MARINE WASTE SOLUTIONS

CLEANING THE OCEANS THROUGH THE USE OF TECHNOLOGY

Project Proposal for Cleaning Plastic Waste

Professor Mary E. Robinson – ENGL 103 (Blended) FALL 2018

Created by: Francesco Gallegos

Table of Contents

History of the Organization

Marine Waste Solutions was founded by in 2008 by mathematician Francesco Gallegos, and engineers James Russell, and Georg Moore. Even though at first they didn't agree with each other, the founders new that ocean trash was a problem that no one was tackling that had to be dealt with. They decided to combine their knowledge and expertise to tackle this problem

Mission Statement

To get rid of plastic from the ocean by implementing a large decentralized, self-organized system

that can efficiently remove trash. We believe that this approach, combined with other efforts,

can help us fight the ocean waste crisis

Vision Statement

To make the world a better place by cleaning the oceans.

Core Values

COMMITMENT

INNOVATION

INTEGRITY

SIMPLICITY
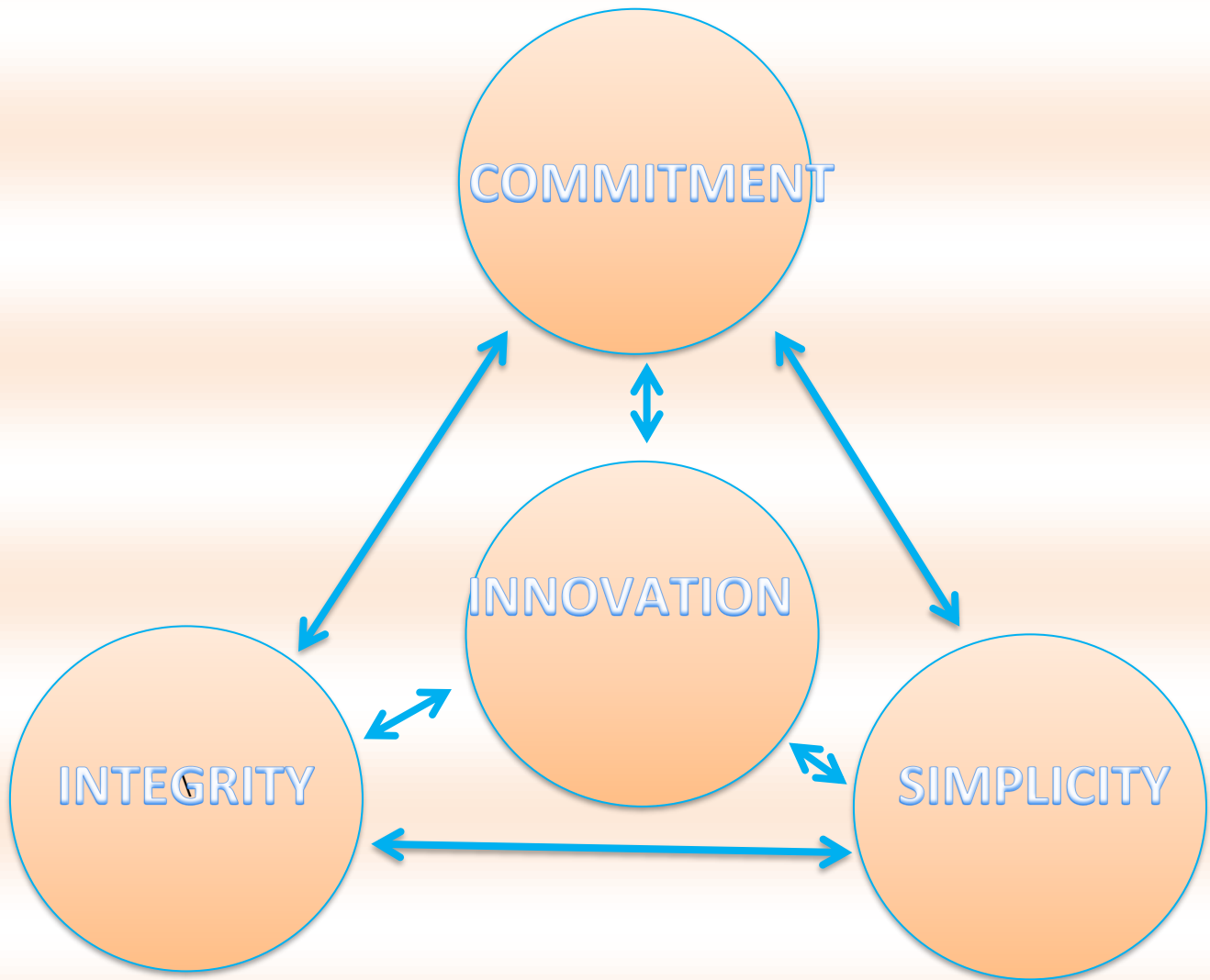
History of Topic

Even though ocean waste is a problem that scientists have well known for decades, it is a problem that we are just starting to look into. Companies and organization, themselves, started to look into problem around the 80s, but research really never gained traction until the mid-2000s. News coverage appears to have increased majorly in the last decade. A lot of that coverage has come from National Geographic and other large news sources such as CBS. The problem, itself, has been in the spotlight the last year because of the organization The Ocean Clean Up. The organization has received major funding from large corporations, and it's planning on using its own technology to collect large amounts of plastic waste with the help of currents.

Inquiries

1. **What do you think happens to waste that is not recycled?**

   A. Waste that is not recycled might be buried in a landfill or burnt.

   B. The waste that is not recycled gets compiled into a larger trash deposit or a barren wasteland.

   C. I have never thought about that before - maybe we burn the waste that is not recycled.

2. **Do you think that plastic waste that is in the ocean is an issue? If so, how does it affect us?**

   A. I do think plastic waste in the ocean is an issue because it can harm animals. It affects the resources that we find in the ocean.

   B. I wholeheartedly believe that waste in the ocean presents an issue to the local animal kingdom in the ocean. This is in turn would affect our fishing resources in the world

   C. Yes I think is a big issue – plastic waste kills sea animals (i.e. choking on soda can plastic rings), this in return gives us fewer fish to catch and essentially eat.

3. **Do you think there is a solution to this problem? If not, do you have any suggestions?**

   A. A small solution might be to create more sustainable resources, possible materials that are more biodegradable.

   B. I believe there are engineers who are developing "sea vacuums" that are meant to filter debris on the surface of the ocean.

   C. Yes, making sure to recycle any plastic waste and to not liter.

Purpose

The purpose of this proposal is to seek significant funding to develop the algorithms that

will help optimize the efficiency at which trash is collected from the sea. We hope to implement

these algorithms to the pre-existing infrastructure that is already at use in the seas.

Review of Literature

Introduction

An estimated amount of 1.15 to 2.41 million tons of plastic enters the oceans every year (The Ocean Clean Up). This trash floats around until it ends up in one of five tropical gyres. These garbage patches, as they are known, can only accumulate trash (Once the plastic enters the gyre, it is very unlikely it will leave). As a result, this trash can only degrade, and fall deeper into the ocean, where it will not only interact with wildlife, but also harm their ecosystems.
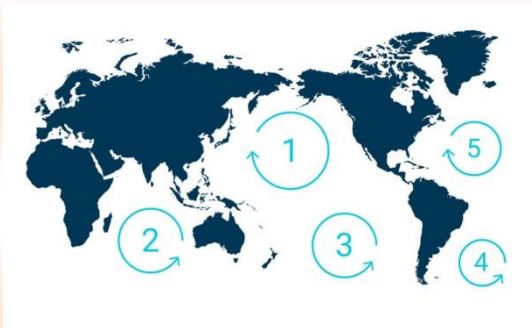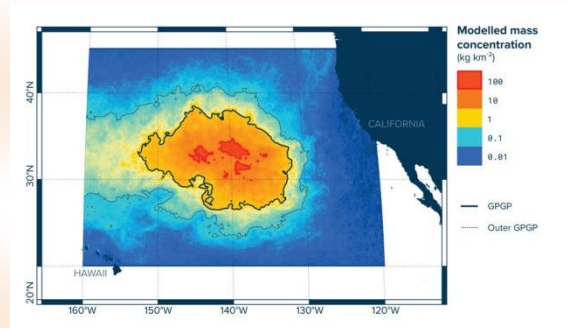

Figure 1: The five tropical gyres

Figure 2: The Great Pacific Garbage Patch

Back Ground

Even though this is a large problem that can only increase in size, there is a large amount of people who are currently working on it. The largest accumulated point of trash in the sea is known as "The Great Garbage Patch". "The GPGP covers an estimated surface area of 1.6 million square kilometers, an area twice the size of Texas or three times the size of France" (The Ocean Clean Up). Because of this, there has been a lot of research with regards to the chemical structure and composition of this patch. Earlier this year, high-tech start up organization The Ocean Clean Up deployed its own system to start collecting ocean trash (this is what inspired me

to work on this problem). Since I can't cover everything, I will focus on the on the source, composition, and effects of this plastic waste.

Source of the Plastic Waste

It all begins with nonpoint source pollution. Surface run-off picks up and carries away natural and human-made pollutants, and it deposits them into lakes, rivers, wetlands, coastal waters and ground waters (EPA). Even though all these sources are important, rivers are the most important when it comes to transporting plastic trash. As Christian Schmidt, hydrogeologist at the Helmholtz Center for Environmental Research in Leipzig, Germany, explains "Rivers carry trash over long distances and connect nearly all land surfaces with the oceans". After the plastic waste has been carried by the by the rivers and into the oceans, it ends up in one the previously talked about ocean gyres.

Even though there a lot of different possible transporters of plastic pollution, the biggest ones (in terms of rivers) are as follow: the Yangtze, Yellow, Hai, Pearl, Amur, Mekong, Indus and Ganges Delta in Asia, and the Niger and Nile in Africa (Patel). These are based on estimates of course, but match the statistics presented in Statista. China, Indonesia, and the Philippines are top three countries polluting the ocean's the most. They mismanaged 8.80, 3.20, and 1.90 millions of tons of plastic waste (3.53, 1.29 and .75 million which ends up as marine debris accordingly). Of course it is not only Asian Country mismanage trash that ends up in the ocean; As Niall McCarthy explains, "The United States is also guilty of polluting oceans with plastic, but at a much lower level than China. Annually, 0.11 million metric tons of waterborne plastic garbage comes from the United States".

Composition of the Plastic Waste

Ocean waste materials range from glass to plastic to even metals. But by far, plastic is the material that is the most abundant. This is because plastic is one of the material that we produce the most. Shoes, cars, toys, and electronic accessories all use plastic. It is very durable. Metal oxidizes and glass can break into pieces. Plastic in the other hand is very flexible and can last for a very long time (There also different types of plastics which can serve different purposes). Because of these reasons, plastic is the material that is most likely to end up in a garbage patch.

Of course, even though plastic is the material more likely to end up in the ocean, it doesn't mean it is all the same. As is explained in the Ocean Clean Up's website, "The vast majority of plastics retrieved were made of rigid or hard polyethylene (PE) or polypropylene (PP), or derelict fishing gear (nets and ropes particularly)." This means that the plastic will decompose at different rates. There will be different sizes. Micro plastic are the most dangerous ones, they can be mistaken for food by fishes. Even though they are the most dangerous, they are not as abundant since plastic takes a very long time to decompose. The following was modelled by the Ocean Clean Up from samples taken at "The Great Garbage Patch":
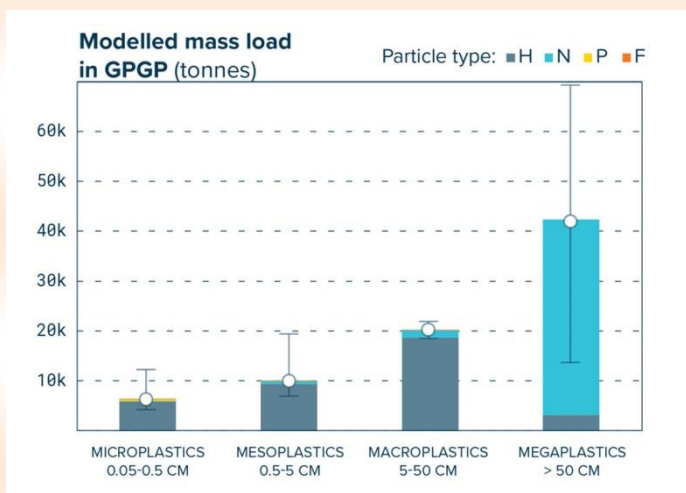

Figure 3:

Plastic Sizes & Their Abundance

Effects on Wildlife

"According to the United Nations, at least 800 species worldwide are affected by marine debris, and as much as 80 percent of that litter is plastic" (Reedy). Turtles, Birds, and Fish often mistake plastic for food, and ingest it. Because their stomachs can break down the synthetic material, the animals think they have eaten enough, and starve to death. This is especially true of the young since they are not as picky. Plastic can also encourage the spread of disease in the ocean. As quoted in PEW Research," According to a recent study, scientists concluded that corals that come into contact with plastic have an 89 percent chance of contracting disease, compared with a 4 percent likelihood for corals that do not". This most likely because plastic can slice open the skin of the corals which facilitate the transmission of pathogens (Katz).

*All Pictures used in the discussion were taken from the Ocean Clean Up's website
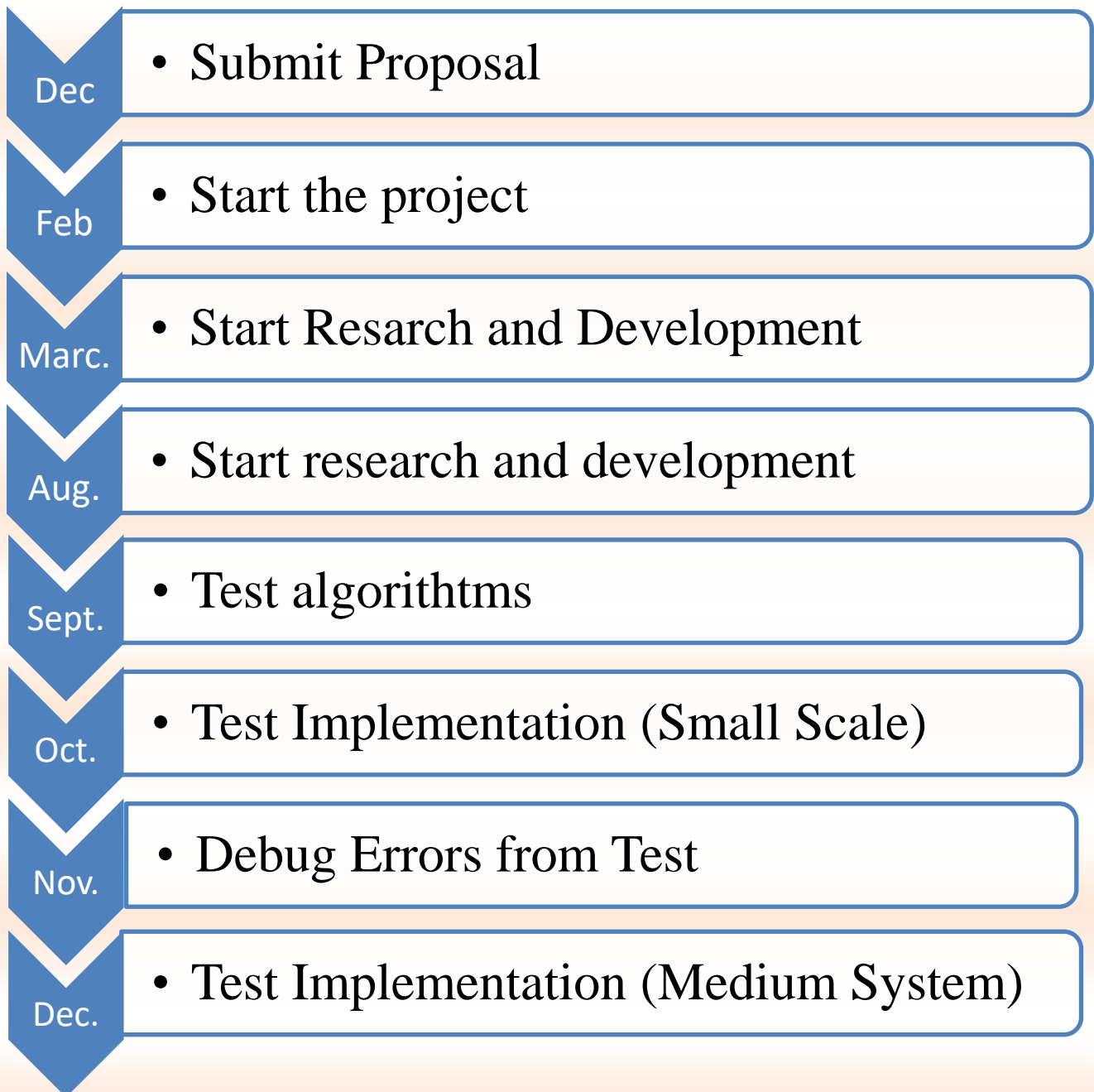
Conclusion

Plastic Waste is a problem that we should start acknowledging. As explained above, there are many different sources that can be traced as the root of this problem. But nonetheless, it is a problem that affects us all. Even though the long term effects of this problem are still unknown, we know that it affects marine wildlife in very dangerous ways. In can kill many different types of species. Since this is a problem that can only increase in size and get worse, I think we should start looking for a solution.

Recommendations

I think by far the biggest source of plastic pollution in the ocean is mismanagement of waste. Because of this, I think we should provide some sort of incentive for countries that manage their waste effectively, and some sort of punishment for countries that don't. Of course, this does not fix the problem of the plastic that is already in the ocean. This is a much a larger problem that many people have try to solve. In terms of this, I would recommend setting up nets specially designed for catching different types of plastic, and then have an optimized system for the collection of the plastic trapped in the ocean. This system for collecting the trash would be best if automatized, but of course, we still have a long way to go.

Timeline for Implementation

(For the year 2018-2019)

Dec	• Submit Proposal
Feb	• Start the project
Marc.	• Start Resarch and Development
Aug.	• Start research and development
Sept.	• Test algorithtms
Oct.	• Test Implementation (Small Scale)
Nov.	• Debug Errors from Test
Dec.	• Test Implementation (Medium System)

APPENDICES

APPENDIX A

Glossary of Terms with Meanings

Ocean Gyre: a circulating ocean current formed by global wind patterns and Earth's rotation

Nonpoint Source Pollution: pollution caused by rainfall or snowmelt moving waste over and through the ground

Surface Runoff: the flow of water that occurs when excess stormwater, meltwater, or other sources flows over the Earth's surface

Polyethylene: Most popular plastic on earth (used in grocery bags, shampoo bottles, children's toys, and even bullet proof vests)

Polypropylene: thermoplastic polymer used in a wide variety of applications (mostly used for containers)

Micro-plastic: small, barely visible pieces of plastic that enter and pollute the environment

Synthetic: made by chemical synthesis, especially to imitate a natural product
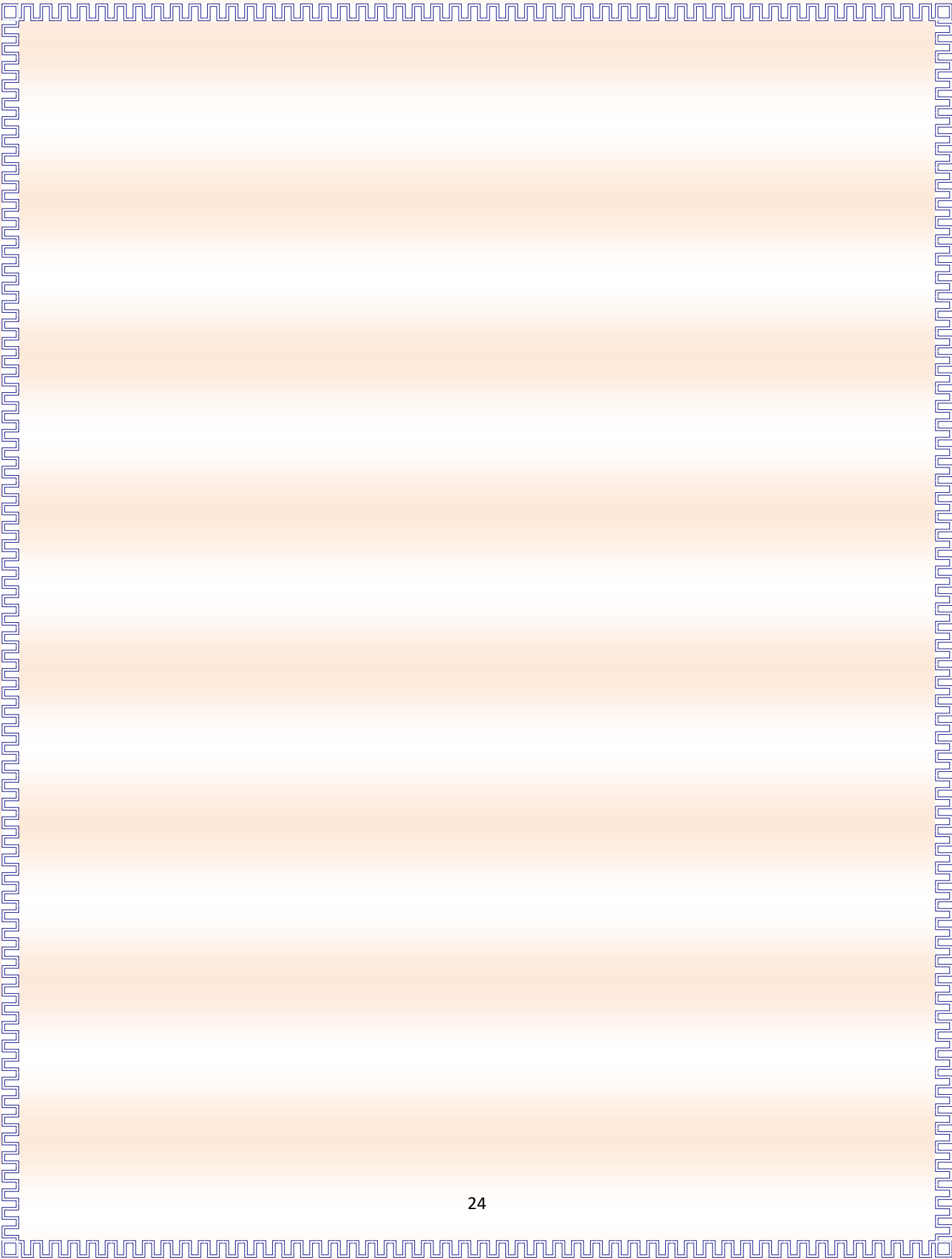
APPENDIX B

(See Insert Resume)

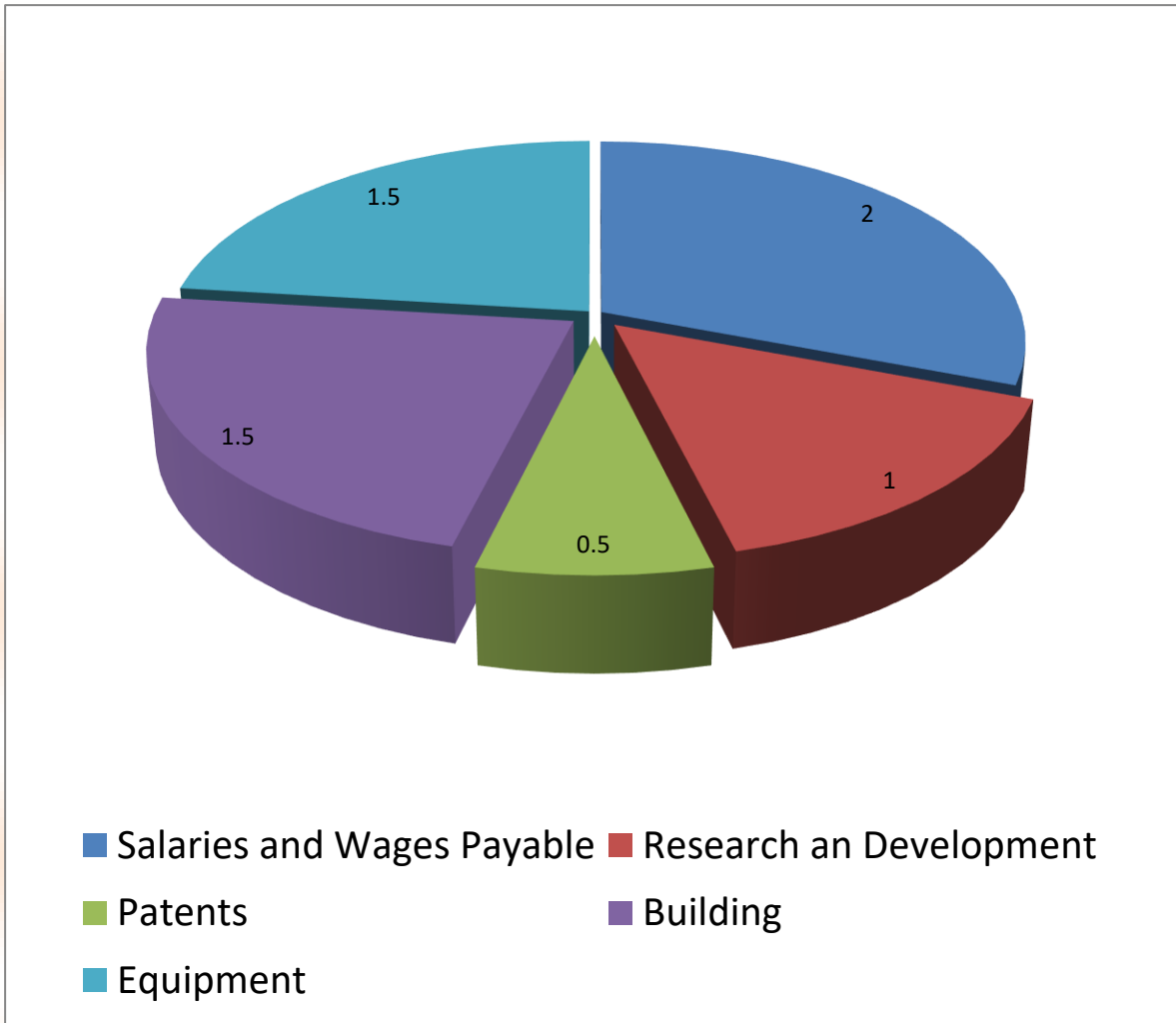# APPENDIX C

(Attached to Another File Similar Case)

APPENDIX D

(Brochure)

APPENDIX E

Budget
(In millions)

Pie chart with the following values:
- 2 (Salaries and Wages Payable)
- 1 (Research an Development)
- 0.5 (Patents)
- 1.5 (Building)
- 1.5 (Equipment)

Legend:
- ■ Salaries and Wages Payable
- ■ Research an Development
- ■ Patents
- ■ Building
- ■ Equipment

Works Cited

"The Great Pacific Garbage Patch". The Ocean Clean Up

https://www.theoceancleanup.com/great-pacific-garbage-patch/, Accessed 5 December 2018

Patel, Prachi. "Stemming the Plastic Tide: 10 Rivers Contribute Most of the Plastic in the Oceans".

Scientific American, Environment. February 1, 2018

https://www.scientificamerican.com/article/stemming-the-plastic-tide-10-rivers-contribute-

most-of-the-plastic-in-the-oceans/

McCarthy, Niall. "The Countries Polluting the Oceans The Most". Statista, The Wall Street Journal.

Aug 7, 2018.

https://www.statista.com/chart/12211/the-countries-polluting-the-oceans-the-most/,

"Basic Information about Nonpoint Source (NPS) Pollution". Basic Information. Polluted Runoff:

Nonpoint Source (NPS) Pollution.

https://www.epa.gov/nps/basic-information-about-nonpoint-source-nps-pollution

Parker, Laura. "The Great Pacific Garbage Patch Isn't What You Think it Is". National Geographic,

March 22,2018.

https://news.nationalgeographic.com/2018/03/great-pacific-garbage-patch-plastics-

environment/

Katz, Brigit. "Billions of Pieces of Plastic Spread Disease in Coral Reefs". Smithsonian,

Smart News. January 26,2018.

https://www.smithsonianmag.com/smart-news/11-billion-pieces-plastic-are-threatening-

coral-reefs-180967962/#X7vPjkmgOv8ZKpYR.99

Reedy, Simon. "Plastic Pollution Affects Sea Life throughout the Ocean". PEW. September 24,

2018. https://www.pewtrusts.org/en/research-and-analysis/articles/2018/09/24/plastic-

pollution-affects-sea-life-throughout-the-ocean