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Wales Institute of Science & Art



Planning the Development of a Weatherproof Skateboard Deck

Workshop & Practice ACHA4011

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1 Introduction

A skateboard, shown in Figure 1, is made up of 3 main components: the deck, the trucks and the wheels. The deck is the base of the skateboard with the trucks attached by bolts through mounting holes, the wheels are then attached to the axles of the trucks through bearings and nuts. The purpose of the deck is to provide a surface for the rider to stand upon and control the movement of the skateboard.

Skateboard decks are typically constructed of 7 layers, or ply, of hard maple veneer. These layers are approximately 1/16 of an inch thick, arranged in with the grain running in a specific direction depending on the layer, bound using polyvinyl acetate glue or epoxy resin, and pressed together (Berger, 2014). When used in wet conditions, the layers of wood can absorb excessive amounts of water and cause them to warp out of shape. This can force apart the layers of the board and weaken the glue bond between them, ultimately leading to a weakened board (Vee, 2021).



Figure 1 - The assembly of the skateboard deck, trucks, and wheels (Henry, 2018).

Liu et al. (2018) determined that to improve safety the deck should be stiffer, providing a more predictable behaviour by reducing the deflection under load, and the deck should be strong enough to withstand the forces of the user landing on it after performing a trick.

This report is focused on the development of a skateboard deck that is suitable for use in wet conditions, and its purpose is to detail the development process of a skateboard deck designed to be impervious to water damage, including details on the structure of the team behind developing the product and how issues would be resolved. The focus of the development would be on finding a suitable alternative material, or combination of materials, to use as the deck. The skateboard manufactured from the alternative materials should maintain, or increase, the stiffness of a 7-ply maple deck and improve its performance and durability in wet climates by removing the potential for waterlogging and delamination.

2 Research – Engineering Team Structure

It would be beneficial to have an engineering team to develop the product as they can apply their understanding of engineering to the product and identify faults and propose alternative solutions to improve the product. The engineering team for this product would consist of an engineering team leader, a materials engineer, and a mechanical product engineer. The engineering team leader would be responsible for co-ordinating the development of the board and communicating with other team leaders and the CEO. The materials engineer would be responsible for researching the ideal materials for the task and experimenting with them to achieve the desired characteristics, and the mechanical product engineer would be responsible for devising a manufacturing plan to produce the skateboard deck.

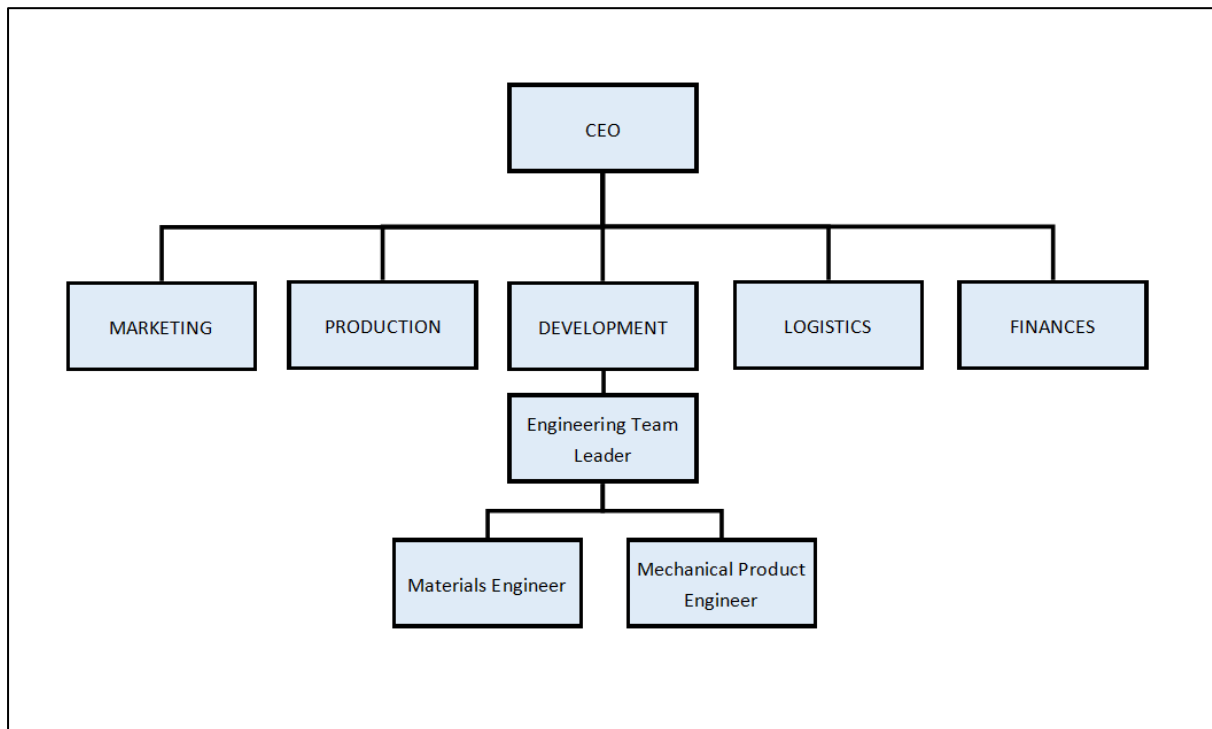


Figure 2 - The engineering team structure in relation to the business as a whole.

This engineering team, shown in Figure 2, would be just one part of the overall business working alongside other departments such as marketing, finances, logistics, and production. This team structure would be one organised by function since the employees are sorted into departments based on their role in the business, having the business structured in this way is beneficial as it encourages collaboration between specialists in related roles (nibusinessinfo.co.uk 2021). The marketing team would be responsible for performing market research, arranging advertising, and contacting skateboard retailers to arrange product sales. The production team would be tasked with the manufacturing of the product, preparing the material, cutting and pressing it into shape, as well as

applying a finish to the product. The quality assessment team would then ensure the product meets certain criteria by, for example, taking measurements of the features of the board to ensure they are within tolerance, and testing the board to ensure it has the expected characteristics.

A roadmap for the development of the product would be established using a Gantt chart. This would outline the responsibilities of each member of each team, clearly show the tasks they need to complete and the timeframe the tasks need to be completed in. This would help to ensure the project stays on track and would also help to identify any areas where a team is behind schedule, allowing management to make changes in order to attempt to prevent delays. Some sections of the project may be a core part of the project and crucial to advancing past a certain point, and a delay in a core part could disrupt the progress of the other departments, bringing the development to a halt until the key task is completed.

To ensure the project is developed effectively the team leaders would organise regular meetings to raise issues, communicate suggestions for improvements, and discuss changes to the direction of the product development if a better, alternative method is discovered. Individual departments could also hold regular meetings to allow the team leader to give the employees the opportunity to ask questions and provide feedback to be raised to the team leader's meetings (BBC Worldwide, 2013). The engineering team leader should also examine the work of the employees they manage, verifying that everyone is working at the expected professional level by examining their work, determining whether it is satisfactory, and discussing the reasoning behind their design choices.

3 Methodology – Product Development

The problem-solving method used in the development of this product is based on the following steps detailed by Sharp (1991).

The first step taken to begin the development of the product would be identifying the needs of the customer. In this case, the customer's requirement is a skateboard deck which does not become waterlogged and delaminate in wet conditions, while providing a similar feel to a maple deck. Then the problem must be specified, this would be the traditional maple board's ability to absorb moisture, negatively impacting structural integrity.

After identifying the problem, the team should perform market analysis to gain an understanding of the products currently available on the market and then propose alternatives based on their research.

From this, the development team can then define their specifications for the product to find an alternative material, or combination of materials, to use to create a skateboard deck with a similar properties and dimensions to a traditional maple deck. The finished product should also have a cost competitive with that of the standard maple boards. The materials used should have a minimal environmental impact, one example of a deck being made from an alternative material is a skateboard deck created from discarded pieces of carbon fibre (CompositesWorld, 2019).

The development team would then research a variety of materials to find suitable alternatives, with consideration for the specifications previously defined. Following this, prototypes would be developed from the researched materials and tested, using the traditional deck as the baseline. The performance of the prototype boards would be tested to measure properties such as rigidity and strength in order to find a suitable material substitute, and the ease and cost of manufacturing would also be assessed. Additionally, the prototype boards could be tested by potential customers to receive feedback on the design.

The development team would then refine the material selection using the data and feedback acquired to narrow down the material selection and use further testing to make a final decision.

4 Discussion – Issues, Legislation & Standards

When a skateboarder is performing some tricks, parts of the deck contact the ground causing the erosion of part the board's material which would then be left in the environment. For this reason, it would be beneficial to have a non-toxic material to ensure that the environmental impact of the shredded material is minimal. This can also extend to any agents used for bonding the plies together, finishing the board, and inks used to create the board's graphic.

It would be beneficial, from both a cost and environmental standpoint, to have a manufacturing process creating as little waste material as possible. This may lead the designers to have preference for a material with a more efficient manufacturing process.

The business could prioritise the use of locally sourced materials to reduce the emissions created by the transportation of materials. Another method that could be used to reduce the carbon footprint of the business is expanding the business by creating new locations closer to customers and material suppliers. This will reduce the fuel used to transport the raw materials and the final product.

If the deck is not stiff enough, it can lead to unpredictable behaviours which could cause the user to lose balance and fall, potentially injuring the user (Liu et al., 2018). This could also occur if the deck is not strong enough and the user applies more force than the deck can handle, for example when landing a trick, causing the deck to become damaged. This could affect the reputation of the business and could prompt legal action, so it is vital that the deck meets the necessary requirements to handle the loads it is expected to encounter, even after exposure to harsh conditions.

It is also vital that the design of the board does not infringe on any intellectual properties. Therefore, the development team should conduct research into copyrights, trademarks, and patents to discover the restrictions that exist in the space, avoid infringing on the owner's rights and request permission to use the intellectual property if necessary.

5 Conclusion

To summarise, in order to create a weatherproof skateboard deck, a team consisting of an engineering team leader, a materials engineer and mechanical product engineer would be necessary. The team would have to identify the problem from the customer's need, analyse the market, specify what needs to be achieved, research ways to achieve their goals, develop prototypes and use the data gathered to select a solution, performing further testing if necessary. In the creation of a weatherproof board, the main aim is to make a skateboard deck that does not become degraded from exposure to water and maintains the characteristics of a traditional 7-ply maple deck in terms of size, weight, stiffness, and strength.

In order to develop myself as an engineer, I will need to put more focus into learning about advancements in the automotive engineering sector as well as other engineering sectors, for example, electrical engineering as vehicles become more dependent on electrical systems. A key part of being an engineer is maintaining an up-to-date understanding of technological developments by reading recently released engineering journals and papers.

6 References

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