

Risk Matrix Example

Likelihood X Severity = Risk Level

Figure 2, Risk assessment matrix template, RiskPal, 2023

2. Engineers Role in Society

As an engineer a specific role must be followed not only to ensure safe practice but also to protect engineering as a profession. To do this an ethical code of conduct is followed. Some of the principles in this code of conduct include competent practice with up-to-date skills and knowledge, integrity and respect for others, promoting sustainability and exercising leadership (Institution of Mechanical Engineers, iMechE, 2023).

It is important to note due to that sustainability has slowly come to the forefront of engineering due to the current socioeconomic climate, protests and global warming. This has led to a greater focus of sustainable practices and constantly looking for alternatives. The main factor in the automotive industry is looking for alternatives to the internal combustion engine (ICE).

Also, in the production of vehicles as the production of the materials used have an impact on global warming thus leading companies such as Tata Steel to 'decarbonise'. To do this Tata Steel have invested in "electric arc technology could reduce carbon emissions from Port Talbots site by 5 million tonnes a year by 2030" (Green Steel Future, Tata Steel, 2023)

Therefore, as an engineer it is important practice to implement sustainability within the industry, sustainability is also a further concern within the automotive segment as the UK government plans to stop selling new petrol and diesel cars by 2030. Therefore, many automotive manufactures have slowly converted to electric cars or hybrid technology to reduce carbon emissions. Furthermore, with emissions getting stricter manufactures are slowly having to end performance variants of their vehicles or stop production of a vehicle altogether this can be seen by Audi ending the production of the TT RS as well as Ford ending the Fiesta model as well as the performance variant of the Ford Focus, the Ford Focus RS.

3. Problem Solving

As engineers pursue a project, they may encounter problems during the development of the project or when the product is finished or due to the supply of parts. A typical example of problem solving in the automotive industry could be when a vehicle is recalled. A recall is when a vehicle that has already been sold needs to be taken back to the dealership due to an inherent malfunction of part design which then require parts to be replaced. An example of this is the mk3 Ford Focus RS' head gasket, from factory early models of the RS received the incorrect head gasket which overtime caused coolant to leak and enter the combustion chamber, which could potentially lead to catastrophic failure of the engine. To stop this from happening Ford had to recall all early models of the RS ad replace their head gaskets.

When a problem has been discovered typically a flow diagram will be used to look for solutions to solve the issue at hand (Figure 3). A flow chart details where the issue lies within the production cycle and whether or not the solution is adequate for the products lifecycle.

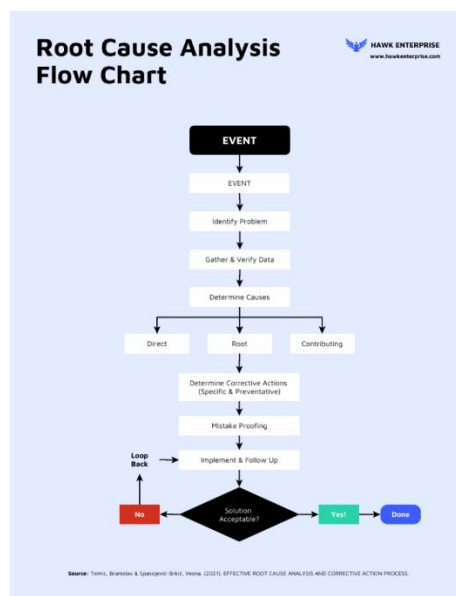


Figure 3 Root Cause Analysis Flow Chart, Venngage

4. Team Structure

Often as an engineer you will be working as a part of a team. However, there isn't only one solution for composing your team. The main structures include, hierarchical, Functional, Matrix, Process-based, Circular and Flat team structures.

4.1 Hierarchical

As the name suggest in this structure leadership is divided by using a pyramid scheme and various teams which then control various positions. This approach allows for multiple layers and is typically chosen for most teams. This structure is good due to the easy reporting structure, the jobs are clear and concise, and it allows for speciality skills and individual positions.

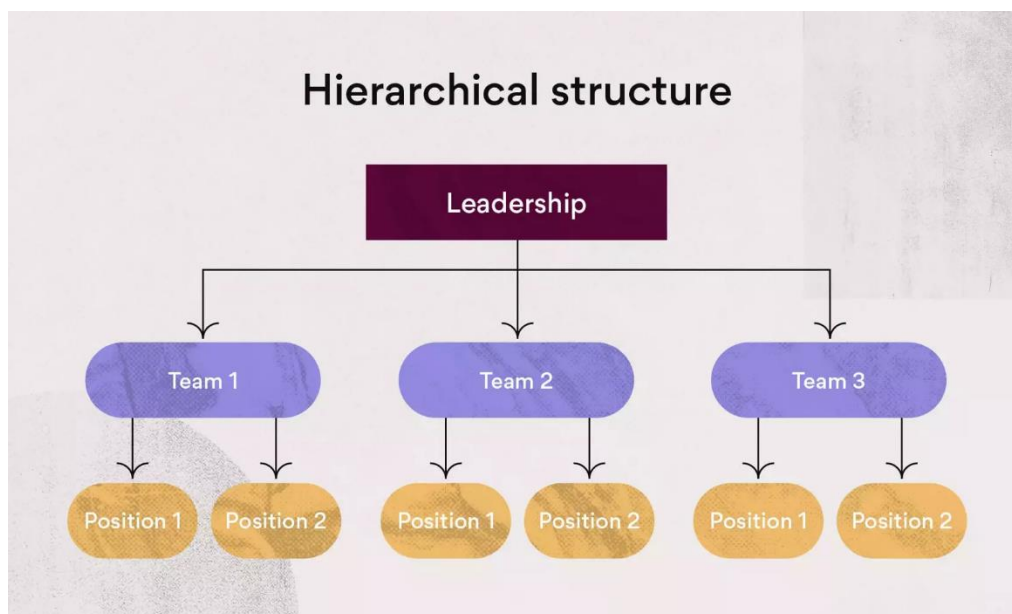


Figure 4 Hierarchical Structure, Asana

4.2 Functional

Within a functional structure likeminded people or people who have expertise on similar subjects are grouped together. This type of structure is good for field experts, team accountability and organisational growth.

4.3 Matrix

In this approach relationships are by order of significance, as in this structure a position may report to more than one leader. This structure allows for improved collaboration and communication, a better balance of leadership and a better balance between units and products.

4.4 Process-based structure

In this structure a hierarchical solution is used however leadership is divided by each process of development. This structure is often preferred by organisations that usually take on larger individual projects. The main points for this structure are efficiency, organisational growth as well as assistance.

4.5 Circular structure

This structure follows a hierarchical based structure however allows for a more fluid relationship with higher and lower-level members. This structure allows for greater communication easy flow of information as well as better relationships between divisions.

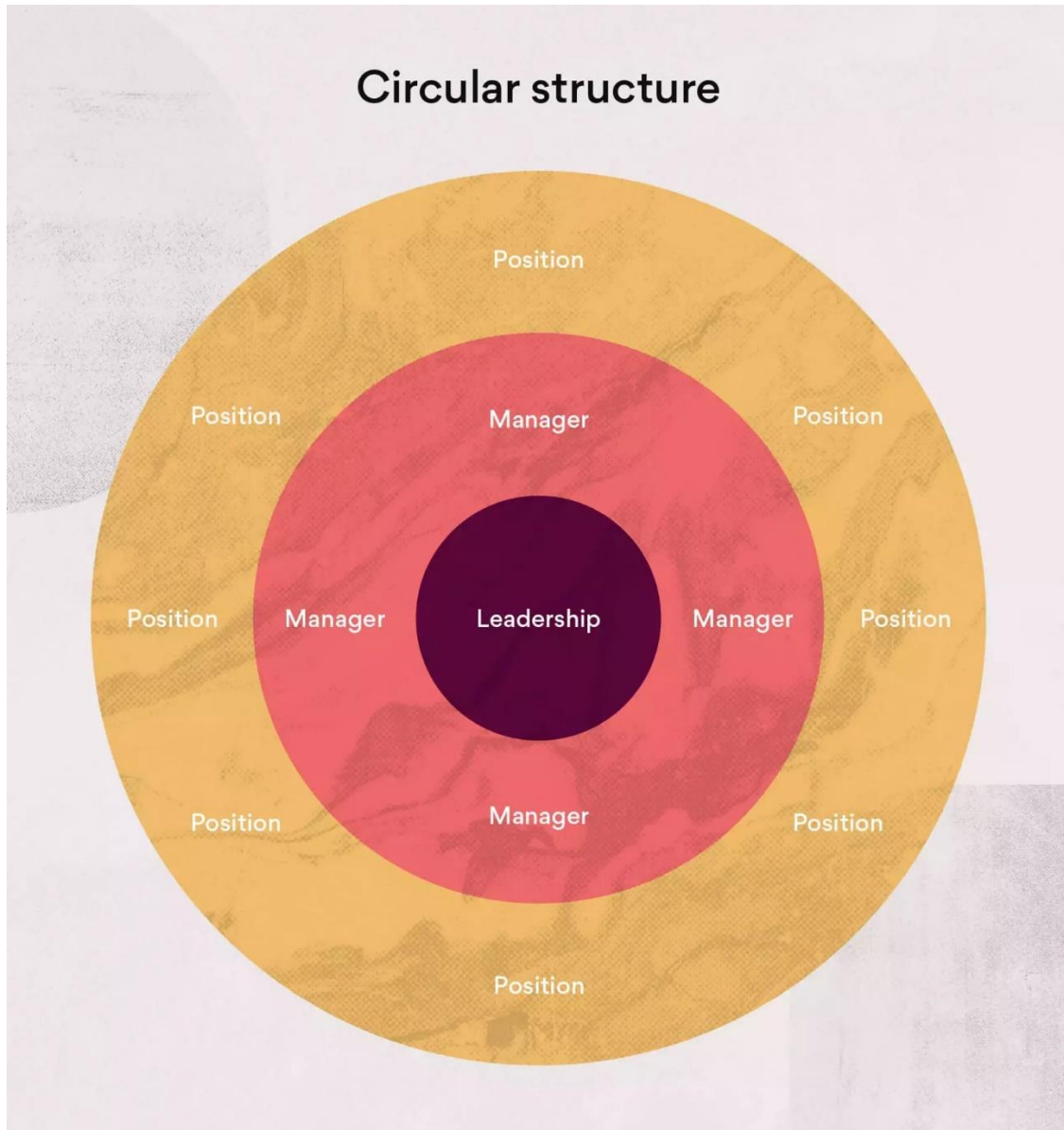


Figure 5 Circular Structure, Asana

4.6 Flat

A flat structure interconnects all levels by having multiple flat levels instead of a typical pyramid structure as seen with the other structures. The main objective of this structure is to allow for cross-functional teams. This structure allows for higher productivity, aligned goals as well as organisation.

4.7 Personal experience within university

Within the engine strip and rebuild we were devised into two separate teams of three. Due to our numbers we decided to use a Flat structure, this is due to everyone having a similar goal in mind. The positive of this structure is that work is being divided equally within the team with no-one being overworked or people being left out. This team structure also allows for better communication as there isn't a significant amount of pressure on team members. However, a consideration to using this approach could be the fact of scale as this approach would be a lot hard to control and organise if there were many team members.

5. Personal Development Plan

Long Term Goals (5 to 10 years)				
Stable career and a house				
Short Term Goals (0 to 5 years)				
Work experiences a general grounding of the industry.				
Goal	Objective	Resources Required	Measurement	Target Date
Nissan GTR	To be able to run and maintain a Nissan GTR	Stable income as well as outright funds	Stable income and funds	2025
House	To be able to own a house	Stable income	income	By 2030
Solid work placement	To find a workplace that I enjoy	Qualifications	Satisfaction	2025-2028
To finish my project car	To finish or near finish my project car	Time and funds	A pre-determined end goal	2026
Automotive Engineer	To gain a clearer understanding and better grounding of my role as an automotive engineer	Qualification, time and experience	A deeper knowledge of the automotive industry	2030

Conclusion

To sum up this report we have looked at some of the various requirements and roles that an engineer undertakes. We have also investigated the importance of sustainability and the wider effect that has on engineering as a profession and touched on the importance of alternate solutions within the automotive industry regarding the production of a vehicle and the vehicles powertrain.

References

British Safety Council, 2023, The Health and Safety at Work Act Explained

<https://www.britsafe.org/training-and-learning/informational-resources/the-health-and-safety-at-work-act-explained>

Health and Safety Executive, 2023, Personal protective equipment (PPE) at work

<https://www.hse.gov.uk/ppe/index.htm>

British Safety Council, 2023, Risk assessments

<https://www.britsafe.org/training-and-learning/informational-resources/risk-assessments-what-they-are-why-they-re-important-and-how-to-complete-them>

Riskpal, 2023, Risk assessment Matrix

<https://riskpal.com/risk-assessment-matrices/>

iMechE, 2023, CODE OF CONDUCT EXPLAINED

<https://www.imeche.org/about-us/imeche-governance/governance-and-finance-reviews/code-of-conduct-explained>

iMechE, 2021, CODE OF CONDUCT REGULATIONS

https://www.imeche.org/docs/default-source/1-oscar/About-us/governance/code_of_conduct_02_03_02.pdf?sfvrsn=2

Tata Steel, 2023, OUR CODE OF CONDUCT

<https://www.tatasteeleurope.com/sustainability/ethical-behaviour/code-of-conduct>

Tata Steel, 2013, Tata Code of Conduct 2013

<https://www.tatasteeleurope.com/sites/default/files/Tata%20Code%20of%20Conduct.pdf>

Tata Steel, 2023, Green Steel Future

<https://www.tatasteeleurope.com/sustainability/green-steel-future-uk#:~:text=Using%20electric%20arc%20furnace%20technology,homes%20in%20England%20and%20Wales>

Department for Transport, Office for Low Emission Vehicles, Department for Business, Energy & Industrial Strategy, The Rt Hon Sir Alok Sharma KCMG MP, and The Rt Hon Grant Shapps MP , 2020, Government takes historic step towards net-zero with end of sale of new petrol and diesel cars by 2030

<https://www.gov.uk/government/news/government-takes-historic-step-towards-net-zero-with-end-of-sale-of-new-petrol-and-diesel-cars-by-2030>

Autocar, 2023, Audi TT Final Edition ends 25 years of production

<https://www.autocar.co.uk/car-news/new-cars/audi-tt-final-edition-ends-25-years-tt-production>

Autocar, 2023, Ford Fiesta production ends after 47 years

<https://www.autocar.co.uk/car-news/new-cars/ford-fiesta-production-ends-after-47-years>

Evo, Jordan Katsianis, 2020, Next Ford Focus RS officially dead

<https://www.evo.co.uk/ford/202489/next-ford-focus-rs-officially-dead#:~:text=Ford%20Europe%20has%20officially%20confirmed,volume%20nature%20of%20the%20model.>

Road and Track, Bozi Tatarevic, 2018, Why the Ford Focus RS Is Having Head Gasket Issues

<https://www.roadandtrack.com/car-culture/buying-maintenance/a14510137/ford-focus-rs-head-gasket-issues/>