Achievement Standard 91358

[1]In this report I will be demonstrating my understanding of how technological modelling supports risk management and supporting my statements with evidence from Sarah Burren's project "Junior". I will be discussing the types of modelling that can be used throughout a project and why different types are used with different stakeholder groups.

First off, what is technological modelling? Technological modelling is a process in which technologists use to help them identify and minimise risk. In technology, risk refers to the possible problems that are associated with a particular design. Risk management refers to reducing the potential for malfunction and/or increasing the level of success of a project. Through many different types of technological modelling we are able to maximise risk management. Technological modelling refers to both functional modelling and prototyping.

Functional modelling is used to test and develop different aspects of a design for an outcome that is still to be finalised. This means that with each test or trial a decision will be made to improve the product and it would modify the outcome. Some examples of this are; mock-ups, toile, stakeholder feedback, templates, sketches/drawings and 3D models.

Prototyping is used to test a designs fitness for purpose and is done once the technologists think that they have perfected their design. A prototype is a one off make of the design. By doing this they will be testing the product to see if it will work effectively within its intended environment. Because the designs fitness for purpose is being tested against the brief the prototype needs to be made out of real materials and made to full scale size. The design of the product is still able to be modified if the technologists find something in the prototype that can be improved upon.

Planning the Project:

The first step in making Junior was to plan which is a type of functional modelling. Sarah Burren spent several months at the end of 2010 just planning this project. "We did charts, calendars, and a huge amount of budget work for contingencies, thinking about 'what if' situations." – Sarah Burren. She needed to budget everything because making a 5 metre marionette could easily go over budget and cost a fortune. This type of research / modelling provided accurate costing information which was important in the initial stages as Sarah needed to provide an outcome within a specified budget. Using this research is a way of providing valid costing evidence for the project. In those months she called up suppliers to try and get the materials as cheap as possible, she called AUT to see if they wanted to get involved, she talked to engineers, sound technicians and a puppeteer named Jonathon Acorn. She did all of this so that she

[1] http://www.techlink.org.nz/Case-studies/Technological-practice/Materials/Junior/

could get ideas on how Junior would be made and presented, what would be needed, what could go wrong and how they would prevent that from happening.

This type of modelling was important because it enabled Sarah and others to think about the technical feasibility and social acceptability of the project. While planning the Junior project Sarah would have been asking herself if she should actually try to make Junior. As an ethical decision was a 5 metre puppet a good idea? Was it going to be a waste of money? What might happen if he wasn't controlled properly and fell over? How could they design Junior in a way that would maximise the amount of control they had over him and prevent the risk of Junior causing injury? By planning she was able to answer these questions and went on with her project.

Planning was a very important type of technological modelling in this project because without it so many things could have gone wrong. While Sarah is a technologist, she is not an engineer or an expert on puppets and she needed the skills and knowledge of both these professions, and more, to make this project a success. Planning things like a budget and timeline was very important because it minimised the risk of spending too much money and/or not finishing the puppet on time and also enabled her entire team to have an overview of the project from beginning to end. She put all of this information in the form of things like charts and calendars so that she could show her work in a way that was easily understood by the people in charge of the Rugby World Cup who would need to know what she was doing as well as her team.

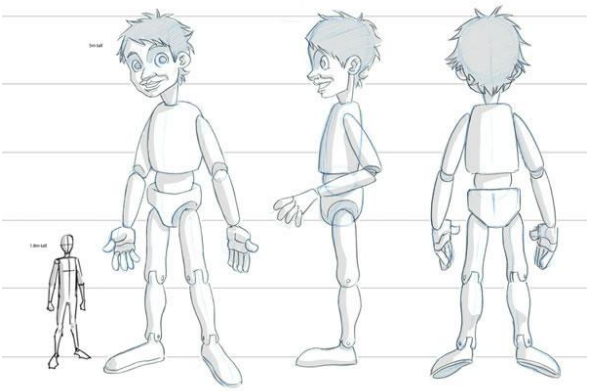
This technological modelling supported risk management because it reduced the risk of miscommunication and confusion between Sarah and her team which could have resulted in costly mistakes being made and time being wasted. Also this type of modelling gave others the opportunity to write comments and add to her plan and get a clearer understanding of the entire project.

Sarah also made a character brief ahead of time because she believed that knowing the characters back story would help to create a consistency when developing the look of the puppet. She spent time with television writer Andy Gunn who helped her to develop Junior's story. This functional modelling was done in order to maximise risk management and minimise the risk of Sarah's team not knowing exactly what she wanted and them giving her something which did not meet her vision and specifications of what it should be.

Drawing Junior:

In the January of 2011 Sarah contacted a designer named Alan Cochrane from Flux Animation studios and asked him to create some sketches of Junior. He was given Junior's back story as well as some pictures of Sarah's 13-year old nephew who Sarah thought Junior should resemble. As a designer Alan would have been able to produce very clear drawings of Junior which would have been easy for the other members of Sarah's team to understand. They drew many drawings, adjusting here and there, until Sarah was happy with the design and the drawings met all the specifications mentioned in the brief.

The drawings helped to convey Sarah's vision across to her team and her stakeholders. It also provided a way for her stakeholders to give constructive feedback and their ideas on how to improve on the designs. This supported risk management because another member of her team might have spotted a flaw in the design that she had not. For example; the engineer may have noticed that if the head was going to be that size then they would have to make it out of an extremely light material or have something else to off balance its weight. If they had not noticed that point and made the head out of a heavy material the marionette would have been top heavy and could have toppled over when in use and hurt people in the crowd.[3] Also, this modelling was very visual and enabled everyone involved to get a clear picture in their minds of Junior. Creating a story around the idea of Junior encouraged stakeholders to use their imagination and "buy" into her idea. This type of evidence is reliable and accurate.



Alan then made working drawings which included the joints on each part of Junior as a guide for the building team and the correct scale and measurements so that it could be used as a sort of blueprint for the builders and clothing designers later on in the project. Having working drawings allowed decisions to be made on the sizes of the materials which then formed the cutting list and also gave the building team enough information to start building/trialling. Working drawings supported risk management in this project because it helped to minimise the risk of the final project not being made to size and/or specifications and also it got Sarah to start thinking about what types of materials would be more suitable for each part of the body.

The Maquettes:

Sarah got Phil Gregory and his team, who make unconventional props and rigs for films, to start construction on Junior in mid-2011. To start they transferred some of Alan's drawings onto transparencies and used an OHP (overhead projector) to project the image onto a wall and adjusted it so that Junior was five metres high. "This modelling really had its uses because it made me aware that this was serious, and things had to be just right." – Phil Gregory. This technique supported risk management because it helped Sarah and her team to visualise the marionette's size and proportions and also helped them to think of further practical and aesthetic modifications. Some decisions that were made as a result of this modelling were that Junior could be a bit squarer and that his feet would need to be anchored due to Sarah's team realising that the wind would be a problem.

Realising this also got them to start thinking about what materials they would make his feet out of in order to anchor him. Concrete is a heavy material so they could have chosen to use that; but would it have been that practical? Sarah and her team chose not to use concrete because it would have been too heavy for Junior. It would have

[2] http://www.techlink.org.nz/Case-studies/Technological-practice/Materials/Print-PDFs/techlink-tp-junior.pdf
[3] http://www.techlink.org.nz/Case-studies/Technological-practice/Materials/Print-PDFs/techlink-tp-junior.pdf

added extra strain on his joints meaning that Sarah would have to make them stronger to be able to withstand the extra weight and keep Junior from being a safety risk. The extra weight would have also made it harder for the puppeteers to lift and control his legs when moving. Also if they did lose control of the marionette then the concrete in the feet could seriously hurt a bystander. Before choosing any materials to use they had to think about whether it was actually a good idea to do so.

Phil and his team then went on to make three maquettes; one of Junior's hand, another of his head, and another of his body. A maquette is a small scale model of a design. This supported risk management as it allowed issues with a design to be identified before it cost them too much or wasted too much time to fix. "With a maquette you can spot issues before you have wasted a lot of material or travelled down a road that is going to be expensive, labour-wise. If you first do it on the small, you can prevent that." – Phil. Making a Marquette gave reliable feedback to the design team prior to construction of the final outcome

Rebecca Lloyd, who is a carver, made the 50cm-high maquette of Junior's head out of a mouldable plasticene-like product called Clean Clay. The development of Junior's face was a crucial part of making Junior because "making a creepy Junior was just as easy as making a cute Junior." – Phil. Making a "creepy" marionette would not have been good because they knew that many children would be at the Rugby World Cup and the people who organised the opening ceremony would not have used Junior if he scared little children. This is a type of functional modelling and was used for stakeholders such as Rebecca because it enabled her to adjust the face until she was happy with it without it costing too much money and wasting materials. The mock-up of the head would have probably been presented to the people in charge of the Rugby World Cup as it is an effective way of showing them their progress and to make sure that they were happy with Junior's look. [4]

By making this maquette Sarah and Rebecca were able make adjustments until they were happy with the look of Junior. They modelled the face physically by moving it around and holding the face above their heads so that they could see what it would look like from a child's perspective. From doing this functional modelling, decisions were made about modifications to the face to reduce the risk of the face being "creepy" and not "cute" such as the decision to make the face less pointy. This is valid evidence because if they had not done this type of modelling then they could have made a marionette that scared the children and therefore they would not be able to use it at the Rugby World Cup.

[4] http://www.techlink.org.nz/Case-studies/Technological-practice/Materials/Print-PDFs/techlink-tp-junior.pdf

Rebecca then made a maquette of Junior's hand which was also an important aspect of the marionette because it was visible to the public. Sarah wanted the hand to be more "cartoony" than life-like so they made it bigger than normal. This modelling helped Rebecca and Sarah to make the final decision on the sizing of the hands. By making a maquette of the hand they reduced the risk of it looking weird or not how Sarah envisioned it.

While Rebecca was making the face and hand, Phil and the rest of his team were busy making a 1.5 metre-tall functional maquette of Junior's body. First they made a card maquette to establish the size and proportions of the joints and limbs Next Rebecca carved the parts out of wood and then Phil and his team put it all together. Because the marionette would not be confined to a stage, the team needed also to construct a model of the telehandler that would hold him up. The telehandler would be moving Junior where ever he needed to be as well as holding him up with the pulley operation system that would be used by people on the ground to make him do different things like walk or wave.

[5]It was important to trial this because it gave the chief puppeteer, Jonathon Acorn, a functional model to work with. He was able to test different ways to string the puppet and then choose the one that gave the best control and effect. This reduced the risk of the puppeteers not having enough control over the marionette and it being a safety risk on the night of the Rugby World Cup or even when they were trialling it.

Phil and his team also created miniature humans to scale to get a sense of Junior's size. "Once we put the small people in there with the maquette, the full rig and telehandler mock-up, it gave us an idea of the scale. By taking photographs we could see that when looking up at the maquette from the scale of a small person he looked a bit long and odd so we actually ended up making his legs shorter for the full size version." – Phil. This functional modelling enabled decisions to be made on the overall aesthetics of the marionette without it costing too much money or time. Again this gave reliable and valid feedback because the team was able to make alterations based on the feedback from making the miniatures

Making the Full Five-Meter Marionette:

Now that Sarah was happy with the overall look of Junior, Rebecca had the hard job of scaling up her models to the full five meter version. First, she cut out the rough shape of Junior's head. She then put some pictures she had taken of the model head onto transparencies and used the OHP to project the image onto the polystyrene block. From this she was able to draw on details such as his eyes, nose and mouth and then cut away. She kept on

[5] http://www.techlink.org.nz/Case-studies/Technological-practice/Materials/Print-PDFs/techlink-tp-junior.pdf

doing this until she was happy with the proportions of his face.

Using the OHP was a very effective type of modelling because it enabled Rebecca to get the life-sized Junior face to look as close as possible to the smaller-scale Junior face. Without the OHP, Rebecca would have had a harder time trying to get the face to look right and it would have probably resulted in the bigger face looking similar but not the same as the smaller one. Polystyrene was used to make Junior due to decisions make earlier. They decided to use polystyrene because it is cheap, easy to carve, recyclable and light weight which means that it was within budget and not much would be wasted. Rebecca also created polystyrene segments of the rest of Junior's body using a scale that was just increased from the maquette measurements.

They then coated Junior's limbs using fibreglass. They chose to make the five meter Junior out of fibreglass because it is really hard and durable. This created a light protective skin and a surface for the painters to paint on. Unlike the rest of Junior's body, his head and torso were left hollow. They decided to do that because it kept the overall weight of the marionette down and therefore reduced the risk of something going wrong. Also, it was convenient to do this because if, for example, during a practice Junior fell over and his head got smashed in, then they could easily make an identical replacement using the polystyrene head as a mould.

When it was time to put all of Junior's parts together Phil worked closely with an engineer named Nick Barnfield and Nick Walter. Barnfield was the person who designed and built the overhead pulley system so he had also made all the mathematical drawings of Junior that accounted for his weight and all of the potential velocity from each of his moving parts. Walter was the person who had constructed [6]the key structural components in lightweight steel.

"Junior has a steel armature, like a skeleton, so where his knees and elbows are it is steel on plywood blocks. You get friction of the wood on steel – but that's good because the wood can wear a bit, it doesn't squeak, and there is no chance of it breaking. And also it has a bit of give, so if he gets twisted it will just chip a little bit of plywood off. These parts were expendable so, if you had to, you could just replace them with new plywood blocks."

This decision supported risk management as it reduced the risk of malfunction on the night of the Rugby World Cup and also during practice. This increased the safety of the marionette because if they had not used plywood blocks but some other material with different properties it could have broken during use and caused injury.

[6] http://www.techlink.org.nz/Case-studies/Technological-practice/Materials/Print-PDFs/techlink-tp-junior.pdf

Conclusion:

In conclusion, many different forms of technological modelling were used through out this project inorder to support risk management and also to make the marionette to the hightest possible standard. Each type of modelling was directed at a certain stakeholder group because it was the most suiable way to gain vaild eviedence for decisions that were made throughout the project. By undergoing many modelling processes Sarah and her team were thinking about what could happen and then deciding on what should happen. Through technological modelling Sarah was able to gain valid and reliable feedback on her work from her stakeholders which inturn improved its fitness for purpose and produced a marionette that was safe and of a high quality.