Executive Summary

Introduction and Background: 11 million Canadians were reported to have diabetes or prediabetes in 2016, this is 29% of the population of Canada. When diagnosed, patients must remain diligent in checking their blood glucose levels and to accomplish this, point-of-care (POC) devices are used, specifically blood glucose monitors and the associated blood glucose testing strips. The direct costs on the Canadian healthcare system was $3.4 billion in 2016 and one of the major contributors to this cost is the dispensing of disposable blood glucose test strips, and in 2012, that cost was $22.6 million in British Columbia alone. The costs of the test strips have become so significant that there have been provincially established limits on the dispensable strips per patient. The following is a proposal for a start-up company called GlucoLess to establish and commercialize high quality and low-cost blood glucose test strips and is seeking an investment of $155,106 at 8% interest which will provide a 10% equity stake with a minimum acceptable rate of return (MARR) of 18%.

Project Plan and Goals: GlucoLess has patented as well as obtained regulatory and reimbursement approvals to utilize the innovative inkjet printing based manufacturing process of blood glucose test strips which aims to provide a solution for the current problem of high cost manufacturing methods in the industry. The main economic goal of the proposed project is to collect critical and informative data over 5 years to demonstrate the commercial potential of the novel technology to entice buyers at the end of 5 years. The additional economic goals include generating a positive net profit as well as a positive after tax net cash flow by year 5, a positive after tax net cash flow net present value over 5 years and an internal rate of return above the minimum acceptable rate of return.

Economic Analysis, Market and Competition: The projected economic data and analysis indicates an after tax net cash flow net present value of $400,878.20 with a MARR of 18%, net positive profits in years 1 to 5, a full pay back of the loan in 5 years with interest and a calculated internal rate of return of 79% which is above the MARR. GlucoLess will specifically target 1.6% of the blood glucose test strip market in Canada and will focus on the diabetes and prediabetes populations in British Columbia and Ontario over a 5 year timeline as in these

provinces over 150 million test strips are dispensed each year. GlucoLess was compared to three highly rated blood glucose monitors and testing strip manufacturers and the high quality low-cost solution GlucoLess provides demonstrates a significant competitive advantage by having significantly lower selling prices for the blood glucose test strips that are compatible with these POC devices.

Risks, Ethics and Sustainability: An expected value risk assessment determined the expected internal rate of return and standard deviation which was projected at 80% and 39% respectively. In addition, risk mitigation measures include appropriate future planning and resource management. An ethical code of conduct of GlucoLess includes integrity, trust and open communication with respect towards all members and the community. Economic, social and environmental sustainability include proper research and planning, community interaction and reducing the carbon footprint respectively.

Conclusion: This proposal supports an investment of $155,106.46 which will yield significant positive returns for the investor and will help shape the future diabetes monitoring industry to establish a more economically sustainable healthcare system for Canadians.

Note: All dollar values in this proposal are in CAD.

Table of Contents

GlucoLess – Start-up Company for Cost Effective and Novel Manufacturing Method for Blood Glucose Test Strips

1.0 Introduction

Currently, there is a significant shift occurring in healthcare in which existing electrochemical testing methods completed in the laboratory are moving towards the use of point-of-care (POC) devices [1]. This change is in relation to the push for a more patient-centred type of care [1]. This proposal for a start-up company has a specific interest in the major market of POC blood glucose testing, in particular, the manufacturing of the blood glucose test strips utilized by the POC devices [1–3]. In Canada, there were 11 million (29%) diabetes and prediabetes prevalent cases which costs the healthcare system $3.4 billion [4]. One of the major contributors to this cost is the dispensing of disposable blood glucose test strips, and in 2012, the cost was $22.6 million in British Columbia alone [5]. Across Canada, it is estimated that more than 240 million disposable blood glucose test strips are dispensed per year, pushing many provincial governments to impose limits on specific patient populations [2–5]. The limiting of blood glucose strips to patients is only one solution, another solution is to reduce the manufacturing cost of blood glucose test strips, and is the focus of this proposal which outlines a new approach to overcome the existing challenges. This business is called GlucoLess and is looking for an investment of $155,106 at 8% interest which will provide a 10% equity stake with a minimum acceptable rate of return (MARR) of 18%. Further details to follow.

2.0 Project Plan, Execution and Overall Goals

GlucoLess has already established the research and development required to allow for the further development of the commercial manufacturing process for blood glucose test strips that are customizable for any POC blood glucose monitor and it is based on the use of inkjet printing [6–8]. The novel method to manufacture the test strips has also been granted a patent, has already been approved by Health Canada for distribution and reimbursement as well as already been incorporated as a small-business in British Columbia, therefore these costs will not be required for this proposal. The target market for GlucoLess is the diabetes and prediabetes populations in British Columbia and Ontario for the 5 year timeline, the two largest dispensers of blood glucose monitoring

strips at over 150 million units per year [2–5]. Current electrochemical sensors manufactured for blood glucose testing use expensive fabrication methods which include photolithography, screen-printing and laser etching which in turn causes the consumer to take the blunt of the high cost [9]. The reason these high cost methods are used is due to the inability of existing lower cost methods to produce the same high quality sensors. The novel and innovative manufacturing method being proposed allows for a low-cost inkjet printing solution to address the existing challenges which allows for high quality blood glucose test strips. Specifically, a start-up company is being proposed to first establish the commercial success of the new technology which will then be sold, along with the patented manufacturing process to a larger multi-national company within the industry to initiate a larger scale impact of the technology on a national and potentially international scale. The focus will be on the manufacturing of blood glucose test strips for the three most prominent blood glucose monitors from 2015: FreeStyle Lite, FreeStyle Freedom Lite and the Bayer Contour Next [10]. The GlucoLess blood glucose test strips to be manufactured at a larger scale have already been optimized for these devices through previous research and have been approved by Health Canada for sale for use with these devices.

The proposed project timeline is 5 years to collect the critical data to demonstrate the commercial potential of the novel technology to entice buyers at the end of 5 years. This is the overall main economic goal of the company. The additional economic goals include generating a positive net profit as well as a positive after tax net cash flow by year 5, a positive after tax net cash flow net present value over 5 years and an internal rate of return above the minimum acceptable rate of return. In order to accomplish these goals a proper team of individuals will be required and include the following:

- Chief Executive Officer (with Chief Financial Officer duties as well) (1, me)
    - Will manage the strategy and goals of the company as well as economic analyses and risk management. Will also help conduct all manufacturing processes.
- Lead Engineer (1)
    - Is an expert in inkjet technology and has already been involved in the research and development of the manufacturing process. Will conduct and establish all manufacturing processes.
- Engineer (1)
    - Will assist the lead engineer in all duties and will conduct necessary testing and optimization analysis of equipment. Will also help conduct all manufacturing processes.
- Technician (1)

    - Will maintain and calibrate all equipment and maintain building networks and infrastructure. Will also help conduct all manufacturing processes.
- Marketing/Sales Representative (1)
    - Will handle all marketing materials, communication channels, sales and be the point of contact. Will also help conduct all manufacturing processes.
- Shipping and Packing Employees (2)
    - Will organize warehouse, package and ship all products. Will also help conduct all manufacturing processes.
- Investor (1)
    - Will be required for initial source of capital as well as for knowledge base for economic analyses and strategy moving forward. GlucoLess is not seeking a bank loan and is willing to pay a higher interest rate for this knowledge and experience as it provides value-added. Comparative research was done to find the Canada Small Business Financing program which has a fixed rate loan at the residential mortgage rate + 3% [11].

In order to acquire these highly skilled individuals, they will be given annual salaries which include medical and dental coverage (except investor) as well as equity in the company. The details regarding salaries and equity will follow in later sections. An office building with a warehouse will be rented and appropriate maintenance will be conducted. Also, the marketing and promotional materials will be addressed in the costs as well as transportation, utilities, business fees, telecommunication and internet. After initial design and prototyping to upscale the research results, further equipment and materials will be required to manufacture the low-cost blood glucose test strips and thorough research has been conducted to identify the list of following required items:

- Supplies for the Office
    - Telephones, Refrigerator and Supplies
    - Computers and Printers
- Specialized Equipment for Manufacturing
    - Dimatix Printer (x3)
    - Dimatix Cartridge (x 3)
    - Metrohm Electrometer
    - Miilipore Water Purification System
    - Laser Cutting Machine
- Consumable Materials
    - Thermo Bag Sealer
    - Polyethylene Terephthalate (PET) Film
    - Silver Ink
    - Sodium Hypochlorite
    - Amber Polyethylene Bag
    - Sodium Acetate Buffer Solution
    - Glucose Oxidase
    - Protective Ink

Another benefit of the manufacturing process developed for the low-cost blood glucose test strips is the ability limit waste of materials, especially the expensive ones. The fabrication parameters have been set to reduce the unit cost of the blood glucose test trips to the lowest achievable at this time, although there is always room for improvement. Also, it is expected that after the first year, the production and selling rate of the test strips will increase by 10% a year, increasing the total revenues as the process will become more streamlined. The selling price of a single unit will be set such that the rate of return is high enough to encourage investment and since the production cost will be low, the selling price will still be significantly lower than existing test strips for consumers. After 5 years, the company will be sold at an asking price of companies with similar cash flows and revenue to be competitive along with all salvage value remaining after the appropriate economic analyses.

3.0 Data

3.1 Quantitative

The quantitative data was collected from a variety of sources. The data is outlined in Table 1 with descriptions, values, notes and references when appropriate. In addition, the designation of specific values are indicated in the notes section (e.g. fixed, recurring annually, CCA, tax etc.). Costs are indicated as negative dollars, revenues in positive dollars, rates, taxes and probabilities in percentages, and number values as integers. Of particular note, the annual salaries of individuals were set based on the average hourly wage of $20.60 in this particular industry [12] as the average hourly wage of employees of GlucoLess is $22.59. All calculations were completed with Microsoft Excel. All data are estimated and projected values are in Canadian dollars and CCA [13], inflation [14] and tax rates [15] are set and estimated by the Canadian government.

Table 1. Quantitative data collected with descriptions, values, notes and references

Description	Values	Notes	Ref.
Timeline to Sell in Years	5	Project plan is to work towards selling in year 5.	
Employer (CEO with CFO Duties) Salary	-$75,000.00	51% equity stake. (Fixed, recurring annually)	[12]
Lead Engineer Salary	-$60,000.00	15% equity stake. (Fixed, recurring annually)	[12]
Engineer Salary	-$50,000.00	10% equity stake. (Fixed, recurring annually)	[12]
Technician Salary	-$40,000.00	5% equity stake. (Fixed, recurring annually)	[12]
Marketing/Sales/Contact Salary	-$35,000.00	5% equity stake. (Fixed, recurring annually)	[12]
Shipping and Packing 1 Salary	-$30,000.00	2% equity stake. (Fixed, recurring annually)	[12]
Shipping and Packing 2 Salary	-$30,000.00	2% equity stake. (Fixed, recurring annually)	[12]

Benefits (Medical and Dental Insurance)	-$6,300.00	Cost of $900 per employee. (Fixed, recurring annually)	[16]
Building Rent	-$34,000.00	(Fixed, recurring annually)	[17]
Building Insurance	-$6,900.00	(Fixed, recurring annually)	[17]
Building Maintenance	-$6,200.00	(Fixed, recurring annually)	[17]
Promotional Materials	-$11,500.00	(Fixed, recurring annually)	[17]
Warehouse, Shipping and Delivery	-$2,700.00	(Fixed, recurring annually)	[17]
Utilities, Business Fees, Telecommunication and Internet	-$38,400.00	(Fixed, recurring annually)	[17]
Initial Upscaling Design and Prototyping	-$10,000.00	(Fixed, non-recurring)	[6–8]
Telephones, Refrigerator and Supplies	-$10,000.00	Class 8 CCA at 20%. (Fixed, non-recurring)	[17]
Computers and Printers	-$10,500.00	Class 10 CCA at 30%. (Fixed, non-recurring)	[17]
Dimatix Printer (x3)	-$120,676.50	Class 43 CCA at 30%. (Fixed, non-recurring)	[18,19]
Dimatix Cartridge (x 3)	-$237.33	Class 43 CCA at 30%. (Fixed, non-recurring)	[20,21]
Metrohm Electrometer	-$266.83	Class 43 CCA at 30%. (Fixed, non-recurring)	[22]
Miilipore Water Purification System	-$1,944.23	Class 43 CCA at 30%. (Fixed, non-recurring)	[23]
Laser Cutting Machine	-$1,340.85	Class 43 CCA at 30%. (Fixed, non-recurring)	[24]
Thermo Bag Sealer	-$140.72	Class 43 CCA at 30%. (Fixed, non-recurring)	[25]
Polyethylene Terephthalate (PET) Film	-$0.0020	Based on $2.20 per kg, 1 g per unit. (Variable, recurring)	[26]
Silver Ink	-$0.0015	Based on $14.80 per g, 0.0001 g per unit. (Variable, recurring)	[27]
Sodium Hypochlorite	-$0.0061	Based on $26.88 per 16 L, 0.228 mL per unit. (Variable, recurring)	[28]
Amber Polyethylene Bag	-$0.0006	Based on $60.27 per 1000 bags, 1 bag per 100 units. (Variable, recurring)	[29]
Sodium Acetate Buffer Solution	-$0.0052	Based on $103.50 per L, 0.05 mL per unit. (Variable, recurring)	[30]
Glucose Oxidase	-$0.0017	Based on $1,680.00 per 1000 g, 0.001 g per unit. (Variable, recurring)	[31]
Protective Ink	-$0.0168	Based on $335.21 per L, 0.05 mL per unit. (Variable, recurring)	[32]
Labour	-$0.0376	Based on 10 min per 100 unit batch, 0.10 min per unit, 0.001667 hour per unit, average hourly salary is $22.59. (Variable, recurring)	[12]
Total Cost per Unit	-$0.0715	(Variable, recurring)	
Total Cost per Package (100 Units)	-$7.15	(Variable, recurring)	
Selling Price Mark-up	200.00%	(Revenue)	
Selling Price of Single Unit	$0.21	Price is close to the average cost of other companies to manufacture test strips of $0.15. (Revenue)	
Selling Price of Package (100 Units)	$21.44	Will sell and ship directly to consumer as obtained Health Canada approval for distribution previous to this proposal. (Revenue)	
Estimated Number of Units Produced and Sold	3,750,000	Market estimated at 2.5% of the existing market of greater than 150,000,000 test strips dispensed in BC and Ontario. (Revenue)	[2–5]
Estimated Number of Packages Produced and Sold	37,500	(Revenue)	
Increase in Sales every Year	10.00%	(Revenue)	

Total Revenue of Sales in Year 1	$803,944.30	(Revenue)	
Corporate Small Business Combined Tax Rate (BC), first $500,000	12.62%	(Taxes)	
Corporate After first $500,000 Combined Tax Rate (BC)	26.00%	(Taxes)	
Inflation rate (average over last 5 years)	1.36%	(Inflation)	
Capital Requested	$155,106	With equity stake at 10%. (Requested working capital)	
Interest Rate Requested	8.00%	This is more than the bank offerings which is at fixed residential mortgage rate + 3.0% as the goal is to attract a passionate investor with value-added. (Interest rate)	[11]
Annual Loan Payments	-$38,847.41	(Interest and Principal)	
Minimum Acceptable Rate of Return (MARR)	18.00%	Set based on the interest rate of 8% as well as opportunity lost (approximately 5% with stocks and bonds) and relatively high as there is reasonable risk with a start-up company. (ROR)	
Value of CCA Class 8 at Year 0	$10,000.00	1/2 of 1st year rule applies. (CCA)	
Value of CCA Class 10 at Year 0	$10,500.00	1/2 of 1st year rule applies. (CCA)	
Value of CCA Class 43 at Year 0	$124,606.46	1/2 of 1st year rule applies. (CCA)	
Salvage Value of CCA Class 8	$3,943.99	(Salvage)	
Salvage Value of CCA Class 10	$2,142.89	(Salvage)	
Salvage Value of CCA Class 43	$25,430.31	(Salvage)	
Selling Price of CCA Class 8	$3,943.99	(Salvage)	
Selling Price of CCA Class 10	$2,142.89	(Salvage)	
Selling Price of CCA Class 43	$25,430.31	(Salvage)	
Selling Price of Company and Patented Process	$200,000.00	This value was based on asking prices of a business with similar cash flows and revenues. (Salvage)	[6]
Total Selling Price	$231,517.19	(Salvage)	
Recaptured CCA of building	$0.00	None, as sold at salvage value but would be taxed at income tax rate. (CCA)	
Tax on Recaptured CCA	$0.00	None, as sold at salvage value. (Tax)	
Capital Gains	$0.00	None, as sold at salvage value with minimal inflation. (CCA)	
Tax on capital gains	$0.00	None, as sold at salvage value with minimal inflation but would be taxed at 1/2 of value. (Tax)	
Middle Demand in Units Sold	3,750,000	Based on confidence of being able to attract such a small share of a large market. (Risk and Probabilities)	
Probability of Middle Demand	75%	Based on confidence of being able to attract such a small share of a large market. (Risk and Probabilities)	
Low Demand in Units Sold	2,812,500	25% decrease from middle value estimate. (Risk and Probabilities)	
Probability of Low Demand	12.5%	Remaining probability split in half with high demand. (Risk and Probabilities)	
High Demand in Units Sold	4,687,500	25% increase from middle value estimate. (Risk and Probabilities)	

Probability of High Demand	12.5%	Remaining probability split in half with low demand. (Risk and Probabilities)	
Middle Cost in Cost per Unit	-$0.0715	Based on confidence of cost estimations accomplished by extensive research. (Risk and Probabilities)	
Probability of Middle Cost	80%	Based on confidence of cost estimations accomplished by extensive research. (Risk and Probabilities)	
Low Cost	-$0.0536	25% decrease from middle value estimate. (Risk and Probabilities)	
Probability of Low Cost	10%	Remaining probability split in half with high cost. (Risk and Probabilities)	
High Cost	-$0.0893	25% increase from middle value estimate. (Risk and Probabilities)	
Probability of High Cost	10%	Remaining probability split in half with low cost. (Risk and Probabilities)	

3.2 Qualitative

The proposed team is uniquely skilled and the only capable to successfully manufacture and commercialize the proposed low-cost blood glucose test strips. GlucoLess is advantageously positioned to disrupt the existing glucose monitoring market with novel and innovative manufacturing methods that can further progress manufacturing methods, policy and most importantly people's livelihood by strengthening the Canadian economy. GlucoLess is passionate about this endeavour and see's the proposed strategy as the best pathway to create the most positive impacts. GlucoLess employees are all motivated to work towards the same goals as each have a stake in the success of the company, but furthermore, want to see change in the market of glucose monitoring as the current manufacturing companies are too drastically impacting insurance payouts of the Canadian government which directly impacts the care to the patients. GlucoLess will strive to create a more cohesive healthcare ecosystem with appropriate costs and the most benefits to patients.

4.0 Economic Analysis

The economic analysis will be broken down in various sections to address different criteria and values that can help an investor feel confident that the money invested will have a high rate of return with minimal risk. In particular, cash flows, break-even analysis, net present worth, net profits, net after tax net cash flows, rate of returns and risk analysis with expected values and standard deviations (within the risk section) will all be addressed throughout the analysis. A key point throughout this analysis is that the number of annual blood glucose

test strips dispensed in BC and Ontario is upwards of 150 M, therefore it has been estimated that GlucoLess will be able to attract at least 2.5% of this market (1.6% of the total Canadian market), accounting for approximately 3,750,000 glucose blood strips produced and fabricated in year 1 which increases by 10% every following year. Also, since the manufacturing process is very efficient, the test strips will be made, for the majority, to order so there is no waste of material and no backing up of inventory. Further justification will be discussed in later sections. Also, please refer to the Appendix for all equations with sample calculations.

4.1 Cash Flow Diagrams

The data for cash flow over the 5 years is presented in Table 2 which is graphically presented in Figure 1. The cash flow diagram shown in Figure 1 overviews the various costs projected for the business over the 5 year timeline. One can observe that the initial costs for the business will occur in year 0 and the subsequent years until year 5 will have projected revenues greater than the costs. A specific advantage of this investment opportunity is that all loan payments are projected to be made on time, in full based on the agreed upon terms. The largest costs are generally for salaries, benefits as well as the variable costs which include the costs of materials required to produce a set amount of blood glucose test strips.

Table 2. Cash flow data broken down into categories

Year	Initial Development Costs	Salary and Benefits Costs	Building and Maintenance Costs	Variable Costs	Loan Costs	Taxes	Revenue
0	-$155,106.46	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1	$0.00	-$330,737.68	-$101,055.92	-$271,625.98	-$38,847.41	-$9,816.33	$884,338.73
2	$0.00	-$335,235.71	-$102,430.28	-$302,852.11	-$38,847.41	-$82,232.37	$986,002.32
3	$0.00	-$339,794.92	-$103,823.33	-$337,667.98	-$38,847.41	-$91,906.80	$1,099,353.14
4	$0.00	-$344,416.13	-$105,235.33	-$376,486.29	-$38,847.41	-$102,203.89	$1,225,734.78
5	$0.00	-$349,100.19	-$106,666.53	-$419,767.16	-$38,847.41	-$113,360.70	$1,366,645.25

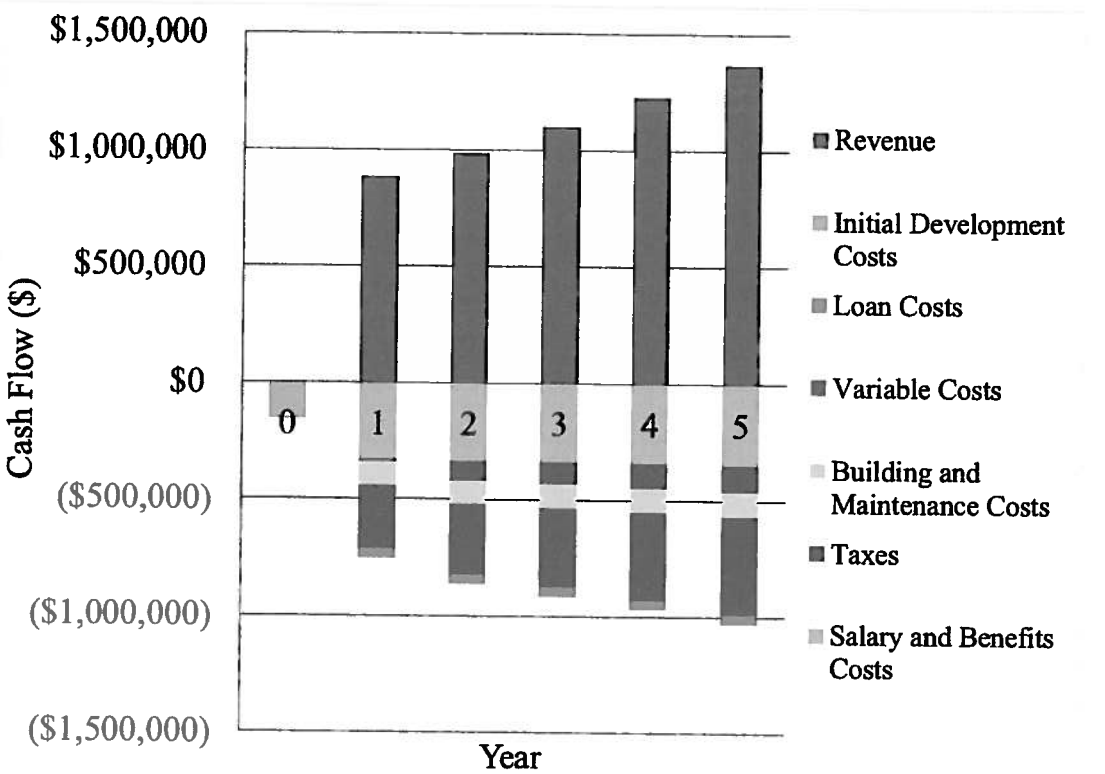

Figure 1. Cash flow diagram with categories indicated.

A break even analysis was also completed in which one can observe the data in Table 3 and Figure 2. Another promising projection is that when directly comparing costs and revenues, one can determine the break-even point occurring in early year 1 as long as the production of the blood glucose test strips goes as planned and the market can be infiltrated. The break-even point will occur at the manufacturing and selling of 1,300,000 units. In addition, a more representative graphical representation of cash flow estimates is shown in Figure 3 in which the after tax net cash flow is shown to show the positive potential after initial costs in year 0 with a substantial positive value in year 5 when the company is sold.

Table 3. Break-even analysis data

Year	Costs	Revenues	Units Sold	Total Units Sold
0	-$155,106.46	$0.00	0	0
1	-$752,083.32	$884,338.73	3,750,000	3,750,000
2	-$861,597.89	$986,002.32	4,125,000	7,875,000
3	-$912,040.45	$1,099,353.14	4,537,500	8,662,500
4	-$967,189.06	$1,225,734.78	4,991,250	9,528,750
5	-$1,027,741.99	$1,366,645.25	5,490,375	10,481,625

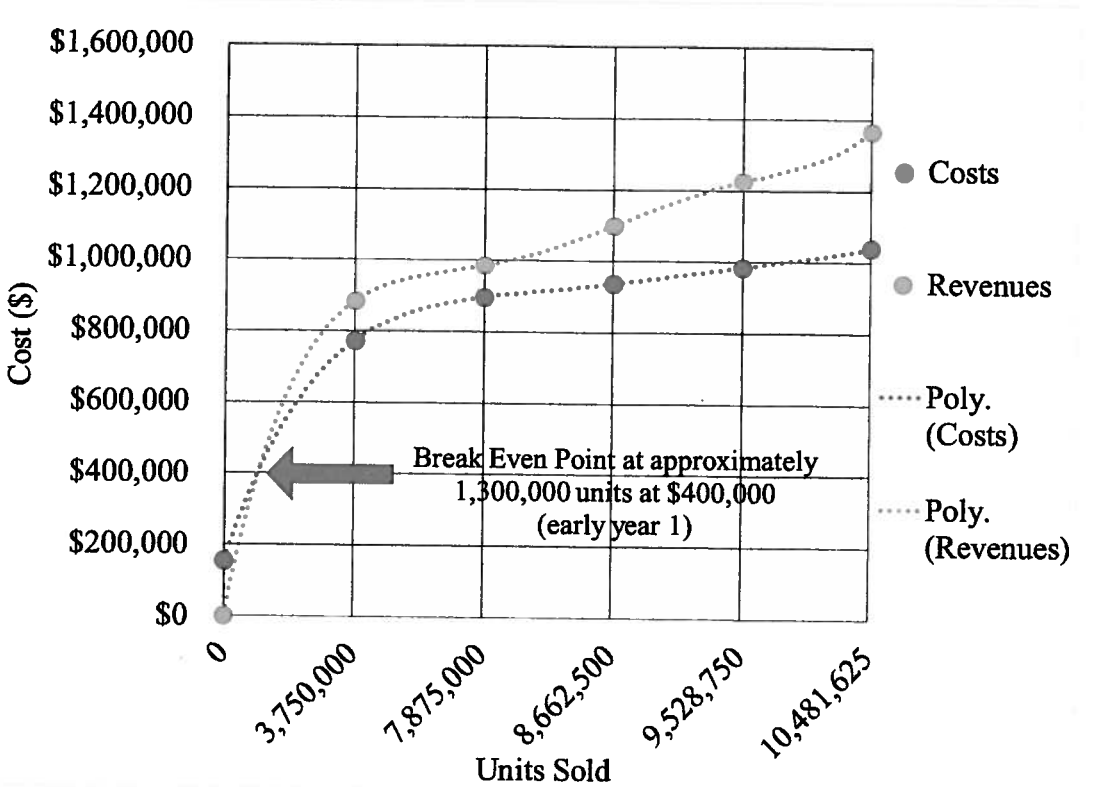

Figure 2. Break-even analysis for costs and revenues.

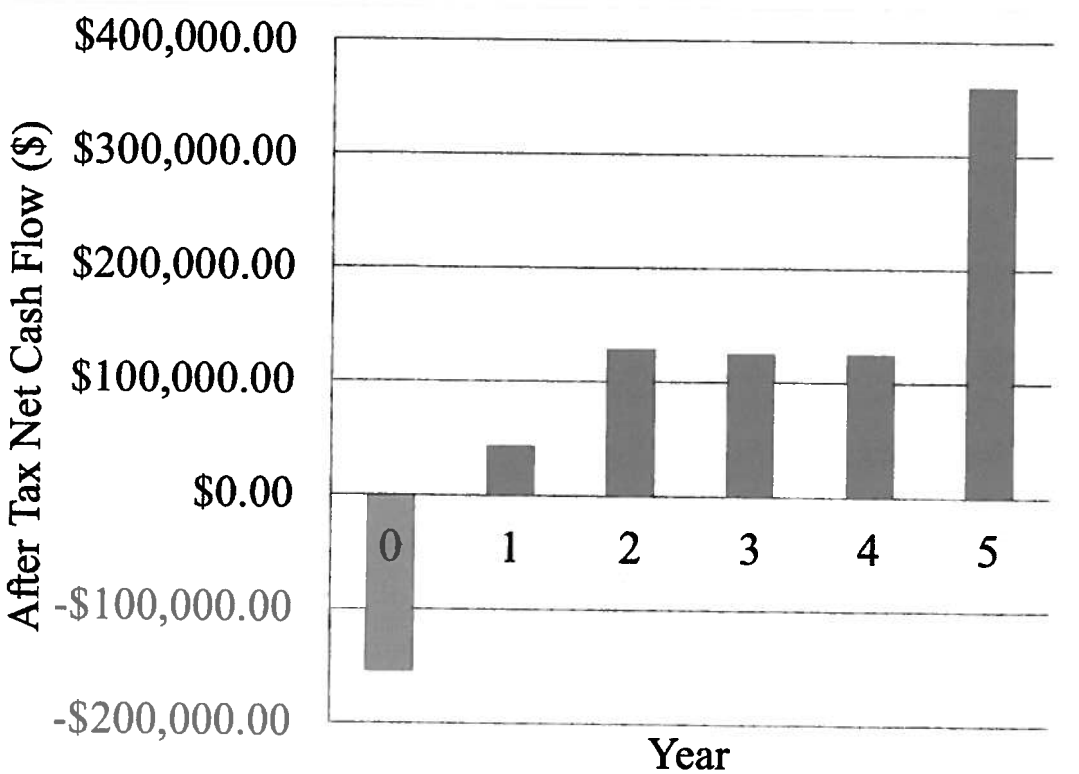

Figure 3. After tax net cash flows.

4.2 Profits, After Tax Net Present Worth, Rate of Return and Additional Added Value

This section will outline the critical values required for any investor in order to feel confident that the invested money will yield a positive return. With that in mind, an analysis was completed on the quantitative data outlined previously. All depreciable items are depreciated in the appropriate class and CCA rate, inflation is accounted for based on historical values, interest and principal payments of the investment loan are outlined as well as taxable income, tax, net profits and before after tax net cash flow. The net present value of the after tax net cash flow is calculated at a MARR of 18% as well as the rate of return and real MARR. The economic analysis data is shown in Table 4 with the extensions. In addition, Table 5 highlights key values of interest to the investor and Figure 4 shows the projected rate of return of the after tax net cash flow net present value. To reiterate, the MARR was set at 18% as the requested capital will be paid back at an interest rate of 8% and the opportunity lost rate is estimated at 5%, in addition to adding reasonable risk which is associated with any start-up company.

Table 4. Economic analysis data for GlucoLess, with extensions

Year	Costs	Costs (with inflation)	Revenues	Revenues (with inflation)	Loan Principal	Loan Interest Payment	Loan Principle Payment
0	-$155,106.46	-$155,106.46	$0.00	$0.00	$155,106.46	$0.00	$0.00
1	-$693,981.43	-$703,419.58	$803,944.30	$814,877.95	$128,667.56	-$12,408.52	-$26,438.90
2	-$720,779.58	-$740,518.10	$884,338.73	$908,556.32	$100,113.55	-$10,293.41	-$28,554.01
3	-$750,257.54	-$781,286.23	$972,772.61	$1,013,003.95	$69,275.22	-$8,009.08	-$30,838.33
4	-$782,683.29	-$826,137.75	$1,070,049.87	$1,129,458.88	$35,969.83	-$5,542.02	-$33,305.40
5	-$818,351.62	-$875,533.88	$1,177,054.86	$1,259,301.48	$0.00	-$2,877.59	-$35,969.83

Undepreciated Value of Class 8 (with inflation)	Undepreciated Value of Class 8	CCA Class 8	Undepreciated Value of Class 10 (with inflation)	Undepreciated Value of Class 10	CCA Class 10	Undepreciated Value of Class 43 (with inflation)	Undepreciated Value of Class 43	CCA Class 43
$10,000.00	$10,000.00		$10,500.00	$10,500.00		$124,606.46	$124,606.46	
$9,122.40	$9,000.00	-$1,000.00	$8,925.00	$8,925.00	-$1,575.00	$107,355.94	$105,915.49	-$18,690.97
$7,397.17	$7,200.00	-$1,800.00	$6,247.50	$6,247.50	-$2,677.50	$76,171.19	$74,140.84	-$31,774.65
$5,998.22	$5,760.00	-$1,440.00	$4,373.25	$4,373.25	-$1,874.25	$54,044.98	$51,898.59	-$22,242.25
$4,863.84	$4,608.00	-$1,152.00	$3,061.28	$3,061.28	-$1,311.98	$38,346.00	$36,329.01	-$15,569.58
$3,943.99	$3,686.40	-$921.60	$2,142.89	$2,142.89	-$918.38	$27,207.25	$25,430.31	-$10,898.70

Taxable Income	Tax	Net Profits	Before Tax Net Cash Flow	After Tax Net Cash Flow
			-$155,106.46	-$155,106.46
$77,783.88	$9,816.33	$67,967.55	$111,458.36	$101,642.04
$121,492.66	$82,232.37	$39,260.29	$168,038.22	$85,805.84
$198,152.13	$91,906.80	$106,245.33	$231,717.72	$139,810.92
$279,745.56	$102,203.89	$177,541.67	$303,321.13	$201,117.24
$368,151.33	$113,360.70	$254,790.63	$615,284.79	$501,924.09

Table 5. Important economic values of interest

Minimum Acceptable Rate of Return	After Tax Net Cash Flow Net Present Value	Calculated Internal Rate of Return	Pay Back Time of Loan (Years)	Interest Paid Over 5 Years to Investor	Additional Equity Value to Investor	Real MARR
18%	$400,878.20	79%	5	$39,130.61	$40,087.82	16.42%

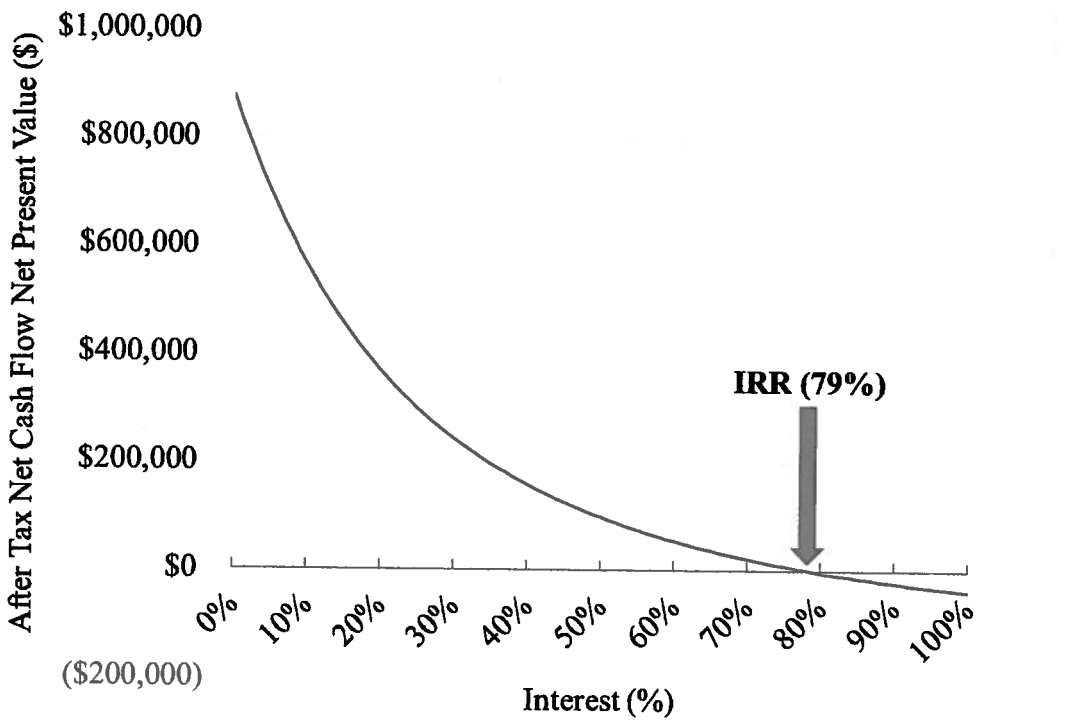

Figure 4. Internal rate of return and after tax net cash flow net present value.

Important points of interest are highlighted in the points below that all show evidence for the security of the investment, many of which are summarized in Table 5:

- Utilizing a MARR of 18% the after tax net cash flow net present value is a positive $400,878.20 demonstrating substantial reason for investing in GlucoLess.
- One of the more sensitive variables in regards to the after tax net present value is the number of units produced and sold as well as overhead costs.
- The net profits from year 1 to 5 are all positive values.

- The calculated rate of return on investment with the after tax net cash flow is 79%, a very promising value to show the potential for significant money to be made which is above a MARR of 18%.
- The payback time for the investment is 5 years and includes $39,130.61 in interest paid.
- With a 10% equity stake, the investor will also see added value of $40,087.82 with the use of the current MARR.
- To account for inflation, the real rate of return was calculated at 16.42%, which is still very promising and demonstrates that the projected values show a high potential for a positive return.

It should also be noted that the projected selling price of the company is set at an asking price of companies with similar cash flows and revenues, however, if the GlucoLess patented manufacturing process shows substantial upscaling promise it can be sold for a significantly larger value, this proposal is however set to be more modest. Overall, the current economic data presented shows a strong case for investment into GlucoLess and can not only provide a positive investment opportunity but also can help push the Canadian healthcare system and patients into a more sustainable glucose monitoring practices.

5.0 Market and Competition

5.1 Market

The number of people in Canada with diabetes and prediabetes is upwards of 29%, accounting for 11 million people who require the need to monitor their blood glucose levels [4]. It is an annual $3.4 billion market [4] with substantial room for improvement. The point-of-care blood glucose monitoring devices is the most used method by patients to self-monitor their blood glucose levels and every patient requires the use of blood glucose testing strips. In Canada over 240 million blood glucose testing strips are dispensed annually at an average estimated cost of $1.00 per strip [2–5]. The total available market (TAM) is currently Canada, however the serviceable available market (SAM) for the 5 year timeline is British Columbia and Ontario (over 150 million blood glucose strips dispensed) while the company will be based in British Columbia. The serviceable obtainable market (SOM) is estimated at 2.5% of the BC and Ontario market (1.6% of Canadian market) and is at a value of

3.75 million blood glucose strips to be produced and sold which is believed to be modest but is appropriate for the number of employees and manufacturing capabilities projected. These details are shown in Figure 5.

Figure 5. Total available market (TAM), serviceable available market (SAM) and serviceable obtainable market (SOM) for blood glucose test strips.

5.2 Competition

In terms of the analysis of the competitors to GlucoLess, the three most highly rated blood glucose monitor and testing strip manufacturers will be compared. The company that manufactures the FreeStyle Lite and FreeStyle Freedom Lite devices with test strips is Abbott and Bayer manufactures the Contour Next device and test strips. It is difficult to obtain the exact cost to manufacture blood glucose test strips of Abbott and Bayer, but an estimation of $0.20 per test strip was determined [33]. The GlucoLess test strip is manufactured at a cost of $0.07 per test strip which gives it a significant competitive advantage in being able to sell each test strip for $0.21 (200% mark-up), essentially the base cost of other manufacturers. This is the major way in which the technology that GlucoLess uses is advantageous to the business, consumers, government and of course investors. A competitive analysis is shown in Table 6 in which important parameters between Abbott, Bayer and GlucoLess

are compared, showing the significant competitive advantage of GlucoLess in regards to manufacturing costs which will benefit the company, investor, healthcare providers and end users. The competition may react by reducing their selling price per test strip, however, it is extremely unlikely that they would come close to the very low cost of manufacturing of GlucoLess, therefore their prices are expected to remain relatively unchanged and the competitive advantage of GlucoLess will remain.

Table 6. Competitive analysis of GlucoLess

	Blood Glucose Meters					
Company	**FreeStyle Lite**	**FreeStyle Freedom Lite**	**Bayer Contour Next**	**Estimated Cost of Manufacturing per Blood Glucose Test Strip**	**Selling Price per Blood Glucose Test Strip**	**Price Increase Compared with GlucoLess Test Strips**
Abbott	√	√	X	$0.20	$2.20	948%
Bayer	X	X	√	$0.20	$1.33	533%
GlucoLess	√	√	√	**$0.07**	**$0.21**	0%

6.0 Risks, Ethics and Sustainability

6.1 Risks

In addition to the previous economic analyses, an expected value risk assessment was conducted and the data is shown in Table 7. In particular, the two independent components addressed were the demand of the product and the cost to manufacture. For each component there were three levels, high, middle and low where the high and low were 25% increases or decreases from the middle value respectively. The probabilities set in Table 1 were based on the confidence of glucose to manufacture the test strips at the projected cost but also the ability to infiltrate the market with the previous work done in regards to regulations and reimbursement with Health Canada. For convenience the values and probabilities are listed below:

- Middle Demand in Units Sold: 3,750,000, Probability of Middle Demand: 75%
- Low Demand in Units Sold: 2,812,500, Probability of Low Demand: 12.5%
- High Demand in Units Sold: 4,687,500, Probability of High Demand: 12.5%
- Middle Cost in Cost per Unit: -$0.0715, Probability of Middle Cost: 80%
- Low Cost in Cost per Unit: -$0.0536, Probability of Low Cost: 10%
- High Cost in Cost per Unit: -$0.0893, Probability of High Cost: 10%

The important values determined by the expected value is the expected internal rate of return but also the standard deviation associated with it. The expected value for the IRR was shown to be 80% with a standard deviation of 39%. The rule of thumb states that if the expected value is at least double the standard deviation, than

the investment is relatively safe. Since 39% is lower than half the expected value, it is another indication that an investment in GlucoLess is one in which a high positive rate of return can be confidently expected even with the risks associated with not knowing the exact demand or cost of manufacturing the blood glucose test strips.

Table 7. Expected value risk assessment

Descript -ion	Prob.	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	IRR	Exp. IRR	IIR^2 x Prob.
Low Demand, Low Cost	1.25%	-$155,106.46	$27,461.92	$3,097.98	$47,594.96	$98,300.13	$387,287.13	35%	0.44%	0.0016
Low Demand, Middle Cost	10.00%	-$155,106.46	-$17,126.72	-$46,616.57	-$7,834.78	$36,498.20	$318,380.44	11%	1.09%	0.0012
Low Demand, High Cost	1.25%	-$155,106.46	-$61,466.26	-$96,053.38	-$62,954.85	-$24,958.47	$249,858.71	-13%	-0.16%	0.0002
Middle Demand, Low Cost	7.50%	-$155,106.46	$160,966.40	$151,950.14	$213,559.16	$283,343.58	$593,603.17	115%	8.64%	0.0995
Middle Demand, Middle Cost	60.00%	-$155,106.46	$101,642.04	$85,805.84	$139,810.92	$201,117.24	$501,924.09	79%	47.33%	0.3733
Middle Demand, High Cost	7.50%	-$155,106.46	$42,395.50	$19,748.32	$66,159.42	$118,998.77	$410,365.28	44%	3.30%	0.0145
High Demand, Low Cost	1.25%	-$155,106.46	$294,470.88	$300,802.29	$379,523.36	$468,387.02	$799,919.21	200%	2.49%	0.0498
High Demand, Middle Cost	10.00%	-$155,106.46	$220,156.49	$217,944.71	$287,140.47	$365,383.80	$685,074.74	152%	15.23%	0.2319
High Demand, High Cost	1.25%	-$155,106.46	$146,257.26	$135,550.03	$195,273.69	$262,956.02	$570,871.85	106%	1.33%	0.0141
	100%								**80%**	**39%**

↑ **Standard Deviation**

In order to mitigate and avoid risks, risk management will be conducted on an ongoing basis by the CEO which will include assessment, evaluation, management and measuring of the risk and then identifying the most appropriate action to move forward. One of the major areas of risk that should be highlighted here is the fact that the projected demands of the product may surpass the resources of GlucoLess over the 5 years. In order to mitigate this risk the labour required per blood glucose test strip was assessed to ensure there will be flexibility on the resources side and is shown in Table 8. This is also why each employee has a responsibility to be a part of the manufacturing process. The GlucoLess team will be committed to meeting all production and payment schedules

and therefore there is significant flexibility in the number of days required for the estimated number of units to be produced and therefore all internal risks will be mitigated from year 0.

Table 8. Labour cost details

10	min/batch
100	units/batch
3,750,000	units
0.1	min/unit
0.001666667	hour/unit
8	hours/day
781	days for specified units
7	employees
112	days/employee (253 total work days)
$22.59	average wage/hour
$0.0376	labour cost/unit

In regards to the external risks, a significant amount of work has already been done to avoid health, safety and political risks by previously obtaining the required regulatory and reimbursement components. In terms of the technological risks, the previous research and development has already been conducted and optimized, the only risk apparent is potential issues if the scaling up process occurs too fast. To mitigate this, GlucoLess will manage the larger scale manufacturing process from the ground up to ensure that all processes are optimized for efficiency and effectiveness at the start of year 1. Overall, the potential benefits outweigh the risks significantly which is the reason for the request for investment.

6.2 Ethics

The corporate ethics that GlucoLess will abide by will be a code of conduct that will help develop trust within all relationships between employers, employees, customers, shareholders and the community. It will be one of transparency that will allow for open communication to alleviate any possible issue that GlucoLess will be confronted with. If required, GlucoLess will consult with legal representation and this cost has already been included in business fees as legal representation will also be required for specific documentation to be filed. GlucoLess will not discriminate and will accommodate diversity. There will be flexibility in sick and vacation days as long as the production milestones are reached and decision making will be an open discussion among

employees and shareholders in which the CEO will request a vote for all major decisions as the GlucoLess team will be working together to a common goal. If any issues arise in which there is negligence or risks the safety and well-being of an individual at GlucoLess or a consumer, it will be reported to the CEO to handle in which a solution to the problem will be handled on a case by case basis. GlucoLess will always maintain a high standard of quality control as the products being manufactured will be directly used by patients for important monitoring of blood glucose levels that can directly impact their quality of life. The CEO and all members of GlucoLess will always maintain respect and integrity throughout all aspects of the company.

6.3 Sustainability

GlucoLess is committed to being economically, socially and environmentally sustainable. In regards to economic sustainability, through the projected economic data over the 5 year timeline, GlucoLess is expected (with a very high probability) of being economically stable, profitable and able to produce high quality products while paying off all costs and loans due to the ability of the low-cost manufacturing processes. Social sustainability will be acquired through constant interactions with the community and healthcare political system to push the concept of reasonable costs for Canadians to obtain high quality care and monitoring. The main goal of GlucoLess is to provide a solution to the constant stress that current blood glucose monitoring systems pose on the Canadian healthcare system. GlucoLess will strive to help obtain a sustainable reimbursement pathway for blood glucose monitoring costs to more effectively use the tax dollars that Canadians have paid. Environmental sustainability is more of a challenge for GlucoLess as the product being manufactured is a disposable, however, the manufacturing process established ensures extremely limited waste of materials as well as a very minimal carbon footprint as inkjet printing machinery is a relatively green process when compared to larger manufacturing equipment. The company being proposed will always work towards a sustainable future.

7.0 Conclusion

GlucoLess is a company that is working towards establishing a more viable solution to the current challenges in the market of blood glucose monitoring, specifically with the development and manufacturing of a high quality low-cost blood glucose testing strip. Important quantitative and qualitative data was compiled and

various economic analyses were conducted and all concluded that an investment in GlucoLess is economically, socially and ethically beneficial to the investor. In addition, the market and competition where the low-cost and innovative manufacturing process of GlucoLess was highlighted. The risks, ethics and sustainability aspects were outlined and the pathway of GlucoLess to market was described with an emphasis on risk mitigation through planning, ethical codes of conduct and sustainable practices. **This proposal supports an investment of $155,106.46 which will yield significant positive returns for the investor and will help shape the future diabetes monitoring industry to establish a more economically sustainable healthcare system for Canadians.**

Bibliography

[1] A. St John, C.P. Price, Existing and emerging technologies for point-of-care testing, Clin. Biochem. Rev. 35 (2014) 155–67. http://www.ncbi.nlm.nih.gov/pubmed/25336761.

[2] S.R. Knowles, K. Lee, J.M. Paterson, B.R. Shah, M.M. Mamdani, D.N. Juurlink, T. Gomes, Self-Monitoring of Blood Glucose: Impact of Quantity Limits in Public Drug Formularies on Provincial Costs Across Canada, Can. J. Diabetes. 41 (2017) 138–142. doi:10.1016/j.jcjd.2016.08.225.

[3] T. Gomes, D. Martins, M. Tadrous, J.M. Paterson, B.R. Shah, D.N. Juurlink, S. Singh, M.M. Mamdani, Self-Monitoring of Blood Glucose Levels: Evaluating the Impact of a Policy of Quantity Limits on Test-Strip Use and Costs, Can. J. Diabetes. 40 (2016) 431–435. doi:10.1016/j.jcjd.2016.03.003.

[4] Canadian Diabetes Association, Diabetes in Canada, Ottawa, ON, 2016. http://www.stridemagazine.com/2003_05 May/article03/article03.htm.

[5] T. Gomes, D. Martins, L. Cheng, J. Kratzer, D.N. Juurlink, B.R. Shah, M.M. Mamdani, J.M. Paterson, M.R. Law, The impact of policies to reduce blood glucose test strip utilization and costs in Canada, Can J Public Heal. 106 (2015) e210–e216. doi:10.17269/cjph.106.4788.

[6] Businesses for Sale, Electrical and mechanical business in eastern ontario for sale, (2017). http://canada.businessesforsale.com/canadian/electrical?and?mechanical?business?in?eastern?ontario?for?sale.aspx (accessed April 10, 2017).

[7] T. Wang, C.C. Cook, S. Serban, T. Ali, G. Drago, B. Derby, Fabrication of glucose biosensors by inkjet printing, arXiv.org, E-Print Arch. Condens. Matter. (2012) 1–21. http://arxiv.org/ftp/arxiv/papers/1207/1207.1190.pdf.

[8] K. Gainey Wilson, P. Ovington, D. Dean, A Low-Cost Inkjet-Printed Glucose Test Strip System for Resource-Poor Settings, J. Diabetes Sci. Technol. 9 (2015) 1275–1281. doi:10.1177/1932296815589755.

[9] M.W. Shinwari, D. Zhitomirsky, I.A. Deen, P.R. Selvaganapathy, M.J. Deen, D. Landheer, Microfabricated Reference Electrodes and their Biosensing Applications, Sensors. 10 (2010) 1679–1715. doi:10.3390/s100301679.

[10] G. Viera, Top 10 Best Glucose Meters from Consumer Reports 2015, Diabetes Dly. (2017). https://www.diabetesdaily.com/blog/2015/06/consumer-reports-glucose-meter-ratings-2015/ (accessed April 10, 2017).

[11] Government of Canada, Canada Small Business Financing (CSBF) Loan, RBC. (2017). http://www.rbcroyalbank.com/business/financing/small-bus-loan.html (accessed April 10, 2017).

[12] Government of Canada, Semiconductor and Other Electronic Component Manufacturing, Salaries Wages -- Can. Ind. Stat. (2017). https://www.ic.gc.ca/app/scr/app/cis/salaries-salaires/3344 (accessed April 10, 2017).

[13] Canadian Revenue Agency, Classes of depreciable property, CRA Resour. (2016) 1–8. http://www.cra-arc.gc.ca/tx/bsnss/tpcs/slprtnr/rprtng/cptl/dprcbl-eng.html (accessed April 10, 2017).

[14] Bureau of Labor Statistics, Inflation Calculator, Bank Canada. (2017). http://www.bls.gov/data/inflation_calculator.htm (accessed April 10, 2017).

[15] Wolrige Mahon, 2017 BC Corporate Income Tax Rates Combined, Tax Rates. (2017). http://www.wolrigemahon.com/tax-rates-2/ (accessed April 10, 2017).

[16] BC Public Service, Benefits Guide, British Columbia, 2017. http://www2.gov.bc.ca/assets/gov/careers/all-employees/pay-and-benefits/benefits-for-bargaining-unit-employees/bargaining_benefits_guide.pdf.

[17] Government of Canada, Semiconductor and Other Electronic Component Manufacturing, Financ. Perform. - Can. Ind. Stat. (2017). https://www.ic.gc.ca/app/scr/app/cis/performance/rev/3344 (accessed April 10, 2017).

[18] Fujifilm, Dimatix Materials Printer DMP-2850, Fujifilm Support Doc. (2016) 1–2. http://www.fujifilmusa.com/shared/bin/dimatix_materials_printer_dmp-2850.pdf.

[19] EE Times, Benchtop ink - jet system costs under $30K US, EE Times. (2005).

http://www.eetimes.com/document.asp?doc_id=1297523 (accessed April 10, 2017).
[20] Fujifilm, Dimatix Materials Cartridge, Fujifilm Prod. (2017) 2017. http://www.fujifilmusa.com/products/industrial_inkjet_printheads/deposition-products/materials-cartridge/index.html (accessed April 10, 2017).
[21] EE Times, Cartridge - based inkjet printhead delivers 1 picoliter capability, EE Times. (2007). http://www.eetimes.com/document.asp?doc_id=1303278 (accessed April 10, 2017).
[22] Metrohm, Metrohm Autolab PGSTAT12 Differential Electrometer, Ebay. (2017). http://www.ebay.com/itm/Metrohm-Autolab-PGSTAT12-Differential-Electrometer-Amplifier-Assy-/321823862952?_trksid=p2349526.m2548.l4275 (accessed April 10, 2017).
[23] Millipore, Millipore Milli-Q, Conquer Sci. (2017). https://conquerscientific.com/product/millipore-milli-q-gradient-a10-water-purification-system/ (accessed April 10, 2017).
[24] Beijing Qinfeng Xinxin Trading, PET laser cutting machine for film, (2017). https://www.alibaba.com/product-detail/PET-TPU-screen-protector-laser-cutting_60156953828.html (accessed April 10, 2017).
[25] Global Industrial, Thermo Bag Sealer, (2017). http://www.globalindustrial.ca/g/packaging/bags/bag-sealer/thermo-bag-sealer-optional-cutter (accessed April 10, 2017).
[26] Shanghai Guangtai Adhesive Products, Polyethylene Terephthalate, Alibaba. (2017). https://www.alibaba.com/product-detail/PET-Polyethylene-Terephthalate_60424070482.html?s=p (accessed April 10, 2017).
[27] Sigma-Aldrich, Silver Ink, Sigma-Aldrich. (2017). http://www.sigmaaldrich.com/catalog/product/aldrich/736481?lang=en&region=CA&cm_sp=Insite-_-prodRecCold_xviews-_-prodRecCold10-6 (accessed April 10, 2017).
[28] Advance 12A, Sodium Hypochlorite, Adv. Chem. (2017). http://www.cleartech.ca/ckfinder/userfiles/files/Advance 12A(4).pdf (accessed April 10, 2017).
[29] Global Industrial, Amber Bags, Glob. Ind. (2017). http://www.globalindustrial.ca/g/packaging/bags/specialty/amber-bags (accessed April 10, 2017).
[30] Sigma-Aldrich, Sodium acetate buffer solution, Sigma-Aldrich. (2017). http://www.sigmaaldrich.com/catalog/product/sigma/s7899?lang=en&region=CA (accessed April 10, 2017).
[31] Sigma-Aldrich, Glucose Oxidase, Sigma-Aldrich. (2017). doi:http://dx.doi.org/10.1016/0076-6879(66)09022-0.
[32] Super Image Technologies, Dupont White Ink, Made-in-China. (2017). http://superimagetech.en.made-in-china.com/product/yKbQexmdZaVS/China-Dupont-White-Ink-for-Textile-SI-MS-TP9030-.html (accessed April 10, 2017).
[33] D. Spero, Why do test strips cost so much?, Diabetes Self. Manag. (2013). https://www.diabetesselfmanagement.com/blog/why-do-test-strips-cost-so-much/ (accessed April 10, 2017).

APPENDIX

Equations Utilized:

Simple Interest:
Interest earned on amount P: $I = Pin$
Maturity value: $F = P(1+in)$
i = interest rate per time period
n = number of time periods

Compound Interest:
$F = P(1+i)^n$ (Sample: Table 4, Year 1 Costs with Inflation, -$693,981.43 $(1+0.0136)^1$ = -$703,419.58)
$P = F(1+i)^{-n}$
F = future value; P = present value
i = periodic interest; n = number of periods

Capital Recovery:
$A = P\left[\frac{i(1+i)^n}{(1+i)^n-1}\right]$ (Sample: Table 1, Annual Loan Payments, $A = \$155{,}106\left[\frac{0.08(1+0.08)^5}{(1+0.08)^5-1}\right] = \$38{,}847.41$)

Inflation:
$i = i'+f+(i')(f)$ (Sample: Table 5, Real Rate of Return, i'=(i-f)/(1+f) = [(0.18-0.0136)/(1+0.0136)]x100 = 16.42%
i = market interest rate; i' = real interest rate

Capital Cost Allowance:
Book value at end of period n: $BV_n=B(1-CCA)^n$
BV = book value; B = cost basis
CCA = capital cost allowance

Investment Project Cash Flows:
Taxable income = Operating Revenue – Operating Costs – CCA – Interest (Sample: Table 4, Year 1, $814,877.95-$703,419.58-$1,000.00-$1,575.00-$18,690.97-$12,408.52 = $77,783.88)
Net profit = taxable income(1 – tax rate) (Sample, Table 4, Year 1, $77,783.88(1-0.1262) = $67,967.55)
Before tax cash flow = Interest + CCA + taxable income (Sample, Table 4, Year 1, $1,000.00+$1,575.00+$18,690.97+$12,408.52+$77,783.88=$111,458.36)
After tax cash flow = Net profit + CCA + Interest = BTCF-Tax (Sample, Table 4, Year 1, $111,458.36-$9,816.33 = $101,642.04)
Net Present Value of ATCF → Excel Formula: =NPV(MARR,Year 1 to 5 Cash Flows)+Year 0 Cash Flow
Internal Rate of Return of ATCF → Excel Formula: =IRR(Year 0 to 5 Cash Flows)

Risk:
Expected Value = $\text{Outcome}_A(\text{Probability}(A))+\text{Outcome}_B(\text{Probability}(B))+\ldots$ (Sample: Table 7, EV = (0.35x0.0250)+(0.11x0.20_+…=0.80=80%)
Joint Probability = Probability(A) x Probability(B) (Sample: Table 7, 0.10x0.125=0.0125=1.25%)
Standard Deviation = $\sqrt{[(\text{Outcome}_A^2)(\text{Probability}(A))+ (\text{Outcome}_B^2)(\text{Probability}(B))+\ldots- EV^2]}$ (Sample: Table 7, SD = $\sqrt{[(0.35^2)(0.0125)+ (0.11^2)(0.10)+\ldots- 0.80^2]}$=0.39=39%)