

EEE4051 ASSIGNMENT 3: BUSINESS PLAN


SMART JEWELLERY TO PROTECT AND ENHANCE SAFETY



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Problem Identification



Femicide in SA is 5 times higher than the global average



3 women are killed each day

Gender-Based Violence in South Africa



Gender-based violence is a worldwide problem, however, South Africa is amongst the countries with the highest rates of gender-based violence cases. According to statistics, women are the main victims of these crimes. These victims, unfortunately, have no quick or efficient way of calling for help. Usually, they do not have the time to dial the emergency number or send a text since the perpetrator is already on to them. And this results in them getting absolutely no help at all which is a tragedy.

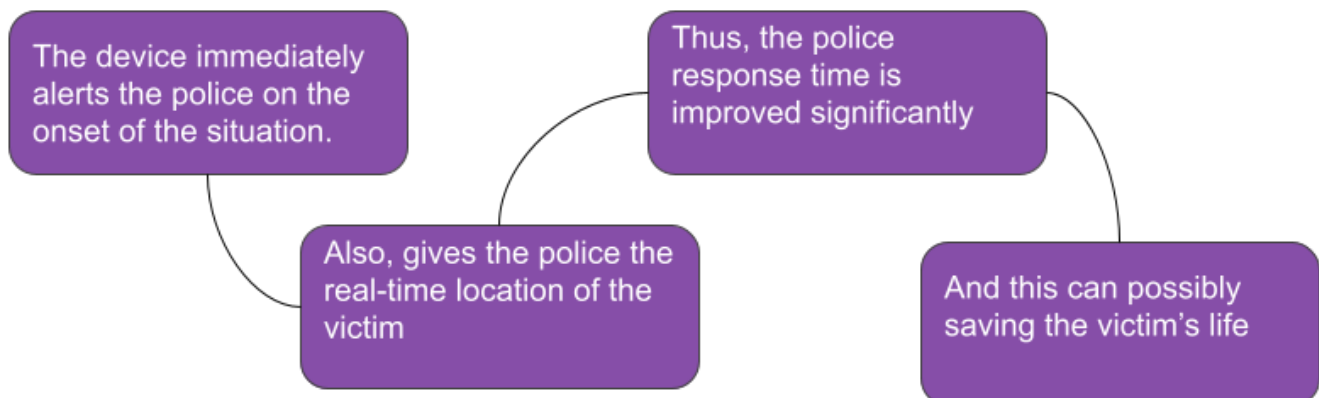
2930

In 2017/2018, a total of 2930 women were murdered in South Africa



Aim of Our Product – Smart Jewellery

Our product aims at ensuring that the victims are able to get help when they find themselves in a dangerous situation. It does this by using **sensor technology** to detect the user's environment and if it determines that the user is in danger it **automatically** alerts the police and the victim's emergency contacts.



Market Analysis

Industry Analysis and Competition Spectrum

As discussed, when establishing the problem statement, gender-based violence is an ongoing issue and is on the rise in South Africa as seen in the statistics mentioned. Based on this information, we can say with confidence that there will be a vested interest in our product from targeted groups.

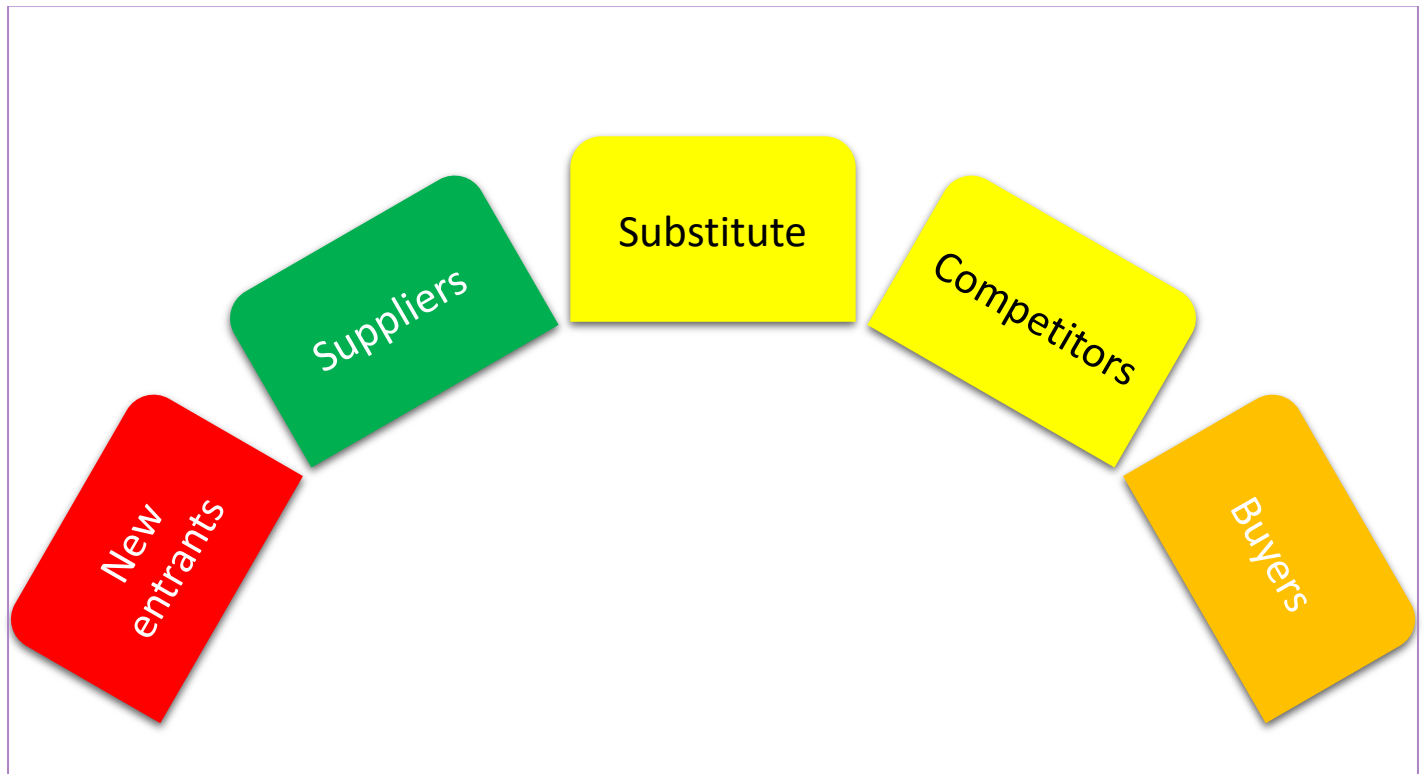
Looking at what other people are doing, there are various companies who either attempted to, such as Cuff smart jewellery [1] who offers majority of the same features our product does, but was discontinued. A company which successfully has implemented the product we have, is invisaWear [2]. In addition to our product's features, they are in partnership with a known security company ADT who provides armed response should an individual be endangered and they also provides access to self-defence classes. The additional features require you pay a subscription fee however.

In terms of competition, we have what is tending towards a monopolistic competition as our competitors, mentioned above offering the same product are US based. Should our customer base and revenue grow we could possibly expand to other African countries as well where technological maturity is relevant without major concern for competition.

STEEPLE Analysis



Porter's Five Forces



Looking at Porter's five forces, the business will be affected by the threats in the Figure above in the following ways:

- Threat of new entrants (**high**): The concept and design is simple to replicate and therefore anyone with sufficient technical knowledge and staffing enter this market.
- Bargaining power of suppliers (**low**): The components used are electronic and raw materials such as metals and plastic which has ample options available.
- Threat of substitution (**low-moderate**): Equivalent products are available overseas only such as the United States as mentioned above.
- Rivalry among competitors (**low-moderate**): Local competitors with the focal features do not have safety against GBV prioritised.
- Bargaining power of buyers (**moderate**): It's imperative that we deliver a good product as safety is critical to an individual's life. The target market is large but depends on customer satisfaction for products to keep selling.

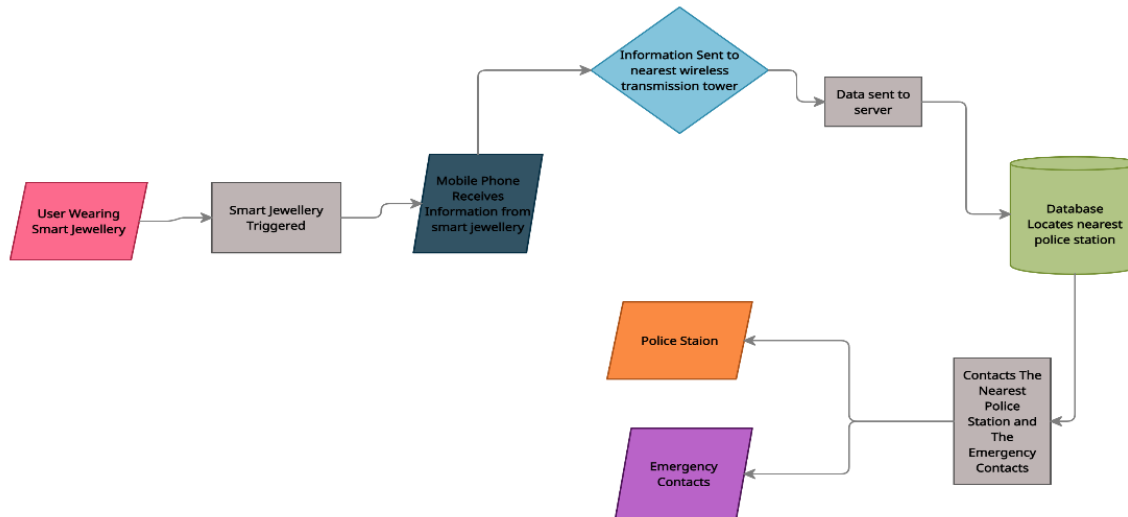
Product Description

Functional Specification

A context on the functionality of the business plan model is shown in the block diagram below which shows the connections and relations between the proposed business plan model (smart jewellery) and its interaction with the environment.

Block Diagram

The functional specification of the product is outlined in the table below which gives an outline based on the requirement, specification, and acceptance test criteria.



Requirement	Specification(s)	Acceptance Test Criteria
Battery of device lasts at least 24 hours	Lithium-Ion rechargeable battery	250mAh-303.8mAh
Offers feedback on physical activity	Temperature Sensor Pulse Sensor	Temperature range 39°C-43°C Heart rate greater than 200 beats/min
Has hands free functionality	Bluetooth connectivity with mobile phone for application interaction and control	Bluetooth version: Bluetooth 4.2 -Bluetooth 5.2
Synchronisation between the mobile phone and smart jewellery.	NFC chipset communicates with the mobile phone	Contactless communication at 13.56Mhz
Be able to withstand harsh weather conditions	Device has IPX rating that denotes level of protection against water, dust, etc	IPX rating range: IP4-IP8

List of the Components

Below is a list of the component both hardware and software that are integrated to make up the functionality of the smart jewellery device.

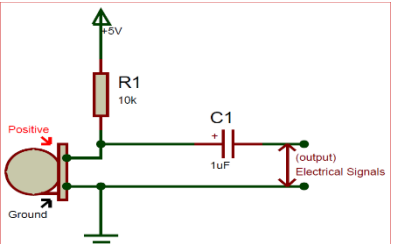

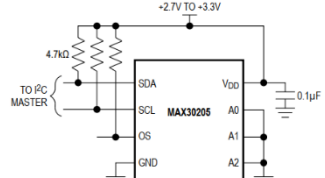
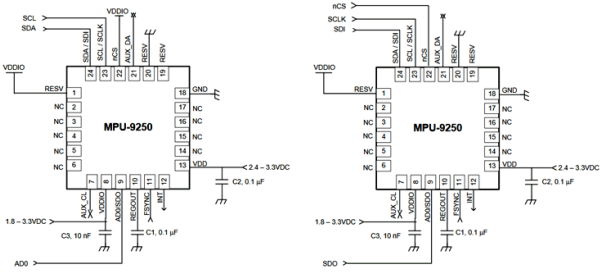
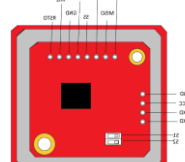
Hardware:

- Microphone
- Pulse Sensor
- Temperature Sensor
- Gyroscope
- Near-Field Communication (NFC) chipset

Software:

- Mobile application (both iOS and Android) to configure the device
- NFC software to establish communication between mobile phone and smart jewellery

Below are the technical specifications of the smart jewellery:

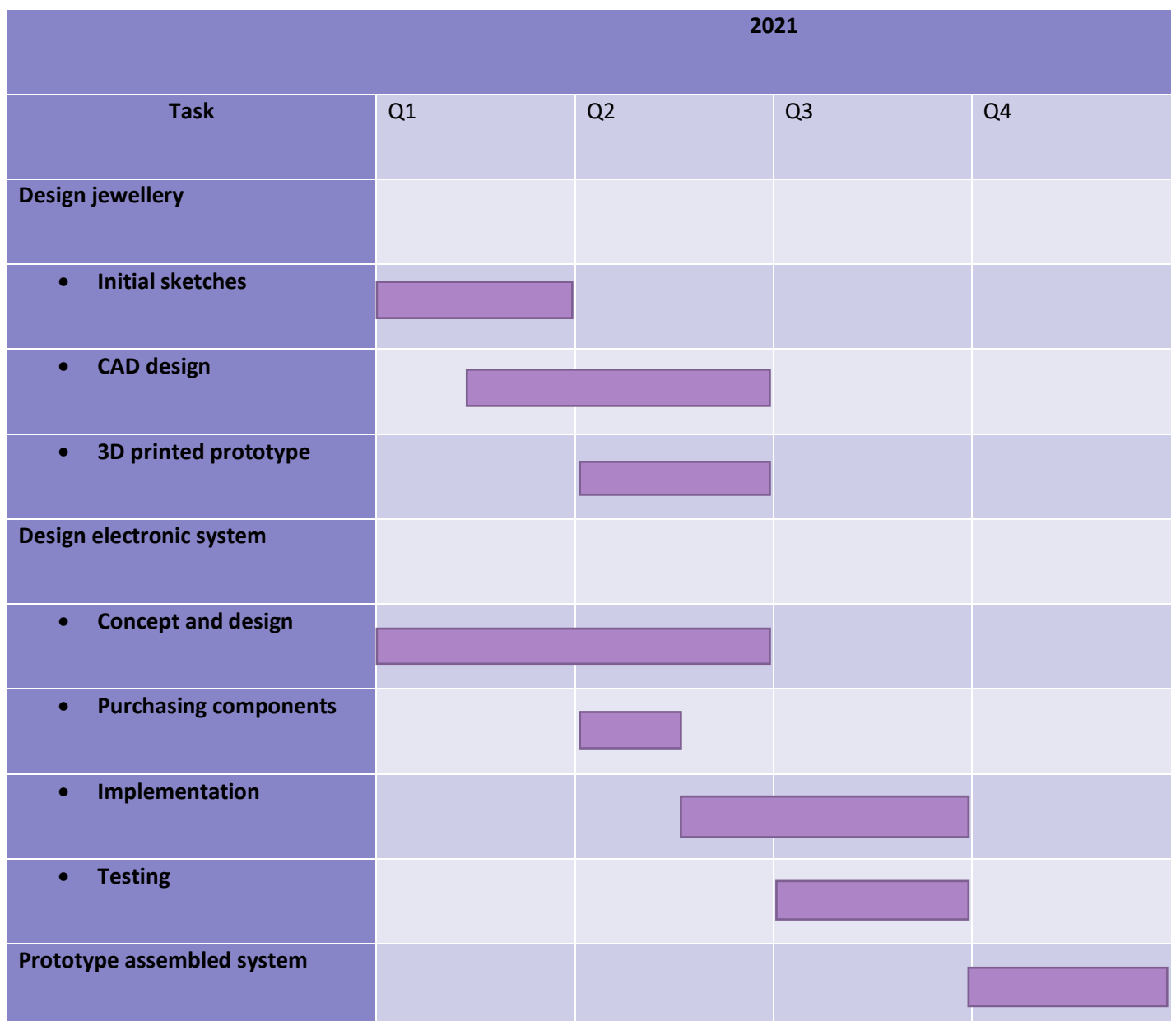
<h3>Technical Component in Smart Jewellery</h3> <h4>Electret Microphone [3]</h4> 	<h3>Specifications</h3> <ul style="list-style-type: none"> • Operating Voltage: 2V to 10V • Current consumption: 0.5mA (max) • Recommended operating voltage: 2V • Operating Frequency: 20Hz to 16,000Hz • Impedance: <2.2kΩ
<h4>Pulse Sensor [4]</h4> 	<ul style="list-style-type: none"> • Biometric Pulse Rate or Heart Rate detecting sensor • Plug and Play type sensor • Operating Voltage: +5V or +3.3V • Current Consumption: 4mA • Inbuilt Amplification and Noise cancellation circuit. • Diameter: 0.625" • Thickness: 0.125" Thick
<h4>Temperature Sensor: model MAX30205 [5]</h4> <h5>Typical Application Circuit</h5> 	<ul style="list-style-type: none"> • Operating Temperature Range: 0°C to +50°C • Input Current at Any Pin: +5mA • Package Input Current: +20mA • Storage Temperature Range: -10°C to +50°C
<h4>Gyroscope: MPU9250 Digital Motion Processor [6]</h4> <h5>MPU9250 9-axis Digital Motion Processor - Overview</h5> 	<h4>3-axis Gyroscope</h4> <ul style="list-style-type: none"> • Digital-output X-, Y-, and Z-Axis angular rate sensors (gyroscopes) with a user-programmable full-scale range of ± 250, ± 500, ± 1000, and $\pm 2000^\circ/\text{second}$ integrated 16-bit ADCs • Digitally programmable low-pass filter • Gyroscope operating current: 3.2mA • Sleep mode current: 8μA • Factory calibrated sensitivity scale factor • Self-test
<h4>Near-Field Communication (NFC) chipset [7]</h4> 	<ul style="list-style-type: none"> • Operating voltage: +2.7V to +5.5V • Supports MIFIRE higher transfer speed communication at 212Kbits/s and 424 Kbits/s • Operating temperature: -30°C to +85°C • Contactless communication at 13.56Mhz • Hard-Power-Down mode (1μA typical), Soft-Power-Down mode (22μA typical)

Product development timeline

Resource Requirements

- Staff
 - Design team dedicated to jewellery design
 - Design team dedicated to electronic design
- Material requirements
 - Metals for jewellery
 - Electronic components
- Equipment
 - Drawing materials for jewellery sketching
 - Equipment for electronic design
 - CAD software for both jewellery and electronic 3D design

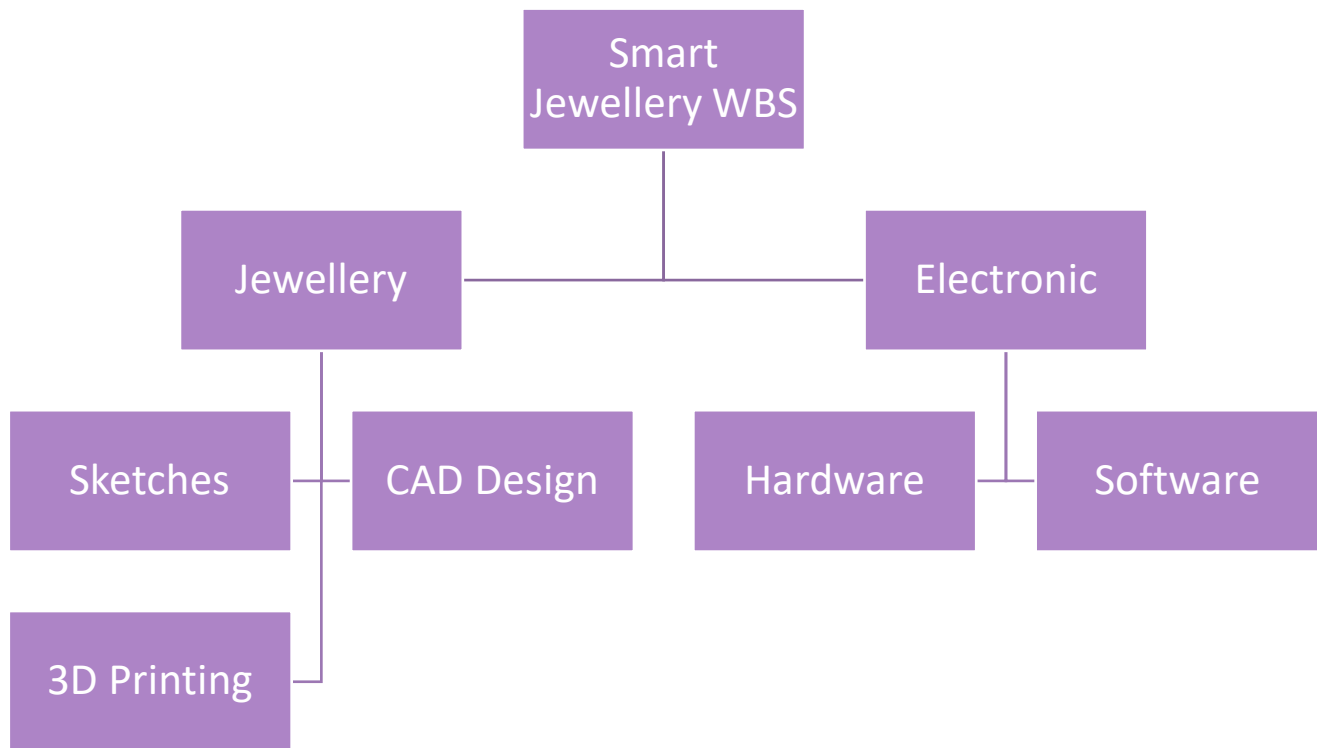
Gantt Chart



Critical Path

From the Gantt chart we can see the critical path is the electronic concept and design which spans over the first two quarters

Work Breakdown Structure

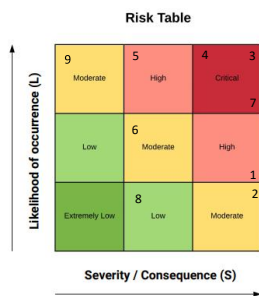


Risk Analysis:

Risk Identification:

- **Financial Risk:**
 1. A lot of money will need to be invested early into research and development.
 2. Finances will be heavily invested in our inventory.
- **Operational Risk:**
 3. Product and service failure.
 4. Breach of private data.
- **Reputational Risk:**
 5. Bad publicity over brand trust and quality.
 6. Bad publicity involving private data security and usage.
- **Health and Safety Risk:**
 7. Risk to customer if product doesn't work when it's supposed to.
- **Environmental Risk:**
 8. E-waste risk.
- **Market Risk:**
 9. Risk of material inflation.

Risk Analysis:



Risk Evaluation:

The list of risks in order of importance and order of being addressed are:

- Risk to customer if product doesn't work when it's supposed to
- Breach of private data.
- Product and service failure.
- Bad publicity over brand trust and quality.
- A lot of money will need to be invested early into research and development.
- Risk of material inflation.
- Bad publicity involving private data security and usage.
- Finances will be heavily invested in our inventory.
- E-waste risk.

Risk Management:

The strategy for each type of risk can fall into the following strategies: avoid (AV), accept (AC), transfer (TR) & reduce (RE)

1. AC- this is a necessary risk to move forward with the product
2. TR- We can manage this risk by getting inventory insurance
3. RE- we can reduce this risk using various quality & assurance testing
4. TR- data security would be outsourced to a data company
5. RE- we will reduce the risk by setting up regulations and procedures when communicating with the public
6. RE- we will reduce the risk by setting up regulations and procedures when communicating with the public
7. AC- this risk we will accept because it would be seen as counter intuitive to the goal of the product.
8. AV- we will avoid this risk by paying for e-waste treatment services and collections. We will also start e-waste collection programs
9. RE- we will reduce this risk by stocking up on material when prices are low, so we have excess when it inflates

Legal (Intellectual Property and Regulations) -KSTSTA002

Intellectual Property

Novel aspects of the product

- Uses machine learning to decide to decide if the sound recorded indicates danger i.e., screaming, crying, common phrases used in such situations such as “I am in danger”.
- Has hands free functionality which most of emergency devices don't have because they require pressing a button.

Patent

Since a patent is territorial [8], our target market is South Africa because it is one of the countries with the highest rate of GBV and currently no product exists in the market that uses machine learning and has hands free capability to offer emergency contact, the product will be patented for 20 years.

Trademarks

To uniquely distinguish the business idea/product from potential competitors, the trademark of the business idea/product will be based on the following statements which come from the novelty of the product:

- Using Machine Learning to stop GBV.
- Hands free capability to save lives.

Copyright

The work that we are to place under copyright protection will be the software and computer programmes that have been developed to make the product work as it is intended to.

Product Regulations

- The main regulation that the product/business idea is likely to face is invasion of privacy, the product has sensors, microphones and a gps monitoring system which tracks and monitors an individual's activity.
- A person's right to privacy is typically infringed in one of two ways:
- When a person intrudes upon another's personal affairs without permission or justification; and/or
- When a person on purpose shares another's personal information without permission or justification.
- The problem is that when the device records and sends information that it is not intended to since the smart jewellery must be active all the time when worn since it is used as an emergency device.

To be mitigate this risk the product/business plan will use cryptography to safeguard people's personal data meaning that only those intended to read and process the data will have access to it, this also means that the risk of losing customers is minimised since our customers will be reassured that their data is in safe hands and no one has access to it as their data is secured, this results in customer satisfaction and our customers being confident in purchasing and using our product.

Pricing, sales, distribution, and marketing strategy:

Marketing Strategy:

The marketing strategy will mainly be digital with print being marketed in retail and cooperating jewellery stores. We will also run campaigns with jewellery brands promoting our product with their brands on it.

New Customer Strategy:

- Online ads on search engines.
- Promotions running in retail and jewellery stores.
- Management and running of business profiles on social media platforms.
- A business website with information about promotions, special deals and an online store.
- Pay Per Click (PPC) using keywords such as "smart jewellery", "safety jewellery", etc.

Customer Retention Strategy:

- Email previous customers with new specials and deals
- Discounts for repeat purchases

Sales & Distribution Channels:

Direct to customer:

We would sell our products on an online store using our website. The products will be sold slightly cheaper than our other distribution channels this would allow us to earn more profit on these products while not underselling it and causing problems for our channels. This gives the advantage of having individual orders and being able to collect more customer data.

Retailer:

We would sell products at common retail stores this would provide well set up distribution and transport channels as well as passive marketing through them. The product will be bought in bulk, but we wouldn't be able to collect a lot of customer data. The retail stores would ask for roughly 30% of the total price sold to the customer and the product cost being 70%.

Branded product:

These would be specifically designed products with the input and guidance of the brand participating. Each deal would have to be discussed separately and stated in a contract between business. This means that the price would have to be negotiated but the advantage we would with the branded products and customer base would be very profitable for both businesses. We would look at contracting with brands such as Tiffany and Co. , Graff ,etc.

Pricing of the Product:

Cost to Manufacture:

For 10 000 basic bracelet jewellery units:

- Stainless steel: R2 000 000
- Bracelet Technology: R5 000 000
- Packaging: R200 000
- Warehouse storage: R50 000
- Distribution: R50 000
- Marketing: R100 000
- Labour: R300 000
-
- **Total Cost:** **R7 700 000**
- Per unit cost: R770

Waste:

For 10 000 units we can set a safety margin for unseen circumstances as seen below:

- Accidents & Losses: 5% 500 units
- Insurance on products: R50 000
- Total Cost: R7 750 000

- Complaints: 0.4% 40 units
- Returned without selling: 15% 800 units
- Samples (promo/marketing): 100 units
- Quality Control: 250 units

- Actual items sold: 8310 units
- Total Cost: R7 750 000
- Per Unit Cost: 8310 units R932.61

Distribution & Competition:

An example of the competition can be seen below with a rough price range of R1 900 to R11 700.



Assuming our highest distribution channel requires the manufacturing to be 60% means our min shelf price is R1 554.35 per unit. This means our overall price range R1 554.35 to R1 900. This shows we have about R345.65 of leeway between our break-even price and our competition prices to work with. The best strategy is to price the product to the higher end of this range thus enabling us to create deals, discounts, and promotions.

CRM Tools:

There are tons of CRM tools and software that can be found for our business we will both be dealing with large bulk orders as well as online sales. This means that we are expecting a large customer base and will need to invest in a professional tool. We have the options of HubSpot, Microsoft Dynamics, Pipedrive, Salesforce Sales Cloud and Zoho. Each has their own advantage such as HubSpot's social media integration or Microsoft Dynamic's sales forecasting feature. Overall, the final software tool chosen was Zoho for its ease of use and ability to deal with mass customer data and show it in an easily digestible manner. Another reason is for its brand interaction feature and wide range of integration such as can be seen in the pictures below.



Business Financial Model

The table below is a cash flow forecast for the period of 2021-2023. We estimate that we will have our first sale of R400 000 by Q4 of 2021. The team consists of five engineers that will fill in the positions of CEO, CTO, CFO and CMO. Each person will initially get a salary of R30 000 and as the business grows the salary also increases. We will also need to hire a lawyer to assist with legal matters.

Cash Flow Forecast		2021				2022				2023			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Cash received (inflows)	>> Cash from customers (sales)				R400	R450	R500	R550	R750	R700	R750	R900	R1,000
	>> Cash from the owner (capital)												
Team	>> Team size	5	5	5	5	5	5	5	5	5	5	5	5
	>> Salary (CEO)	R0	R0	R0	R30	R30	R30	R30	R35	R35	R35	R35	R50
	>> Salary (CTO)	R0	R0	R0	R30	R30	R30	R30	R35	R35	R35	R35	R50
	>> Salary (CFO)	R0	R0	R0	R30	R30	R30	R30	R35	R35	R35	R35	R50
	>> Salary (CMO)	R0	R0	R0	R30	R30	R30	R30	R35	R35	R35	R35	R50
	>> Salary (Engineer)	R0	R0	R0	R30	R30	R30	R30	R35	R35	R35	R35	R50
	>> Salary (Support)					R10	R10	R10	R15	R15	R15	R15	R20
Cash paid (outflows)	>> Cash paid to employees	R0	R0	R0	R450	R480	R480	R480	R570	R570	R570	R570	R810
	>> Cash paid to suppliers			R500		R112	R75	R100	R137	R152	R137	R125	R160
Investment	>> External Investment												
	Balance (end of month)	R0	R0	-R500	-R550	-R692	-R747	-R777	-R734	-R756	-R713	-R508	-R478

Key Metrics

- **Burn Rate:** The burn rate is calculated to be R480 000 for the year 2022. However, in 2023 we anticipate that there will be a huge demand for our product and hence we increase the production quantity thus the burn rate will increase to R570 000.
- **Runway:** Until Q3 2022 that is a period of 1 year .
- **Break Even:** The business will reach the break-even point in Q3 of 2024 (in 4 years)
- **Lowest point:** The lowest point lies in the third quarter of 2022 at R777 000.

Investment Needs

According to the cash flow forecast above, the lowest point lies in the third quarter of 2022 at R777 000. Therefore, for the business to stay afloat an investment of R777 000 is needed. This investment will be paid in three tranches.

- **First Tranche:** 2021 Q3 – 680 000
- **Second Tranche:** 2022 Q1 – 50 00
- **Third Tranche:** 2022 Q2 – 47 000

Investment proposal (value, timing, and projected returns for investors)

Investment proposal

Investment Value

Based on our current financial model the team will need to have raised an amount of R 50 000 to kick-start the business so that the product is developed. Once operations commence the company will run at a loss towards the end of the third quarter of its first financial year to the end of the second quarter of its third financial year before it starts to make profit.

It is estimated that the company will require an investment valued at R 200 000 to in order to maintain a positive cashflow.

Type of investment

In order to raise the required amount, the business will need equity investors to purchase shares of the company. The company will issue 20% of its shares valued at R 200 000. It is projected that the equity investment will rise in value, hence the investor(s) will generate revenue from their investment. They have the option to sell back their shares to the founding members.

Valuation of the company

There are several ways to determine the value of a company. The valuation may be based on revenues, profits, assets, and a combination of many other factors. The valuation of the company is at R 1 million and this valuation is based on the value its share price.

Return on investment

The investors will receive a return on their investment through dividend pay-outs over a certain period of time. The company will pay out some of its earnings as dividends and the remaining amount will be retained by the company and reinvested.

Team members, roles, and proposed shareholding structure

The founding members of the company are Stalin Koster, Liam Mcevoy, Sachin Louw, Sivuyile Sifuba, Blessing Nukeri. This is a very diverse group of individuals with backgrounds in Mechatronics, Electrical and Computer engineering. Not only that this group of individuals have other interests and traits that will be beneficial to the growth of the company.

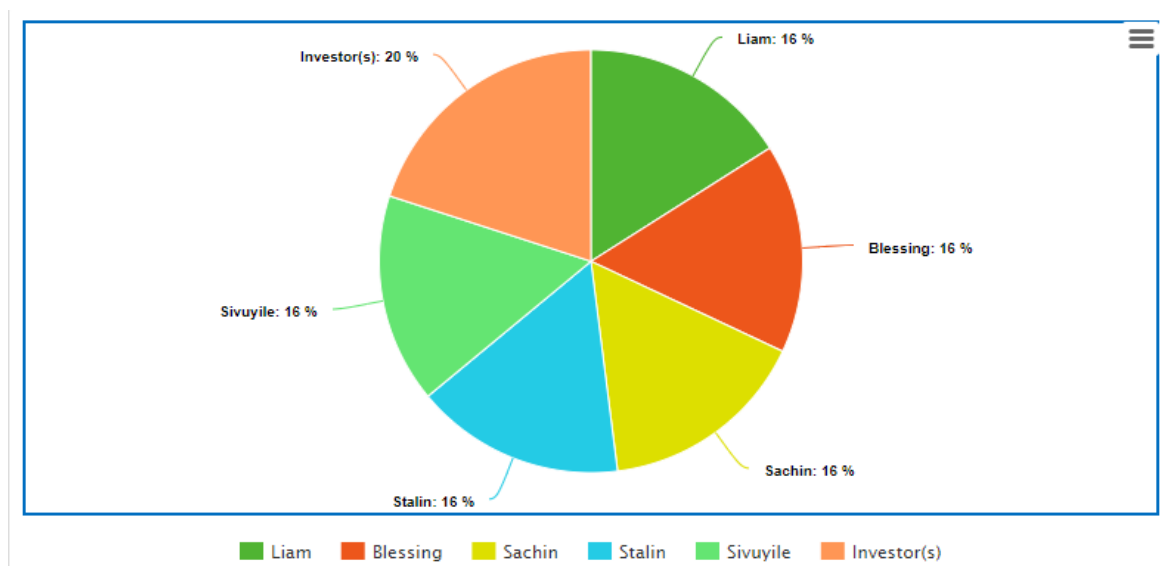
- Sachin Louw (CEO) – Sachin is the appointed CEO of the company. He is an Electrical & Computer engineering student. He will be responsible for making major decisions on behalf of the company, making sure the company is operating and functional. He has good leadership qualities like compassion, reliability, inspirational and commands respect.
- Liam Mcevoy (CTO & Engineering team) – Liam is the appointed Chief Technology Officer in the company. He is an Mechatronics student with a solid foundation in electronics and in writing software. He will be responsible for all the technological needs of the company.
- Blessing Nukeri (CMO & Engineering team) – Blessing is the appointed Chief Marketing Officer. She is an Electrical and Computer engineering student. She will be managing the company's marketing and advertising initiatives.
- Stalin Koster (CFO & Engineering team) – Stalin is the appointed Chief Financial Officer. He is an engineering student with a solid technical knowledge. He will be responsible for handling the company's finances.
- Sivuyile Sifuba (Engineering team) – Sivuyile Sifuba will be part of the engineering team and will hold no executive position. He is a Mechatronics student. He will be working alongside Liam, Blessing and Stalin.

Additional staff members

The company will require additional staff members for the day-to-day operations of the business. We will need a business accountant to put together the company financial records, analyse them to ensure we are efficient in our business practises. The company will also need to hire another engineer who will join the engineering team since some of the founding members of the company hold executive positions within the organization.

Shareholder structure

The figure below shows the shareholder breakdown structure. Each member of the founding team will each own 16% of the company shares with 20% going to the investor(s).



Should the company require more funds, more shares will be issued so that we can raise the necessary capital for our operations to go as planned.

References

- [1]"TechCrunch is now a part of Verizon Media", *Techcrunch.com*, 2021. [Online]. Available: <https://techcrunch.com/2016/09/23/defunct-smart-jewelry-startup-cuff-sued-by-vendors-for-unpaid-work/>. [Accessed: 15- Sep- 2021].
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