

Engineering Project Managment

by Rhys Jones

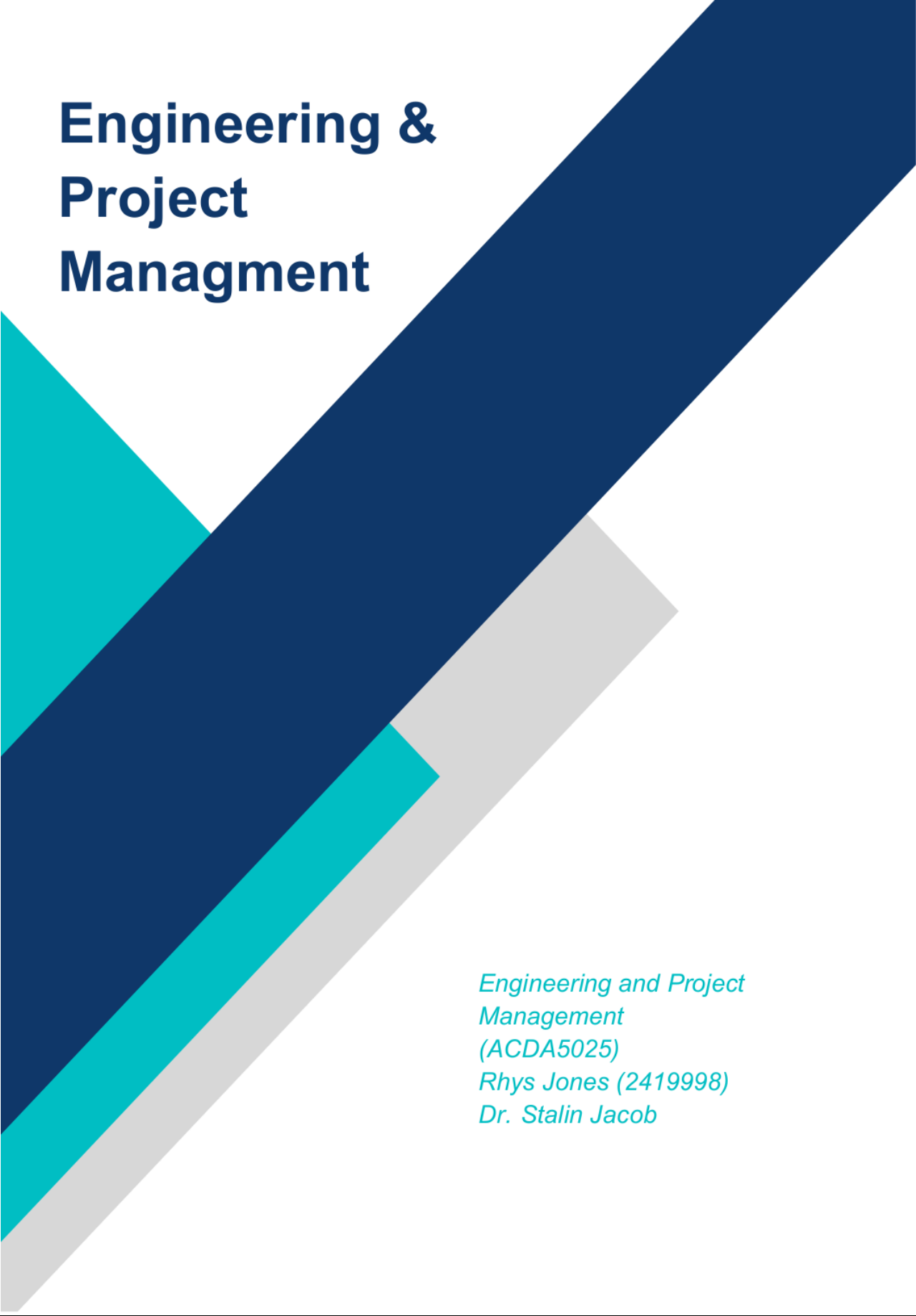
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Engineering & Project Managment

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1.) INTRODUCTION

This project proposal is based on the design and build of an electronic Bluetooth speaker. The main reason I chose this device is because it is useful in everyday life and it includes different electronic sections that all need to work together for the final product to function correctly. The speaker would receive an audio signal from a phone or other device using Bluetooth, then the signal would be processed and amplified before being output through the speakers. This means the project can show how wireless communication, signal processing, power supply and audio output can all be used together in one electronic device.

The project will only be completed as a proposal, so the Bluetooth speaker will not be physically built. However, the design will still explain how the speaker could be made by looking at the components needed, the project planning, the cost of the project and the possible risks involved. The proposal will also include the environmental, ethical and safety concerns linked to the product, such as battery safety, noise pollution and electronic waste. This introduction will explain the purpose of the project and show why a Bluetooth speaker is a suitable electronic device to design for engineering and project management.

2.) TASK GIVEN

The task given was to produce a project proposal for the design and build of an electronic device. For this project I chose to design and build a Bluetooth speaker as it is a useful electronic device that requires multiple parts to work together like receiving the signal, amplifying it and then outputting the signal to a speaker to make the noise sent from a device. This project will only be a proposal so the speaker will not be physically built, but the design can still be explained by showing what components would be needed and how they would work together.

3.) AIMS AND OBJECTIVES

3.A) AIMS

The proposal will explain what the device will do, what components would be needed, what specifications the speaker would have and how the project could be planned if it was built. It will also include a time scale and how much money would need to be invested in this project for it to be built as a prototype.

3.B) OBJECTIVES

- To research and choose suitable components for the Bluetooth speaker design.
- To create a clear project plan showing the tasks, durations, dependencies and milestones.
- To identify the main risks in the project and explain how they could be reduced.
- To consider the environmental, societal and ethical impacts of the proposed device.
- To complete a cost-benefit analysis and critical path analysis for the project.

3.C) MILESTONES

The milestones are the main achievable points that are going to be completed in the project. These are used to make sure the project is moving in the correct order and that each part is finished before moving onto the next section.

- Project idea chosen
- Research completed
- Specifications decided
- Circuit design completed
- Program completed
- Casing design completed
- Risk and impact sections completed
- Final product completed.

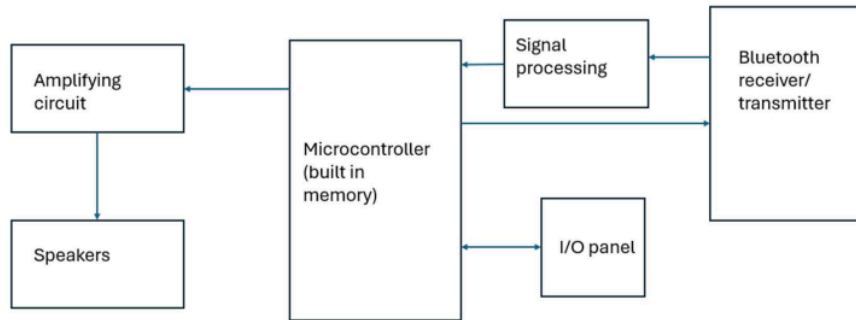
4.) BACKGROUND RESEACH

Bluetooth works by using low power radio waves on a frequency between 2.4Ghz and 2.483Ghz. [1] Using these radio frequency we can small packets of data through radio frequency pulses that goes is encoded at the Bluetooth chip and decoded by the receiver which turns the radio frequency back into binary that can be used to output audio. The reason Bluetooth can work well everywhere is due to adaptive frequency hopping that is set by the transmitting device. This frequency hopping avoids any interference that can be caused by frequencies that already have data being sent on them. [2]

Speakers work by changing electrical energy into mechanical energy which then creates sound. When an electrical signal travels through the voice coil inside the speaker it creates a magnetic field. This magnetic field reacts with the permanent magnet inside the speaker which causes the voice coil to move backwards and forwards depending on the audio signal being sent through it. This movement then makes the speaker cone move in and out which pushes and pulls the air around it. As the cone moves it creates pressure waves in the air and these waves are what we hear as sound. The faster and stronger the cone moves, the different the sound will be, such as changing the volume or frequency of the audio. [3]

5.) DESIGN BLOCK

The first section of the Bluetooth speaker starts with the Bluetooth receiver and transmitter. This is used to connect to a phone or other device and then receive the audio signal wirelessly. The signal then goes into the signal processing section where the audio can be cleaned up or changed before it is sent further into the circuit. After that the signal goes into the microcontroller which controls how the speaker works and uses the built-in memory to store the final program. The microcontroller is important because it links the different parts of the circuit together and makes sure the correct signals are going to the correct places. The microcontroller then sends the audio signal to the amplifying circuit which increases the signal so that it is strong enough to power the speakers. Without the amplifying circuit the speakers would not be loud enough because the signal coming from the processing section would be too small. The I/O panel also connects to the microcontroller and lets the user control the speaker, such as changing the volume, turning the device on or off, or pairing the Bluetooth. All of these sections need to work together because if one section does not function correctly then the final output from the speakers would not work as intended.



The main purpose of the Bluetooth speaker is to produce louder audio than a standard phone speaker by receiving an audio signal from a device and then outputting it through the speakers. The inputs for the device will be the buttons such as the power button, pause button, volume increase and decrease buttons, skip button and previous button. These are needed so that the user can control the speaker without needing to use the connected device every time. The outputs of the speaker will be the audio from the speakers and LEDs for the power indication so that the user can see when the device is turned on. The performance, manufacturing cost, power and physical size and weight will also need to be added later because these will affect how useful and realistic the final design will be.

Name	Bluetooth speaker
Purpose	To produce audio louder than a standard phone speaker
Inputs	Power button, Pause button Volume increase button, Volume decrease button, Skip button, Previous Button.
Outputs	Speakers for Audio, LEDs for Power indication
Functions	Uses Bluetooth to receive audio signal from a device then outputs the audio through the speakers
Performance	Outputs audio every second
Manufacturing cost	To Be Added
Power	To Be Added
Physical size and weight	To Be Added

6.) Deliverables

The deliverables for this project will be the final program and the final designs needed for the Bluetooth speaker. The final program would be used to control any parts of the speaker that need coding and make sure that the device works as intended. The next deliverable would be the final circuit Board design which shows how all of the components are connected together such as the Bluetooth module, amplifier, battery circuit and speaker output. Finally, the casing design will be included because this is needed to hold all of the parts together and protect the circuit boards inside. This means that even though the speaker is not being built physically, the project will still show how it could be made in the future.

7.) RESOURCES

The resources needed for this project will be the parts and information required to design the Bluetooth speaker properly. Firstly, I would need time to research the correct components such as the Bluetooth receiver, microcontroller, amplifier, speakers, battery circuit and outside casing. The next resource needed would be technical knowledge from data sheets and online sources so that the components chosen are suitable and will work together without causing problems. Financial resources will also be needed because the cost of each component has to be considered to make sure the design is realistic and not too expensive. Finally, scheduling will be important because each part of the proposal needs to be completed in the correct order, such as choosing the components first before doing the circuit board design and then the casing design.

8.) EQUIPMENTS

The Equipment's list is a rough estimate of what the cost will be for the total cost of the project as there will be other costs that cannot be calculated yet. The largest cost for the project will come from Personnel cost, the computers to work on, Office space for rent, Furniture including desks and software licenses. Proteus and Easy-Pc are needed for the programming and the PCB design these are expected costs for a first-time project but can be used again for future projects making them a single time purchase. The soldering iron, solder and components are needed for the Final design on the PCB while the breadboard is for testing in the interim. There are general running costs from the power and water needed for the office space and insurance in case anything happens to the building.

Item required	Cost
Proteus license	£3,000
Easy Pc license	£500
Soldering iron	£50
Solder	£10
Components	£150
PCB first	£30
PCB final	£60
Breadboard	£20
Personnel cost	£54,000
Rent for office space	£4,000
Furniture	£3,000
Computers	£10,000
Power	£300
Water	£200
Insurance	£10,000
Total cost	£72,320

9.) RISK MITIGATION

Risks are something that can often be prevented or planned for when creating a project. There are also risk that aren't preventable that need to be taken into consideration. One risk that could happen during this project is choosing components that do not work correctly together. This could happen if the Bluetooth module, amplifier, battery circuit and speakers are not checked properly before the final design is made. The way to reduce this risk would be to check the data sheets for each component before choosing them and make sure the voltage, current and power ratings all match each other.

Another risk that could happen is the project taking longer than expected because some sections of the design might need to be changed. This could happen during the circuit board design or the casing design as the parts may not fit together properly the first time. To mitigate this, the project should be planned to use a Gantt chart and the harder tasks should be started earlier so there is time to fix any issues. The design could also be checked in stages instead of waiting until the end, because this would make it easier to find problems before they affect the final proposal.

10.) ETHICAL CONCERNS

There will always be ethical concerns in a project about misuse of the device and the safety of the device especially when it comes to batteries as they can explode or catch fire. One ethical concern with this project is how the Bluetooth speaker could be used by people after it has been designed. The purpose of the speaker is to produce audio louder than a standard phone speaker, but this could also cause problems if it is used in public places or around other people. If the speaker is too loud then it could create noise pollution and disturb people who do not want to hear it. To reduce this problem the speaker could be designed with a sensible maximum volume so that it still works as intended but does not become too loud for normal use.

Another ethical concern is the safety of the user when using the speaker. The Bluetooth speaker would need a battery and charging circuit, and if these are not designed correctly then there could be a risk of overheating or damage to the device. This could be dangerous because batteries can become unsafe if they are charged with the wrong voltage or if too much current is drawn from them. To mitigate this, the design would need to include battery protection and the correct rated components so that the speaker is safe to use.

The production of the speaker also has ethical concerns because electronic devices use materials that can be bad for the environment if they are wasted. Components such as batteries, circuit boards and plastic casing can become electronic waste if the speaker breaks or is thrown away. This means that the design should try to use materials that can be recycled where possible and should also make the casing easy to open so parts can be repaired or replaced. This would make the speaker more responsible as it would reduce waste and make the product last longer.

13.) REFERENCES

- [1] Bluetooth, "What determines Bluetooth range?," Bluetooth, [Online]. Available: <https://www.bluetooth.com/learn-about-bluetooth/key-attributes/range/>. [Accessed 16 03 2026].
- [2] C. F. & C. Pollette, "How Bluetooth Works," howstuffworks.com, [Online]. Available: <https://electronics.howstuffworks.com/bluetooth.htm>. [Accessed 21 03 2026].
- [3] "How Do Speakers Work? Speakers and Sound Production Explained," <https://www.soundcore.com>, [Online]. Available: <https://www.soundcore.com/blogs/speaker/how-do-speakers-work-speakers-and-sound-production-explained>. [Accessed 20 04 26].

14.) APPEDIX

Prevent Training Certificate

[*Project Managment Assignment\Prevent Certificate.pdf*](#)

Equality, Diversity, and Inclusion training certificate

[*Project Managment Assignment\100% equality.pdf*](#)

Gannt Chart Real Time

[*Project Managment Assignment\Gannt Chart\Real time Gannt Chart.xlsx*](#)

Proposed Conecpt Gannt Chart

[*Project Managment Assignment\Gannt Chart\Conceptual Gannt Chart.xlsx*](#)

Critical Path

[*Project Managment Assignment\Critical Path\Critical Path Analysis.pptx*](#)

Engineering Project Managment

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

77 /100

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6



Comment 1

It would have been better with some values

PAGE 7

PAGE 8



Comment 2

It would have been better with caption

PAGE 9



Comment 3

It would have been better with conclusion

GRADING FORM: ENGINEERING PROJECT MGT

RHYS JONES

76.80

ENGAGEMENT WITH LITERATURE

Marks for this section will be awarded for your engagement with literature evidenced through relevant, credible sources cited throughout your report



Engagement with an appropriate range of literature. The report includes background research on Bluetooth operation and speaker working principles. The literature section is quite limited and needs more academic, technical, and manufacturer-based sources. Component datasheets should have been used to justify the Bluetooth module, amplifier, speaker, battery, and charging circuit. Referencing needs improvement, as only a few sources are included.

2.6

KNOWLEDGE AND UNDERSTANDING

Marks for this section will be awarded for your identification and ordering of the tasks, identification of the risks to your project, identification of any environmental and societal impacts of the project.



Excellent, detailed knowledge and critical understanding of Engineering and project

management. The report shows a good understanding of how a Bluetooth speaker receives, processes, amplifies, and outputs audio. The aims and objectives are relevant to the task. The specification table is incomplete. More technical detail is needed on power rating, battery capacity, amplifier output, charging method, Bluetooth version, are expected. It is evident that the environmental and societal impacts of solutions to broadly defined problems have been considered.

16

COGNITIVE AND INTELLECTUAL

Marks for this section will be awarded for your risk mitigation techniques and the ethical considerations for your project.



Excellent critical evaluation and analysis of concepts and principles of Engineering and project management. The report identifies some relevant project risks, such as component incompatibility and project delays. The ethical concerns section considers battery safety, noise pollution, and electronic wastes are mentioned. The analysis is descriptive. The cost section lists estimated expenses, but it does not properly evaluate benefits. It is evident that the environmental and societal impacts of solutions to broadly defined problems have been considered.

19

PRACTICAL SKILLS

Marks for this section will be awarded for your use of the available tools and techniques in the identification of risks and milestones and in

determining your minimum project duration.



An advanced application of a range of established methods and tools. The report includes milestones and deliverables, which helps show project planning. Gantt chart and critical path analysis are available. The risk section includes mitigation ideas, but it needs a proper risk matrix with likelihood, impact, risk rating, and residual risk. REVENT and Equality, Diversity and Inclusion certificates are included. The project needs clearer project deliverables. It is evident that the responsibilities, benefits, and importance of supporting equality, diversity, and inclusion have been recognised

16.4

TRANSFERABLE SKILLS FOR LIFE

Marks for this section will be awarded for the structure, coherence, presentation and overall quality of your reports.



Can communicate professionally confidently and consistently. The report has a clear structure, with sections covering the introduction, task, aims, background research, design, resources, costs, risks, ethics, references, and appendix. However, it should avoid repeated use of first-person phrasing. The report would also benefit from the inclusion of a table of contents and a conclusion.

22.8