Business Plan for FutureSiSens

"Development of a new Home Sleep Test (HST) device for the diagnosis of the Sleep Apnoea-Hypopnoea Syndrome (SAHS)"

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Abstract

The purpose of this thesis is to develop and explore the creation of a business plan for a start-up called FutureSiSens, considering different restrictions as assumptions. A research of the market related to the business will be carried out taking out the best decisions as strategies for the succeed of the business idea that will be developed.

The company, FutureSiSens, was born in June 2016 and has the objective to launch a new home sleep test device for the diagnosis of the sleep apnoea-hypopnoea syndrome. This new device will incorporate their main product, the FutureSiSens gas flow sensor.

The business plan will explain all the information needed to understand what the company is about, description of members, structure and responsibilities. Within the business plan, all the technical characteristics of the particular gas flow sensor as well as the description of the new product will be shown. Moreover, a marketing plan will be carried out pointing out the strategy that the company will need to follow to succeed in the production and distribution of the device as well as an analysis of the competitors in the sector.

Last but not least, a financial analysis will be effected after making projections of sales. The results obtained will show the viability or not of this business idea.

Keywords: Business Plan; GFS; FutureSiSens; SAHS; HST device; marketing plan; financial analysis.

1. Introduction

FutureSiSens is a Technology Based Company (EBT), participated by the Autonomous University of Barcelona and was established in June 2016.

FutureSiSens, S.L. is dedicated to the design, development, manufacture, installation and consultancy, including integrated generation, measurement and sensing solutions including thermoelectric sensors and associated electronics company.

FutureSiSens is a spin-off company from the University of Catalonia, specialized in the development of a gas flow sensor (GFS) with CMOS Si-compatible thermoelectric technology (TE).

The mission is related to the purpose of the company, referring to "the reason why the company exist". FutureSiSens has a clear and straightforward defined mission "We have the mission to be the most innovative company in flow sensing and intelligent monitoring. We strive to grow our business through constant innovation in order to improve safety and energy efficiency."

The vision is related to "where the company wants to be in the future". The vision of FutureSiSens is "Become the most recognized new player in innovative flow sensing and intelligent monitoring through on-going innovation with differentiated products and customer centric development, where the best people prefer to build their careers and develop new, excellent ideas together with highly skilled colleagues."

The mission and vision is in alliance with their slogan: "Measure, Acts and Safe".

FutureSiSens has been developing low cost TE-based Si-CMOS microsystems with minimal power consumption to detect flow variations. The GFS with the integrated low-power electronics for signal management and wireless communication will allow real time monitoring of gas flow variations, useful in various integrated systems, such as gas networks, pipelines, in air-conditioning and building automation with the goal to improve safety and energy efficiency and in health applications.

The differential advantages consist of 8 advantages: FutureSiSens has developed a small and autonomous TE compatible Si-CMOS Gas Flow Sensor with high sensitivity, rapid response, wireless and real-time monitoring within a broad range of operational environmental temperatures and explosive gas measurements.

Due to all that advantages, there are many possible applications that can be used our GFS integrated in different devices.

In the following sections the description of the business idea that FutureSiSens has decided to go into the market will be explained.

2. Gas flow sensor integrated in a health application

The GFS will be integrated inside the home sleep test (HST) device for diagnosis of the sleep apnoea-hypopnoea syndrome (SAHS). This product will be the one analysed during the business plan, with which product FutureSiSens wants to make a business. How FutureSiSens came up with creating this type of device will be also explained in the following sections.

To start with the description of the integration of the GFS inside the HST device, the first thing to do is list all the elements that form the HST device and which will contain the FutureSiSens final product.

- Nasal Prongs
- Slide
- Cannula
- Filter/ Connector
- Main device with electronics
- Battery
- User's Guide / Response Card
- Box

To have a better understanding of all the elements listed, *figure 1* will illustrate them and explain the place where the GFS will be collocated.

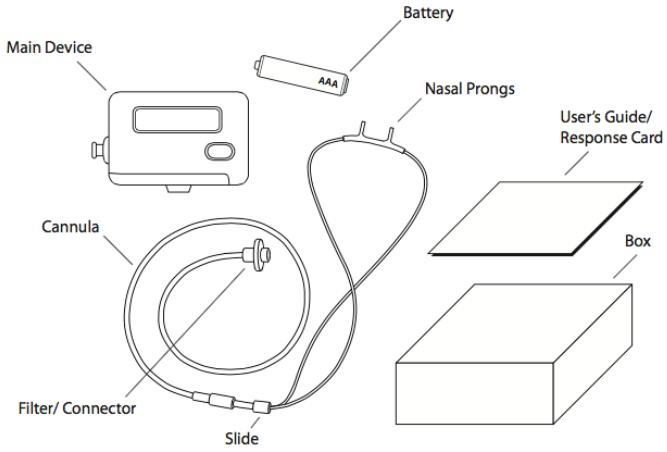

Figure 1 .- Elements that form the FutureSiSens HST device for diagnosis of SAHS.

To have a precise detection and a good use of the GFS inside the device, the nasal prongs has the perfect size for placement of the GFS (2,6x2,6 mm). It is the inlet entrance of the air flow allowing precise detection.

3. Product

Our final product would basically help people to detect if they suffer from SAHS with the use of a **portable, easy, handy, low cost and reliable device**.

Moreover, it will be a device that can detect and quantify the apnoea-hypopnoea index (AHI). This index informs the user, at the end of the sleeping period, about the severity of his or her SAHS.

Based on the AHI, the severity of OSA can be classified as follows:

- **None or minimal:** AHI less than 5 per hour
- **Mild:** AHI between 5 to 15 per hour
- **Moderate:** AHI between 15 to 30 per hour
- **Severe:** AHI more than 30 per hour

This clear and valuable information will be stored in the device so the user can hand in the results of one or more tests to his/her doctor. Of course, with a result with a severity of less than 5 a visit to the doctor could just be ignored, letting other patients go first. By doing that, it would allow the reduction of waiting lists in most countries that have been analysed before.

4. Marketing Plan

For our case study we will focus on the numbers related to the sleep apnoea-hypopnoea syndrome (SAHS) which belongs to the group of breathing disorders. The most common one is the obstructive sleep apnoea (OSA) which is characterized by the frequent starting and stopping of breathing while someone is asleep.

This kind of apnea happens when the muscles in the back of the throat relax and block the airway. These muscles help to bolster oral and pharyngeal structures like the tongue, uvula, soft palate, and tonsils. When the airway is either completely or partially blocked, there is usually 10 to 20 seconds of breathing cessation, which can lower blood oxygen levels. The brain panics when this happens and rouses the body to restart breathing. Generally, this is a very brief awakening that most people do not even notice or remember. It can happen over 30 times an hour all throughout the night, which significantly disrupts restful sleep cycles.

The values seen in *table 1* corresponds to the total market size for the two areas that would be considered for FutureSiSens in Europe and the United States of America (USA).

EUROPEAN + USA MARKET

Sleep Apnoea-Hypopnoea Syndrome	**Nº of people**	**Nº of people affected**
a. Men (30-70 years old) / (>18)	243.419.355	72.663.144 (29,85%)
b. Woman (30-70 years old) / (>18)	252.779.953	34.321.894 (13,57%)
TOTAL	**496.199.308**	**106.985.038 (21,56%)**

Table 1.- European + USA market size of SAHS.

The values obtained shows that approximately, 3 out of 10 men have some type of SAHS while 1 out of 10 women has some type of SAHS. For both calculations a population between 30 and 70 years has been considered for Europe and a population older than 18 years for USA. The average value obtained for this range of market tell us that approximately 2 out of 10 people could have SAHS.

After examining these results, it is also important to predict what share of the total market size FutureSiSens will achieve during its expansion and how many people will use the final product. For that reason, Spain has been established as the first year target for testing the market and extraction of the potential of our device. This will provide an ideal strategy for the other areas analysed.

Nowadays, professionals form the SAHS medical sector have a long waiting lists for the traditional tests. People need to stay during at least one night in hospital for the polysomnography (PSG) test, the most used and complete one. As shown in the following table, there are important problems related to availability of a PSG test. Waiting list times are growing. The waiting list can be up to 60 months in some regions of the United Kingdom.

	Centers with PSG / 100.000 hab.	Beds for PSG / 100.000 hab.	Annual studies of PSG / 100.000 hab.	Waiting time for PSG (months)
United Kingdom	0,14	0,3	42	7-60
Belgium	0,5	1,5	177	2
Australia	0,34	1,3	288	3-16
USA	0,46		427	2-10
Canada	0,32	1,4	370	4-36
Spain	0,24	0,5	64	1-18

Table 2.- Comparison of Spain with other countries of values related to SAHS tests.

As can be seen, there is an enormous opportunity in the market to create an alternative solution, with home testing so eliminating the need to spend a night in the hospital with the use of a FutureSiSens product. Of course, our device will not give the doctor as much information as a PSG but will still offer reliable information by showing the possibility of SAHS.

To succeed in our niche market, a clear strategy is really important. Learning from the mistakes that can occur during the strategy pathway can also help FutureSiSens to change the focus of the product and dealing with end consumers with the passage of time.

The possible business customers that FutureSiSens could have are:

- Pharmacies
- Private health system (private hospitals / doctors)
- Public health system (public hospitals / doctors)
- Online

As can be seen, there will be a clear need of partnering with a well known pharmaceutical laboratory company that will put its name on our product and offer us their distribution channels for accessing the whole market. That will allow us to reduce cost of marketing and grow faster, however, some shares of the revenues will be given to the pharmaceutical laboratory.

Regarding the unit cost of the device the following table will be used which lists all the different related costs that exist:

PRODUCT	COST (€)
1. Components of product	€/unit
Gas Flow Sensor	€5,00
Nasal Cannula	€0,52
Electronics	€40,00
Software	€1,50
Assembly + Packaging	€12,00
Warranty + Transport	€4,13
TOTAL	€63,15

Table 3.- Product costs.

As can be seen, the total cost per unit is not that expensive. This achieves one of the objectives (be a cheap and competitive price inside the existing market). However, the selling price will not correspond to the 63,15€ listed. That cost per unit does not take into consideration any type of fixed costs of the company. Therefore, to cover those and make some profit, FutureSiSens decision will be to **sell for a price of 150 € per unit to the pharmaceutical company**.

Even with this price, and comparing it to the rest of the competitors that have an average market price of 650€, it can be said that it is still very cheap compared to other similar products. For that reason, the pharmaceutical company will have some margin to increase the price as they think necessary to sell the product inside the market and also make a profit to cover their fixed costs in the distribution and marketing channels.

5. Sales Forecast

First of all, the assumptions for the calculations will be taken into consideration:

- The product will be launched into the market in January 2019.
- The devices will be distributed and commercialized by the chosen pharmaceutical company.
- Sales values will come from a share of the total market size.
- In 2019 the market will be Spain.
- In 2020 the market will expand to all Europe.
- In 2021 the market will cover Europe and USA.
- In 2022 and subsequent years, the market will finally expand worldwide. An increase of 20% over the European and USA market will be considered for the world market size.
- In 2022 the market will be constant for the next years.

The system that has been selected to achieve the final values consists basically on **getting a share of the total market analysed** in the *Marketing Plan* section. By doing that, even knowing that it is only a projection, the numbers obtained will be more real. Moreover, on the following table, it will be seen that three different scenarios or projections have been considered. The average of the worst and best projections will be the one that has been used for the financial analysis calculations.

SALES FORECAST (units sold)

YEARS	**2019**	**2020**	**2021**	**2022**	**2023**
Worst Guess Projection	333	3.651	5.349	6.419	6.419
Average Guess Projection	**666**	**7.301**	**10.699**	**12.838**	**12.838**
Best Guess Projection	999	10.952	16.048	19.257	19.257
Selling Locations	**Spain**	**Europe**	**EU + USA**	**World**	**World**

Table 4.- Sales Forecast & Selling Locations.

As can be seen, the second year of sales compared to the first has a big increase in the products sold. The main reason for that corresponds to the strategy adopted in the first year to sell the product only in Spain, for analysis of the market and to see which drawbacks can be found with the product. This was done so during the second year some modifications could be effected to achieve the wider market in Europe by better reviews of the end users. Furthermore, another thing that has to be mentioned is that from the year 2022 to the 2023 the market has started to be saturated, with steady growth of sales.

6. Operational Plan

Having calculated the projections of sales for the first year, the way that FutureSiSens wants to proceed will depend on orders to the production company: Centro Superior de Investigaciones Científicas (CSIC), which will supply the units needed for every month. In other words, the production orders will be done monthly and in advance.

CSIC will be the manufacturer of the device. This company corresponds to the Institute of Microelectronics of Barcelona. It is the largest public research and development center of microelectronics in Spain. The

facilities of the IMB-CNM-CSIC include a series of laboratories for Micro-Nano-electro-mechanical systems (MEMS & NEMS), biochemical processes, electronic instrumentation, physical characterization and nanotechnology. In Spain, IMB-CNM-CSIC houses a research facility classified as Infraestructuras Científicas y Técnicas Singulares (ICTS): a clean room of micro and nanofabrication (1500m^2), which makes this institute a reference for micro and nanotechnologies in the south of Europe.

FutureSiSens is already collaborating with the CSIC as first prototypes of the GFS are done in those installations. A good access and easy location of the facilities are important. Barcelona is well communicated by road, sea or air which will assist transportation of the elements needed for manufacture as with the delivery of the final product to the pharmaceutical laboratory company for its distribution.

The management and organization of FutureSiSens consists of CEO **Sebastián Moreno**, holding a Physic Degree at UAB. He is the Managing Director of Pfisterer, also founder of Upresa S.A.U., CEO of Infisat, and finally founder and shareholder of Sema Cables, S.L.

The Vice-CEO and team coordinator role is dedicated to **Javier Rodríguez**, UAB full professor for 25 years.

Aitor Lopeandía takes the role of Chief Technology Officer (CTO), he is also an UAB associate professor for more than 12 years.

The research team consists of engineer **Ivan Álvarez**, who has been responsible for UAB technical support for the past year. **Llibertat Abad**, who is responsible for microfabrication part of the team and is a CNM-CSIC, RyC researcher with more than 12 years of experience in his sector. Moreover, we find **Javier Gallardo**, responsible of the electronics and software department that has **Antonio Miguel López,** an UPC associate professor with more than 20 years of experience, with him working in the electronics part.

The intention of FutureSiSens regarding the HST device management will consist of a different team that they have nowadays. The following positions must be occupied for the success of the business idea:

- Managing Director
- Commercial Agent
- Software development expert
- Electronics expert for the main device
- Administration Agent

All the positions mentioned will be filled either by new personnel or someone already working inside the company.

For the HST device, the main credit policy that FutureSiSens has decided to give to the pharmaceutical laboratory consists of entire payment of the total devices delivered at the beginning of that month at 30 days. There will be no possibility to pay in fractionated periods from an initial strategy point of view. Due to that strategy, income from the device will be considered to be obtained at the end of the selling month.

7. Financial Plan

The following table illustrated all the expenses that FutureSiSens has:

EXPENSES	
1. Product	**€/year**
App Licenses	114,15 €
Software	10.000,00 €
Patents	10.000,00 €
TOTAL	**20.114,15** €
2. Salaries	**€/year**
Managing Director	100.000,00 €
Commercial	80.000,00 €
Technical 1 Software	60.000,00 €
Technical 2 Electronics	60.000,00 €
Administration	40.000,00 €
TOTAL	**340.000,00** €
3. Facilities	**€/year**
Rent	6.000,00 €
Travel & Accommodation	12.000,00 €
Office supplies & Computers	2.125,00 €
Administrative Agency	3.000,00 €
Others	1.200,00 €
TOTAL	**24.325,00** €
4. Marketing	**€/year**
Partnership with well-known company	10.000,00 €
Website	6,95 €
Distribution of product	0,00 €
Events	2.000,00 €
TOTAL	**12.006,95** €
OVERALL TOTAL	**396.446,10** €

Table 5.- FutureSiSens expenses.

As seen, the overall expenses during first year, 2018, will achieve a value around the 400.000 € for the fix costs. Some of the expenses of the company will increase during the future years as respectively the company will have more sales and importance inside the market.

The way that FutureSiSens will achieve all the cash needed during the next years will be based on different sources:

- Founders Capital
- Subsidies
    - Fundació Repsol
    - EIT Health
    - SME Instrument – H2020 European Union
    - NeoTec
- Technology License
- Design of microchips for other clients
- New Clients Projects

As it can be seen in the above list, the intention is to use **non debt capitalization methods**. To understand it better, FutureSiSens doesn't want to go for any capitalization method as bank credits, external investors (private equity, crowdfunding or business angles) between others that at the end you are sharing your business with others and you will need to payback some money to them with interest's rates in some of the cases. The reason for going to this type of capitalization strategy its because there will be a big share of the revenues with the well known pharmaceutical laboratory company and at the same time if the company can survive with this type of capitalization it is safer and efficient.

In the following figure it will be illustrated in a visual way the projections of variation in financing from the first year 2017 to the year 2021:

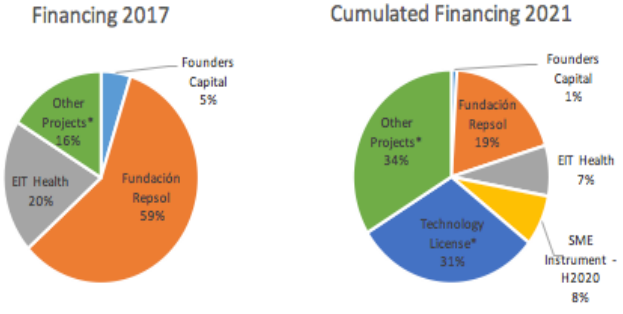

Figure 2.- Cumulated financing shares 2017 and 2021 of FutureSiSens projections.

For the calculation of the break-even point (BEP), the profit and loss projections as the projected cash flow the following assumptions are taken into consideration:

- The product has been successfully validated and it is ready to be commercialized at the beginning of 2019.
- It has been agreed with a well known pharmaceutical laboratory to do a partnership and use their distribution channel as marketing resources.
- Sales will start on January 2019.
- First year will be focused in the Spanish market only. Second year will grow to all Europe. Third year will get also USA market. The following years will be considered the whole world market.
- All financing required will come from the list explained in the capitalization section. No bank credits or external investors have been considered.
- Taxes will be subjected to the current legislation.
- Sales values after year 2020 will remain constant.
- Production costs of the products will be paid by FutureSiSens.
- Production cost will be reduced 10% after the first year of sales. The following year will be reduced 2%. From that point, the last two years considered, will be reduced 1% each year.
- Marketing, stock and distribution costs will be responsibility of the pharmaceutical laboratory. Therefore, these costs wont be considered in the financial analysis.
- Salaries will increase 2% every year from 2019.
- Office supplies and computers have been quantified for a same price every year considering its lifetime.
- Travel and accommodation expenses will increase a 10% every year from 2019.
- Administrative agency will also increase 2% every year from 2019 and will be paid on January.
- The term of "others" is considered for any office materials, food or drinks bought during that year.
- Product related prices such as software and patent have been considered 10.000€ each as a real value FutureSiSens has paid or asked for.

After looking at all these assumptions it will be proceed with the calculation of the break-even point:

$$BEP = \frac{Fixed\ Costs}{(Unit\ Sale\ Price - Varaiable\ Costs)} \quad (1)$$

Having all the required values from last sections we obtain that the BEP is:

$$\boldsymbol{BEP} = \frac{396.446{,}10\ €}{(150\ € - 63{,}15\ €)} = \boldsymbol{4.565\ units}$$

Obtaining a values of 4.565 units means that FutureSiSens would need to sale that amount of devices every year in order to make revenues equal to expenses.

Regarding the P&L projections as the cash flow some graphs will be shown to have a better representation of the values obtained:

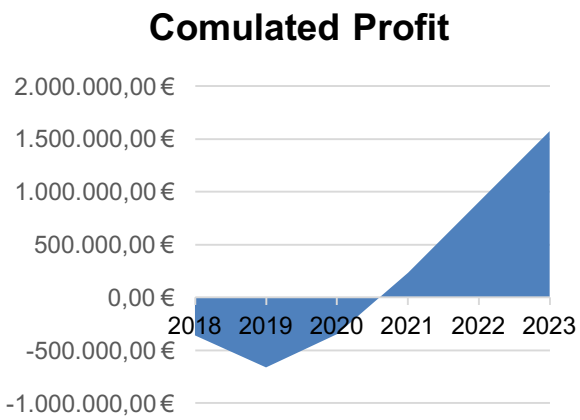

Figure 3.- Cumulated Profit.

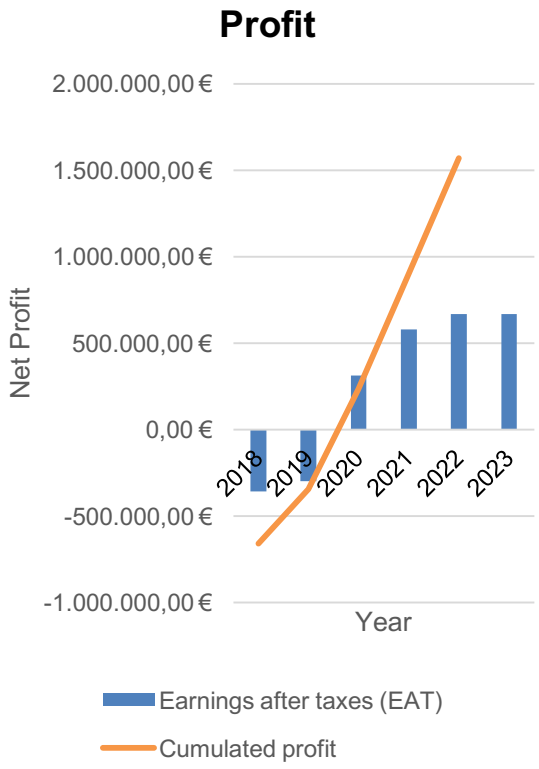

Figure 4.- Profit.

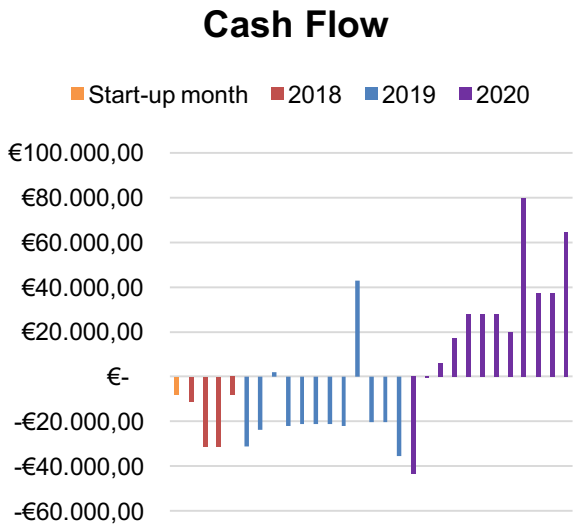

Figure 5.- Cash Flow.

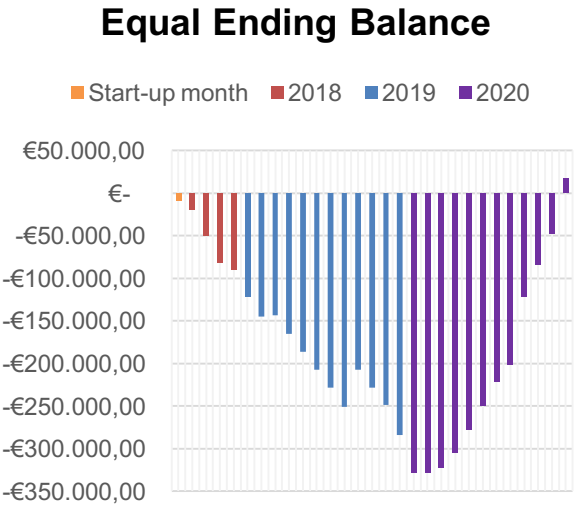

Figure 6.- Equal Ending Balance.

5. Conclusions

A project with reasonable profitability has been defined, not only economical but also social, as it gives the opportunity to a sector of the population to have a first diagnosis of SAHS at home for a reasonable price, easily accessible by renting it from the pharmacy which will allow adequate treatment.

The development of all the sections of the business plan has been carried out successfully in general terms. For a brief conclusion, and to make sure all sections have been successfully described, a summary of all the important points considered throughout the business plan will be listed in a Business Model Canvas format:

1. **Customer Segments:** as can be extracted form the niche of our business, our main customer segment corresponds to the people that think they suffer from SAHS and may want to test themselves by using a HST device for a first exploration. Moreover, doctors and pharmacies will also play an important role for our customer segment.

2. **Value Proposition:** the value proposition that our device will give to our customer segments will consist of the easy way of using it, its cheap price, its comfort, its more than one usage and its high reliability.

3. **Channels:** regarding the channels they will be those of the pharmaceutical laboratory that will take care of making the product reach all the customer segments.

4. **Customer Relationship:** the relationship with the end users will be practically null. FutureSiSens will sell the product to the pharmaceutical laboratory company and it will be them who have the relationship with customers. However, regarding the product and any damage or problem that may occur to it, we will have some warranty and technical service to help customers to solve their problems.

5. **Revenue Streams:** the incomes of FutureSiSens will come mainly from the sales of the HST device, however, other revenues from the technology licenses, design of microchips and other external projects related to the use of the main product that is the GFS will also be considered.

6. **Key resources:** the key resource that FutureSiSens has is the gas flow sensor (GFS) which is the main product of the company.

7. **Key Activities:** for FutureSiSens, the key activity is innovation and R&D which is clearly its mission. Furthermore, for the success of the business idea described in this business plan, we find other key activities also important such as: validation of the HST device and agreement with the pharmaceutical laboratory for use of their distribution channel and image.

8. **Key Partnership:** as mentioned before in the key activities, the key partnership will be with the pharmaceutical laboratory.

9. **Cost Structure:** as listed in the expenses section, all the costs related to the production of the HST device will be taken into consideration (variable costs). Moreover, other expenses of the company such as the lists of fixed costs described in the financial analysis will also have to be considered.

As a consequence of all the above mentioned, a great business opportunity emerges as shown in the financial analysis. However, even with the viability of the project, there are also some weaknesses that can be found in the business idea. To see a SWOT analysis will be used:

Strengths	Weaknesses
• High skilled technology based team. • Good microchip design skills. • Patent for the FutureSiSens GFS.	• Low knowledge of the health sector. • Low experience with business.
Opportunities	**Threats**
• Partnership with a pharmaceutical laboratory that has good knowledge of the health market and a good distribution channel. • High number of people with SAHS that have not yet been diagnosed due to long waiting lists or high price of existing tests.	• Validation of the product. • Failure of agreement with the pharmaceutical laboratory company. • Unwillingness of customers to buy the product. • Doctors not convinced of our device results.

All in all, as the author of this business plan and the knowledge I have acquired during my university studies related to the creation and development of a start-up, I consider that this business idea is viable and its development with the parameters explained above would make it successful with very controlled risks.

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