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ENGINEERING PROJECT TECHNICAL REPORT

WORKSHOP AND PRACTISE – ACHA4011

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Introduction

In this Technical Report, I will be explaining the process of creating a product that will be used in vehicles. However, as a Team Leader I will need to think about all aspects that go into the production of a new product such as team structure, the product development process, environmental and sustainability side effects that could potentially be imposed and things such as my own personal career development plans too.

The product I have decided to make is a light-weight but effective roll cage for a Renault Clio Sport 182 Trophy. I want to make a roll cage for this car because from factory these car do not come with pre-made roll cages for the car. The Clio 182 has never been the most prolific track car when it comes to motorsport either, However as time has past people have started to realise the amount of potential that these small, fun sized cars have due to the simply modifications which can be manipulated in order to create the perfect track day car. These cars are relatively inexpensive, well balanced and have an ideal power to weight ratio therefore making a very accessible and perfect entry level track day vehicle.

These modifications can be as easy as reducing the interior to one single seat and gutting it top to bottom, and adjusting the suspension accordingly or in this case using a team to develop a light-weight roll cage which is better then its Alternatives.



FIGURE 1

Engineering Team Structure

I believe that it is also important to have a good Team Structure put in place as this can impact the way a team would collaborate together. However, there are many different pathways that can be taken when choosing what kind of Structure you want your team to work in. This is because some team structures will have different levels of hierarchy. This means where members of the team will have to report to an individual who will in the end make the decision on the final development idea. In other cases, all members of a team will have an equal say in what they think about the product. Therefore I will have to decide what approach I would like to make in order to structure my team to make it work most efficiently for the production of my Roll Cage.

Vertical Team Structure

A Vertical Team Structure is when there is a Hierarchy put in place between the members of the team. Having a Hierarchy when working in a Team structure means that there will be different levels of leadership and management between the members of your team. When working towards your goal, all parts of the process in making the product will need to go through a certain team member before actually getting the go ahead to continue due to having the different levels of authority or chain of command when having a vertical structure.

A Vertical Team Structure is organised by having the Top management and Bottom Management, having middle layers in between. This means that when making a decision on a product The Vertical Team Structure acts as a flow going from the person with the most control over the product through, to the person with the least.

This type of team structure can be used when having a larger group in a team. This is because a vertical structured team allows for a well-structured organization. Having the implementation of different managerial and leadership roles means that a larger team can be divided up. Dividing up a team helps to separate different responsibilities and roles in a team project so that the right person can work on the subject that they have specialize in.

These specific roles are then supervised by members in the group who are higher up in the managerial food chain. This process goes on up until it can go as far up in the Managerial line as it can which means that an idea will need to go through lots of people before a final decision is passed on. These types of team structures can lead to things such as miscommunication between two people as the information has to travel up and be passed on to get the end goal (which can be rejected).

Horizontal Team Structure

Horizontal team Structures can also be referred to as 'Flat Organizational Structures'. This kind of team structure is most commonly used when there is fewer members in a project. This is because while still having the Hierarchy system in place like a Vertical Team Structure, it doesn't go through as many people which means there is a less likely chance to have any miscommunication between

group members. If there is, this can be rectified quickly and efficiently as a smaller group means information can travel through the team members and management at a faster rate.

Having fewer layers of management within a team can help members communicate concerns and other things they feel relevant to team members. In having fewer layers of management, members of the team can feel more in contact with the person who makes the decision as there is closer contact, creating better communication within the team as a whole.

However, having fewer levels of management within a team gives members a greater amount of freedom when it comes to their part in the group exercise. Some members in the team may thrive off of this whereas other member in the group may find this more challenging. If the reporting structure is too slack, the end goal for the project could be slightly different to what was previously imagined. This is because with less supervision group members can make more choices by themselves without consulting others first, meaning due to the decisions made in the production process for their aspect of the product, the product as a whole could have issues in other areas as these changes were not accounted for.

Matrix Team Structure

A Matrix Team Structure is where members in a group will have to communicate to multiple people in leadership roles. When having this kind of Team Structure in place, you will find that the workforce has much more flexibility and project development in turn becomes more efficient.

These Team structures are usually used when there is a big team of people working on a project. People can be divided into groups where they have a shared knowledge on the chosen subject. Using these small teams within a big group, each team can be responsible for different aspects of what the product entails. Teams like these often need more cooperation and communication between managers to ensure that the project is still going in the right direction and each group is sticking to its plan. This is to make sure that at the end of production, all of the smaller groups can then 'merge' with other smaller groups to create the final product.

I have decided to use the Matrix Team Structure in order to create my Roll Cage for a Clio 182 Trophy. I have decided to choose a Matrix Team Structure because I feel this would suit the work ethic I need. A roll cage needs to be light-weight so that it keeps my car competitive on the track but it also needs to fit the right criteria of race regulations. However most importantly, my Roll Cage also needs to be strong enough so that in the event that the car rolls over, the driver needs to be protected to make sure they do not suffer from any severe injuries.

I think due to having lots of different things to think about, it would be smart to split my team up into smaller groups where individuals can work on their preferred area to a better standard. With smaller teams specializing in smaller areas, these groups can perform to the best of their ability while letting people with higher leadership roles manage them, communicating final design ideas or elements of the product where improvement is needed or where compromises have to be made.

Product Development

There are many stages when it comes to the making of a product. The different stages of product development are Ideation, Research, Planning, sourcing and costing.

The first stage of developing a product is ideation. As a group we would need to come up with an idea which we all thought would be relevant but also have the positive outcomes we were looking for. In order to do this we would need to do a lot of brainstorming to generate the idea. However, lots of people can get stuck on this first stage as they are hoping to come up with a revolutionary idea that can benefit them the most. This can be an unrealistic goal as these things can be hard to figure out and don't show themselves very easily.

The next stage is Market Research. Market research is very important as you need to find out what sort of alternatives there are already out ready to be bought. In addition to this, Market Research is also very important because it can allow you to get validation from people who would consider having the same product that you are building. Sharing your idea with target markets can be very useful as it allows a team to get feedback on what they are creating with things like forums and surveys.

Planning comes after Market Research. Planning out a 'Roadmap' can help when trying to describe and pitch your idea to people. A simple sketch can help when showing what goes where or what something is made out of. When having a group discussion about your product, a diagram can help so that people can try and get a final picture of the outcome the team is going for and can also help in achieving your end goal being the finished product. However, Planning also helps with setting up a timetable with a larger group. A timetable that everyone shares can have different kinds of meeting slots and whether this is the whole group or just certain sectors. This allows for better communication between management in the group and the team members.

After a plan is set you will need to source materials and other things needed for the product. If funding is needed this is also the time to gather resources like sponsors to help invest in the product. Doing this is commonly known as 'Building your supply chain'. This is a key stage in the development process as management is crucial to oversee the project as a whole and make sure everything is on course for the final goal. Materials must be agreed on by management, to which different areas of management need to make sure they are taking care of the groups of team members they are needed to support and guide.

When all of these steps are completed, there will be a much clearer perspective for the cost of the Final product. The product must be affordable, but also be competitive when performing its duty on the track to keep up with other cars on cornering speed and weight etc. In addition to this, the cost of the product must be affordable to be interesting and stand out in a market.

Issues, Legislation & Standards

When considering Issues, Legislation and standards, lots of things come into play such as Health and Safety. Health and Safety is the standards that need to be met in a workplace. This is due to the machines that would need to be used to make the product and the rules that need to be followed when using the machines. Team members would need to be trained before using the machines to ensure nothing goes wrong and they are protected at all times. Other Health and safety standards would be signs showing what PPE needs to be worn in certain areas of a workshop and precautions which need to be taken before using machinery.

When making a Roll Cage, it would need to follow the right rules and legislation to be allowed into a competitive race which is another thing that you would need to think about. If legislations are not met, the product can't be used making it useless.

Personal Development Plan

Personal Development is good as it helps you to plan for the future. Envisioning where you want to go and what you want to accomplish is vital as without these long term goals, it is hard to plan ahead for where you want to end up in the future.

In the future, I would want to work within a race team. I like the high intensity of having a car on a track from 24 hours and having to keep it in good condition throughout an entire race to stand a chance at being a competitive team. I believe the high intensity conditions would drive me to work harder and more efficiently as it is a timed goal.

Conclusion

In writing this report, I have learnt lots about what it takes to be part of a team leader and understanding how you need to be firm but fair. In the end decisions need to be made, but I believe having group discussions and working as smaller teams benefiting a bigger group would be most ideal. A Matrix system allows less of a dictatorship and more of a democracy, making everyone's opinions and ideas equal to each others. Peoples needs must be met, but in the same way the products end goal must not change as this was the purpose.

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