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Engineering Project

Workshop and practice (ACHA4011)

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1 Introduction

In engineering, teamwork and planning are two incredibly important (somethings)

If well utilised they can take a great concept and turn it into actuality. On the flipside without

2 Team Structures

Working as an in-house design team for a small firm developing products for motorcycle racing use. the company as a whole is set up so briefs are given to the design team on a regular basis. Briefs can at times overlap and can vary in their requirements.

The specified brief is to develop a subframe and battery mount for converting SV650 motorcycles from road to track bikes.

The need for such a product has already been identified by a separate team within the company specialising in marketing and product research.

There are several approaches to team layout. In this instance the team is cross functional.

The advantage to this approach means a higher rate of workflow within the team so the time between the initial brief being given and the product coming to market is decreased whilst also ensuring a reliability in quality. This is due to each member having their own separate skillset. (Rebecca A. Proehl, 1996)

The disadvantage in teams like this can be found in interpersonal relations and conflicting ideas, however this can be mitigated through management.

A matrix team might also have been a good option as it serves a good balance between cross-functionality and autonomy

This team is also structured horizontally. This means the team members have a high degree of control over decisions, each having relatively equal say. (Indeed Editorial, 2022)

In this team there are three engineers.

In this team the role of the team leader has low control of the decision-making process. Their role is more to check progress and manage the workflow appropriately. This means allocating work to the correct team member with the desired skillset, recognising the rate of workflow in each member and ensuring tasks are not left behind. Relocation jobs if required as well as ensuring deadlines and targets are met. It is also incredibly important in a vertical structure to encourage collaboration

They are also the design engineer and have good familiarity with manufacturing processes and importantly are familiar with using the correct departments or consultants in order to overcome any legal/bureaucratic issues in which they may face.

There is a manufacturing specialist whose main role is to ensure a product can be easily and efficiently manufactured and to decrease cost within the manufacturing process. Finally there is the Prototype and test engineer who is responsible for making the initial prototypes and running the preliminary tests on the product. They also work closely with 3rd party testing firms in order to carry out long term tests of a part in order to work out points of potential failure. Having in house testing allows for efficiency in updates during the early stages of design.

3 Organization and Planning

Planning and organisations is important in any teams success rates. Without adequate attention in the planning phase key issues can easily be overlooked and the setbacks can be costly for the company. A good example of poor planning at the design stage could be the Juicero Press in 2017, which utilised 400 individual parts and internet connectivity, which made it unviable to produce cheaply and in the eyes of the consumer the same effect could be achieved by hand, making the whole product unnecessary complicated to use and maintain. This could very directly be compared to this project, if it is either too difficult to use, maintain or implement the demand and usage will simply not be there.

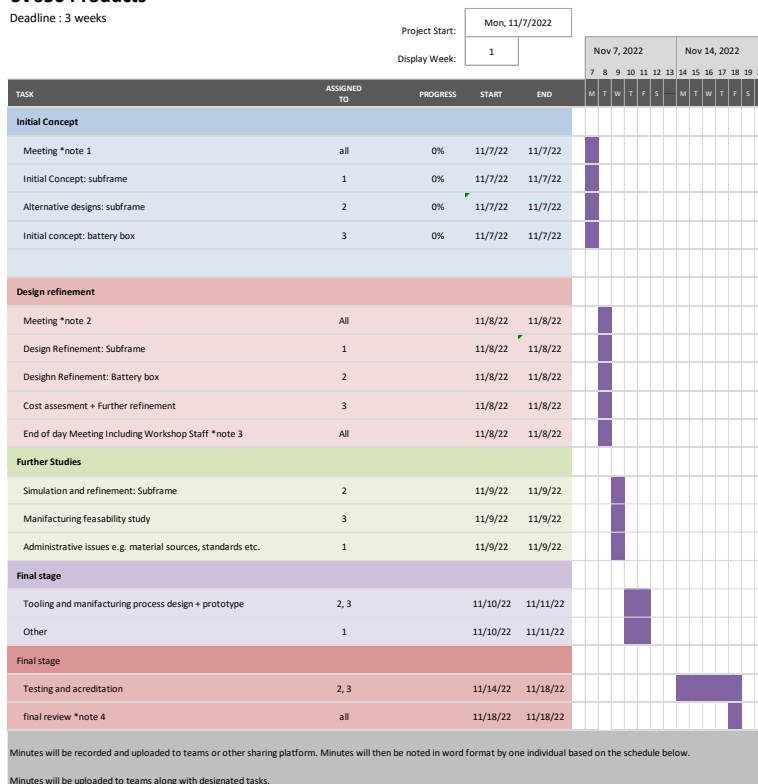
In this example the first step would be to discuss the brief provided within the team, for each member to voice their opinions, ideas and concerns.

Gant charts are normally used in this instance in order to efficiently structure the team and the various tasks in regard to the timeframe provided.

The Gant chart for this product could look much like the chart below, Fig. 1.1

SV650 Products

Deadline : 3 weeks



Notes

- 1 To access initial concepts and formulate above gant chart
- 2 Review previous days work, check work allocation and encourage group sharing
- 3 Ensure design concept is heading in the correct direction and include workshop staff for feedback
- 4 Review product before submission and ensure all tasks are completed.

Fig 1.1 *where 1 is the team leader, 2 is the design engineer and 3 is the manufacturing specialists.

This Gant chart could be considered as linked, this means that certain tasks are linked to other tasks and must be completed before moving to the next. An example of this would be that the design must be complete enough to avoid making any changes in manufacturing before tooling was designed unless the changes were driven by limitations in the manufacturing process.

Structure in the initial plan is very important however in any project flexibility must also be important. Not every issue can be foreseen, and updates could be required later down the line, however these can be costly so must be minimised as much as possible, in this project the aimed completion time and the provided deadline differ by 1 week. This is planned time to overcome any issues in good time, ensuring both the deadline is met and the risk of poor working practice is minimised; for each person has more time than required to carry out their role correctly. Also, for this reason typically daily meetings are held for each employee to share their progress and give input into the project respective to their area of expertise.

Another thing to appreciate would be the varied workload throughout the project. It is the role of the team leader in this team to manage workflow as best. The Gant chart above shows how tasks are allocated primarily to the most suitable member, then secondly to another member in order to aid progress where possible. This may also be the case where one member finishes their set tasks, at which point the team leader will direct their time to aid another member or complete other necessary tasks that may be required.

It is also important not to overload employees as this will decrease mean productivity. (Dale N Glaser, 1999)

Issue are always a possibility in any project, especially if there are is a high turnover of each project as is typical within this company.

The limitation of future issues is an action that must be taken with each individual decision. In a small team communication is important as jobs can be shared and may not be directly suited to a persons skillset, at which point they must have enough understanding to know when to seek guidance from others.

The other method used in this case is to first develop the minimum viable product, a minimum viable product is a product that consists of all the relevant features required to make the product saleable, not to say the product is never developed past this point however will always be the priority (Eric Reis, 2009)

A minimum viable product will allow the maximum amount of time before the deadline for any issues to be rectified before progression. In the example of a subframe, the main structure must first be designed, tested and checked for manufacturing constraints before additions that may not be necessary, however moderately desirable, such as tie down points for wiring or aesthetic changes are made.

4 Legislation and Standards

The health and safety at work act of 1974 is incredibly important in the workplace, it covers the responsibilities the employers and employees have to each other and to the public. This legislation encompasses most areas of the working environment and ensures workplaces are as safe as reasonably possible (HSE, 1974). It is also paired with other legislation, such as the Management of health and safety at work act of 1999 which ensures correct documentation.

The standards that affects such projects can be split into two sections, Firstly the standards the product has to meet to be correctly certified and legal in terms of sale. An example of this would be very early on in this project an enquiry to trading standards will have been made. They will give any information on necessary certification. In this instance type approval may be required in order for the product to be sold. Type approval being legislation covering all Motorcycles along with relates parts, accessories and products. (Gov.UK, 2018)

This also demonstrates how consultation is utilised within the team, as it is not necessarily expected of each member to have an in-depth knowledge of applicable regulations, but not negate the impact they will have over the product development.

Standards can also be interpreted as how correctly an individual complete their tasks, a historical example would be in 1981 where an walkway collapsed killing 114 people. The cause of this was due to a change in the design which was not correctly assessed by the engineers on the project, leading to structural failure.

The steps to mitigate risks such as this is to firstly work to employ chartered engineers. Chartership demonstrates that an engineer is competent to a widely accepted level. (Engineering Council, 2022 it may be the case that during the hiring process the chosen candidate is not chartered however in which case it may be prudent to assist the individual in gaining their chartership. In the meantime, processes already in place such as peer reviewing work and allocating the correct amount of time for each task will mitigate any risks that it may bring.

5 Personal Development Plan

Being in the first year of a degree I don't believe necessarily it is time to have a set goal as to where I might want to go after university. The principle reason being I don't yet know which field I actually enjoy. For example I know I am interested in motorcycle power train design however I have very little experience and understanding of what goes into developing powertrains. Therefore I'm not yet equipped to make an educated decision on whether this would be a good area of industry to pursue. My aim is over the next 2 years is to build the information I need and begin to have an understanding of specific areas of industry I have passion for.

Another consideration I have is that I don't necessarily want to work for anyone, this is something I have known for many years and since I started my business as a mobile mechanic last year I'm not entirely sure how I would enjoy working for a company again.

I hope over the next 3 years to keep growing my business. I'm not entirely sure how best to do this, especially going into the 2nd and 3rd year of university and the time constraints that will come with this.

The main issue I have currently is that my business is non-scalable. I am limited by the fact there is only so many working hours of the day and I don't believe the demand is high enough to take on a second mechanic, nor could I charge enough for this to be profitable.

I think a more realistic aim would be to combine my knowledge once my degree is completed and remodel the business to cater for more specialized work, such as race vehicle prep, engine development etc. as well as keeping the day-to-day maintenance and repair of motorcycle as it would still be profitable.

This however ties into my first point about needing to complete more of my studies in order to make a decision on what I am passionate about as well as accessing the market for a specific area and its viability, in terms of both profitability and achievability.

To summarize, I'm not entirely sure yet exactly where I will end up and in what field, however I am aware of the options available to me now and that these will undoubtedly change. I believe no matter how dedicated to a goal one might be, the path to reach it is never as straight as one would hope and to not constantly evaluate your goals would lead to wasted opportunity.

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7 Results

Show your results and compare them to literature comment on if they meet expectations.

8 Conclusion

Briefly and concisely describe your significant results and findings (Critically analyse what it means).

Did you meet your aims and objectives? Suggest further work for improvement if possible.

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