GNG2101
Deliverable H
Professor Hanan Anis
PM - Cooper Lawrence
Team A6

Economics Report

Due: Nov 19th, 2020

Nicholas Anderson	300078674
Evan Charkowy	300126081
Sofia Ershova	300114465
Liam Genik	300052849
Evan Schonfeldt	300111231

TABLE OF CONTENTS

OVERVIEW

In this deliverable, the goal was to outline the associated costs, income statement and net present value for the marketing and manufacturing of the hearing device case, branded *Hear Shield* by the A6 team. In this report, the details of the economic constraints will be discussed as though the manufacturing and marketing were already underway. The details will be looked at

from a start-up business point of view separate from the University of Ottawa to allow for the most accurate numbers.

ASSOCIATED COSTS

Cost	Direct/Indirect	Variable/Fixed	Type
Electricity	Direct	Variable	Expense
Marketing	Indirect	Fixed	Expense
Printing Materials	Direct	Variable	Material
Equipment	Direct	Fixed	Material
Depreciation	Indirect	Fixed	Expense
Salaries	Direct	Fixed	Labour
Overhead	Indirect	Variable	Expense
Rent	Indirect	Fixed	Expense
Taxes	Indirect	Fixed	Expense
Debt	Indirect	Fixed	Expense

Above is a list of all the costs which the company will experience when developing our waterproof case for the Nucleus 7, however the price of the device is different in that it will be what the consumer pays for the product. Our company's goal is to achieve a price which is significantly less than the sound processor which the product aims to protect. Thus, a 30% profit margin will be applied to our products as this is considered an above medium return with most products, however it will still land our product with a price which is far less expensive than the Nucleus 7 due to the sound processor's price being quite large.

INCOME STATEMENT

Since our product was designed for the Nucleus N7, we will have to work with their company to ensure that all legalities are taken care of and that the device is compatible with the product. They will probably also want a share of the profits to be able to use their product for ours. If our operations expand to include other hearing aid companies, this will be true for them as well.

Overview

In order to create an income statement, we will need to calculate the cost per unit, sales revenue, gross profit, operating expenses and operating income. Using some assumptions that we made and which will be outlined in a later portion, we can roughly calculate our expected revenue and manufacturing and operating costs. This will be used for our NPV analysis to determine our break-even point and ultimately, whether our company would be profitable.

Calculations

Cost per unit:

Materials include: ABS plastic for the case, O-ring, silicon filling, tracker

Price of material needed to manufacture one unit:

ABS plastic: the average cost of this material is around $0.15 per gram. We have estimated the mass of our device to be approximately 9 grams, so the cost for making one unit would be $0.15 * 9 = $1.35

O-ring: the o-ring that we used came in a pack of 2, cosing $5.10. We only need one, so the cost of the o-ring component is $2.55.

Silicon filling: the silicon molding kit that we used to develop our prototype cost $39.99 for an approximately 626 mL container. Based on the dimensions of the case (volume: 14 mL) the device itself (volume: approx. 5 mL) and the tracker which will go in the device (volume: approx. 5 mL), we have estimated that the volume of silicon used for the case is 4 mL. From the cost per 626 mL, we can figure out the cost per mL and multiplied by 4, the cost of silicon for 4 mL for one unit is $0.26.

Tracker: the cost of one tracker is $15.31

Cost per unit: $1.35 + $2.55 + $0.26 + $15.31 = $19.47

30% of the price: $5.84

Sales price per unit: $25.31

Operating expenses:

Operating expenses for our company would include utilities, marketing, cost of operating equipment, depreciation, salaries, rent and other overhead (such as legal fees for the right to use the N7 device).

Utilities: $400 * 12 = $4,800

Marketing: $10,000

Equipment operating cost: $6 * 337 = $2,022

Salaries: $15 * 8 * 4 * 48 = $23,040

Rent: $3 * 500 * 12 = 18,000

Other overhead: $10,000

Total operating expenses: $67,862

Income Statements (3 years)

Year 1: (10,000 sold)

Sales Revenue	$253,100
Unit Cost	$194,700
Gross Profit	$58,400
Operating Expenses	$67,862
Operating Income	-$9,462

Year 2: (11,000 sold)

Sales Revenue	$278,410
Unit Cost	$214,170
Gross Profit	$64,240
Operating Expenses	$67,862
Operating Income	-$3,622

Year 3: (12100 sold)

Sales Revenue	$306,251
Unit Cost	$235,587
Gross Profit	$70,664

Operating Expenses	$67,862
Operating Income	$2,802

NET PRESENT VALUE ANALYSIS

Net Present Value

Our business would break even once the profit is positive. Without accounting for taxes and interest and simply the operating income, the business would break even after the third year. However, after accounting for taxes and interest, a net present value analysis is necessary to determine the future value of the business and when it would break even based on present value.

After 3 years:

Operating income: $2,802

Interest: $2,802 * 0.05 = $140.10

Earnings before taxes: $2,801 - $140.10 = $2,661.90

Taxes: $2,661.90 * 0.15 = $399.29

Earnings after taxes (net income): $2,661.90 - $399.29 = $2,262.62

PV = ($2,262.62)/(1+0.05/12)^3 = $2,234.57

Break Even Point

Given that the present value is still positive even after interest and taxes, it is safe to conclude that the business would break even in the third year of operations, assuming all assumptions that were made hold true.

ASSUMPTIONS

In order to calculate all the costs and profits for this report, we made several assumptions about the product we will be producing:

- The unit price of our product would be the cost of material needed to manufacture one unit, plus 30% of that cost to maximize profit. We decided that setting our price to that point would ensure minimal loss and help us to break even as fast as possible. As well,

one of our design criteria was that the cost of the device would be low compared to the cost of the hearing device itself and setting our cost to that would satisfy that criteria.

- To determine how many units we are projected to sell, we made a few assumptions about the target audience for our product. Hear-it.org estimates that about three million Canadians suffer from hearing loss and of those, around 510,000 (17%) wear hearing aids. We will assume that we will distribute our product nationwide, since shipping it around the country is not too difficult and it is hard to find hearing loss statistics for specific regions or provinces. There are many types of hearing aids available in Canada, however our product was designed specifically for the Nucleus N7. Since it is a very specific type of hearing aid, we will assume that about 5% of all hearing aid wearers wear the Nucleus N7, bringing the number to 25,500. We cannot assume that every Nucleus N7 wearer will buy our product for various reasons, and because of that, we will assume that we will sell about 10,000 units per year, at least for the first few years of production. This would be until we expand and get other hearing aid manufacturers to partner with us, after which the unit sales are expected to increase.
- We will assume that sales will increase by 10% each year. This assumption was made as it is expected that marketing and sales of the product will encourage more sales.
- For the purposes of this analysis, for simplicity's sake we will assume that we would be manufacturing our products at the cost of the materials for developing our prototype. However it is important to note that eventually, we would be buying the materials in bulk to reduce material costs.
- We will assume rough estimates for volumes and dimensions, since we have to calculate them and exact dimensions for some components are not on hand. As well, rounding to whole numbers will be done.
- We are assuming that we are excluding taxes and interest for the income statement. Those calculations are not required as per the deliverable instructions. However for the net present value analysis, we will assume a 5% yearly compound interest rate, as an upper bracket given by Canadian banks, and an income tax rate of 15%, the net tax rate after general tax reduction on Canadian businesses.
- We will assume that utilities cost around $400/month. We would probably start in a small space, and utilities average around that price in the area.
- We will assume that the price of labour is $15/hour (minimum wage as the assembly job does not require too much specialized skill). We have 10 workers (small for a startup) working 8 hour days (a normal workday), four days a week (extra weekend as we are starting out and have a very specific product as of starting that will not be in very high demand), with four weeks of vacation time. These are reasonable working conditions.
- We will assume we have a 500 sq. ft. building (starting small) and rent on average is $3/sq. ft./month.

- We will assume that we have 10 functional 3D printers, one per worker, and an assembly line. Cost of running one printer is around $6/day.
- We will assume that we will not be expanding in the first three years of the company so operating expenses will not change.

PROJECT PLAN UPDATE

The project plan has been updated to reflect our current progress and goals for the upcoming weeks. THis has been submitted in the submission for this deliverable but as a separate file.

CONCLUSIONS

Through analyzing the economic side of manufacturing the product, it is reasonable to conclude from the results, that this would be a viable business. There is a high demand for these kinds of products in the accessibility market and not nearly enough on the market. What few products are out there make it difficult for clients to find or gain information about them in order to make an informed decision.

Ideally, the A6 team would partner with multiple hearing aid manufacturers in order to be able to market to a larger number of clients than only those who have a nucleus 7 device. In this case, our costs would significantly change and our profits would theoretically increase.

It is important to note however, that although the business looks as though it would be a viable business, start-up businesses usually have difficulties in the first few years and so these results may not accurately mirror what would happen in the first few years but how the business would perform after a few years in.

REFERENCES

https://www.hear-it.org/three-million-canadians-suffer-from-hearing-loss#:~:text=Research%20from%20the%20Hearing%20Foundation,do%20not%20use%20hearing%20aids.

https://www.bankofcanada.ca/rates/interest-rates/

https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/corporations/corporation-tax-rates.html