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Technical Report

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1 Introduction

This technical report will cover the process and planning of creating a product within the engineering sector. The product will be machine guards for manual lathes and milling machines to provide the user with the best protection from hot swarf particles that can damage eyesight, cut and skin burns, whilst being strong enough to endure any accidents. This report will look at the different challenges involved with the development procedure between departments in the team structure along with all the health and safety requirements and legislations that need to be met to ensure a well-made product.

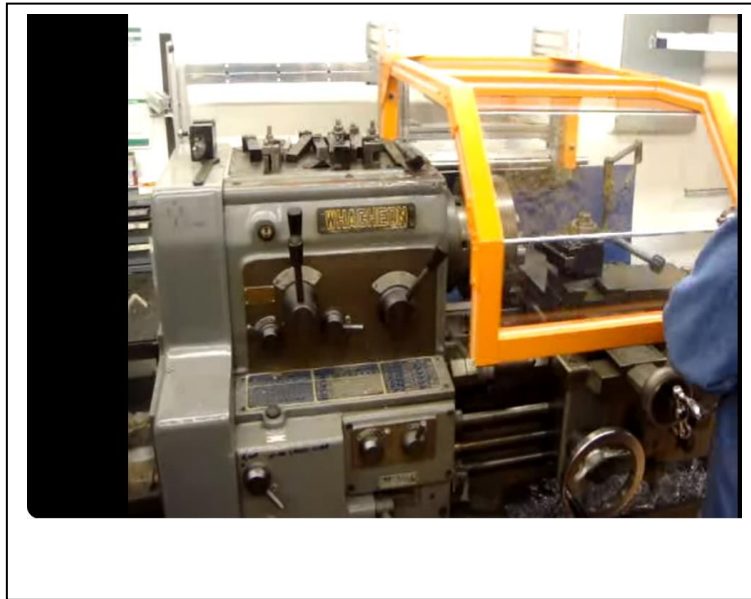


Figure 1 - Sliding lathe guard (NPSA Safety, 2016)

2 Engineering team structure

Looking at the various team structures that exist throughout the engineering industry and selecting which structure is best for the product being made, has a few factors.

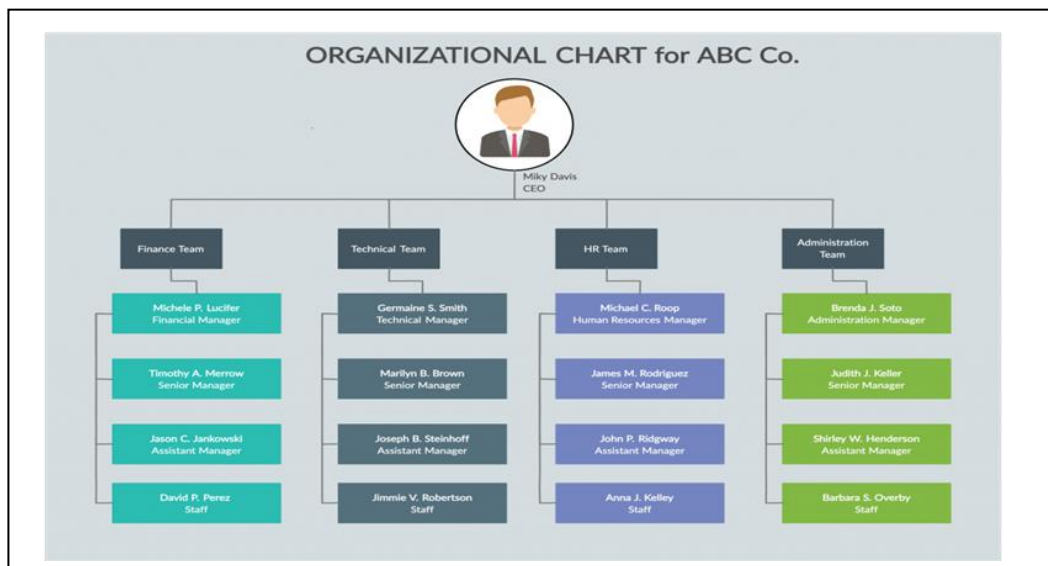


Figure 2- Organisational chart (Nishadha, 2022)

The hierarchical structure as shown in figure 2 is a very good generic lay out used in most high production engineering companies. This structure allows all the work that is being developed and researched to be approved by the CEO or the single manager in charge of the product development. It restricts issues of debate between departments on different design parts of the product and the ultimate decision being made by an individual. The CEO will be the most significant member of the team and make all final decisions on the product, the head of departments below the CEO such as HR, engineering manager, financial manager, CAD (computer aided design) and the quality control manager will have the respected authority to manage the employees within their teams and delegate specific aspects on creating the product to the appropriate engineer.

With this team structure the important gain is that with managers at the top of the individual branches along with the senior managers or supervisors are easily accessible for every member of the team, to be able to address any issues or concerns they have with the development processes for the product and if they have any personal issues or personal issues they can take the issues up the chain of command. By doing this, the supervisors in each area can work up the chain by relaying the issues to their respective managers who in turn then go to the CEO and put the issues forward to resolve. This allows for a sense of loyalty and respect from the top of the chain of command working down to the individual engineers.

Each member of the entire team structure will all have to conform to a set of professional codes of conduct and set code of ethics within their sector (NSPE, 2019). These state that the engineers should be guided on all their relations to the highest standard of honesty and integrity. They should give their best to serve the public interest. Engineers should avoid any conduct that deceives the public in any way. Engineers are required to not disclose any information any technical data that they receive internally in the company or from their clientele to anyone outside of the workplace. The engineers should not be influenced in their professional duties by external conflicting interests. Engineers should not try to advance or obtain employment by untruthfully criticizing any other engineers' work (NSPE, 2019).

Each member within their respected departments will be expected to follow the code of ethics and engineering responsibilities as stated above to ensure that the entire project is completed to the best quality, standards and as safely as possible. Companies that follow their code of ethics and engineering responsibilities are benefited by this as it shows great integrity to any potential customers looking for projects to be undertaken by companies. It shows that they can trust the company to deliver the best quality of work and helps with any perspective candidates looking to join the company. It will also help fill any roles that is needed, as it will attract the best employees who are looking to join a well set up company who value their employees for their hard work and ingenuity.

3 Product development

In this section, the discussion of what processes are involved in the development stages for designing the product. Looking at the team structure, the first step would be to use a simulated model of the product and model it to its specific measurements and conformity's, by using a CAD model. This allows a good idea for the individual processes needed to create the component. Along with giving a good estimation on the amount of time needed on the production of a single unit, cost of the raw material and any tooling and specialised inserts needed to ensure the best accuracy.

This will ensure that if any of the departments have any concerns or suggestions, they can be tested with a simulation to prove or disprove that their suggestions will work and can then be discussed by all the managers of departments, allowing the CEO to communicate with the customer prior to making any physical changes. This in turn will allow everyone involved in the project to suggest any actions to take or any changes to be implemented early in the project before making a physical prototype from an engineering drawing. There are many different issues that could arise within the development area of the product such as two managers or engineers opposing each other's decisions made by one another. Completing multiple simulations throughout the procedure would ensure that these disagreements would not arise within the team.

This could lead to poor communicating between two different branches and lead to work being continued by each department whilst not communicating with either team effectively (Puduserry, 2021), in turn when the project requires the departments to put their work together the project will not conform and lead to them blaming each other, causing the work to grind to a halt, the superiors having to use their time to intervene and correct the mistake and the CEO having to find the best compromise to continue the project. Along with this it takes precious time off the progress of the product, and engineers on both sides getting frustrated having to rework what they spent time and effort on, to correct for the mistakes of other departments, whereas if the team and management had been communicating effectively the errors would not have been made in the first place. Communication between departments is very essential in the engineering industry as there are so many components that comprise making the individual products for customers (Puduserry, 2021).

This issue can be resolved by ensuring that managers have regular meetings at key points in the development of the product and the managers of each department having regular check-ups with their teams to help them with any needs, suggestions and concerns they have.

The nature of engineering and the client is forever evolving. A customer may give an original drawing and once interpreted into an engineering drawing it may not be exactly how they envisioned the design. By the time that the product is finished off and SEP (sound engineering practice) (Procter, 2018) is conducted and all the legislations are met, the drawing will more than likely have been altered significantly from the original. It is then down to the engineer to explain and use their qualifications and experiences to persuade the client to alter their design and allow for some changes. This can be an issue for engineers, especially the design management, as clients have a set image in their head of what they want, and when it starts to differ they are fixated on keeping it to their specifications, not realising that alterations are needed to make the product work and meet all the legislations and standards needed. This problem can be resolved by having a good working relationship with the client, and with good working practices to show the client that they can trust you, they will become flexible with your professional input and agree to changes ensure the development runs smoothly.

4 Issues, Legislation and Standards

When developing a product there are a few issues that need to be assessed. First, the health and safety aspect of creating a product needs to be adhered to, to be specific the health and safety at work act needs to be followed very closely (Procter, 2018). This act ensures what procedures are followed when undertaking any act in a workplace. It includes working with individual hazardous materials and liquids, manual handling to name a few. The main underlining points that employees must follow are the duty of safety from employer towards their employees and the public and the duty employees have for themselves and each other. If the health and safety at work act is followed in each development and manufacturing stage, there should not be any implications regarding health and safety internally and externally with clients (Procter, 2018).

When looking at the legislations, such as British Standards (BS) and international organisation for standardization (ISO) requirements are met when reading and following the 1998 Provision and use of Work Equipment Regulations. (Procter, 2018) This is abbreviated to PUWER. PUWER is a set of UK regulations that are given to ensure the best safety for people using 'work equipment' which can range from office equipment to Computer numerically controlled (CNC) machines (Procter, 2018). The PUWER assessment is used throughout a machines entire life cycle from commissioning all the way to decommission. It is required to have periodical assessment through its work cycle (Procter, 2018). Regulation eleven of PUWER looks at the steps that can be taken by machine manufacturers and employees using machine to reduce the risks from dangerous projectiles to crush zone along with fast moving parts (Procter, 2018). The guards are inserted to reduce the risk of injuries and fatalities to those who use the machine. The guards are therefore subjected to regular testing by PUWER (Procter, 2018). This is an aspect to consider when developing, to give the clients the best possible use out of the product with the maximum sustained safety. Meeting codes such as BS EN (European standards) ISO 14120 And BS EN ISO 13857 (Procter, 2018). This ensures the best safety and continues use of the product with along with the client's trust.

The biggest ethical considerations need to think about when developing a product that the product being made is safe. This means taking the time to do valuable research on materials that are going to be used to make the product all the way through to the design of the product. By doing this ensures that the best decisions are being made and realising that cheaper, more available materials are putting the team and the user's life in danger. The quality of the product will be apparent while on the market, as it will have been assessed and proven to be more durable and safer for its users compared to cheaper alternatives, which is a huge benefit.

Environmental consideration is something that should always be shown in the design and manufacturing procedure during development. Certain materials may be cheaper to acquire and still provide the right safety requirements and meet all the BS EN and ISO requirements (Procter, 2018). Research into alternative materials and processes that yield the same safety results should be considered to allow the product to be more sustainable and appealing when comparing products on the market.

5 Personal Development Plan

In this section I want to discuss my future and how I am going to implement them. I am going to complete my current course at university of trinity St David's (UWTSD) while studying automotive engineering degree. I want to spend time working in industry such as Nissan or another company that produces hybrid and fully electric vehicles. Using my experience from industry I plan to work for myself and start an electric and hybrid vehicle maintenance and repair service. Along the journey I will put myself through all the courses and training required to gain all the knowledge I can to be the best technician I can be.

6 Conclusion

The most defining factor to consider while producing a product, no matter what team structures are chosen or the quality of engineers, is that communication is the most important aspect to having a successful project. In this report it shows that with all the research and understanding, from team structures to codes of ethics; communication between everyone involved in project is the key component and is such a simple requirement but when done well can outline the product and put it above the rest in the respected market.

7 References

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