UNIVERSIDAD DE EXTREMADURA

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Máster en Dirección TIC

Trabajo de Fin de Máster

Can the Internet of Things Make People's Lives Easier? A Business Approach Based on an ICT Solution

Daniel Flores Martín

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Resumen

El crecimiento del sector tecnológico dedicado a Internet de las Cosas es cada vez mayor. A día de hoy existen numerosas empresas dedicadas a la mejora e innovación de dispositivos inteligentes. Gracias a estos dispositivos se pueden automatizar tareas o realizarlas de manera más sencilla, lo que facilita la vida de las personas en gran medida al beneficiarse de sus funcionalidades. Este beneficio se vuelve aún mayor si tenemos en cuenta que los dispositivos inteligentes pueden conectarse entre sí. Sin embargo, la gran variedad de fabricantes y protocolos que existen dificultan en muchos casos esta interoperabilidad. Es por ello que se ha desarrollado una solución que sirva para mejorar esta interoperabilidad entre dispositivos, denominada EPSIoT. Este trabajo muestra un plan de negocio que, a través de la creación de una startup, comercialice la solución desarrollada de manera que se logre un mayor nivel de interoperabilidad entre dispositivos de Internet de las Cosas y facilitando así la vida de las personas. Además, se realiza un análisis de la situación actual del mercado en la Internet de las Cosas para después, a partir de la información recopilada, realizar el plan de negocio que permita poder sentar las bases de una nueva startp dedicada al sector tecnológico.

Palabras clave— Internet de las Cosas, Interoperabilidad, Necesidades de las personas, Plan de Negocio, Oportunidades de negocio

Abstract

The growth of the technological sector dedicated to the Internet of Things is continuously increasing. Nowadays, there are many companies dedicated to the improvement and innovation of smart devices. Thanks to these devices, people tasks can be automated or performed more easily, which greatly facilitates people's lives by taking advance from devices' features. This benefit becomes even greater if we consider that smart devices can connect to each other to perform complex tasks and increase their possibilities. However, the great variety of manufacturers and protocols that exist make this interoperability difficult. That is why a solution has been developed to improve this interoperability between devices, called EPSIoT. This master thesis aims to develop a business plan that, through the creation of a startup, markets the solution developed so as to achieve a higher level of interoperability between Internet of Things devices and thus facilitating people's lives. Therefore, an analysis of the current market situation in the Internet of Things is conducted and then, from the information gathered, the business plan that can lay the foundations for a new startup dedicated to the technology sector is developed.

Keywords— Internet of Things, Interoperability, People Needs, Business Plan, Business Opportunities

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Chapter 1

Introduction

Contents

The Internet of Things (IoT) is changing consumer expectations and the way that companies work. The initial adoption of interconnected smart devices was slower than expected, but nowadays, the demand for technology is now developing at a quicker pace. That demand will put new pressures on companies and also provide them with new opportunities.

A simple Internet of Things definition is: "the interconnection of smart devices over the Internet [4]". IoT allows devices to communicate with us, with applications and with other devices. This technology has been demonstrated with the advent of smart home appliances. It is the Internet of Things that now allows us to control the heating, lighting, sprinklers and other appliances from our smartphones.

The IoT application goes far beyond smart refrigerators and toasters, and is becoming more and more important. IoT offers companies unprecedented opportunities to collect data and automate processes. It also offers companies the opportunity to develop new products or services. Recent studies estimate that by 2020 there will be 20-30 billion devices connected to the Internet [5, 6]. The purpose of these devices is to make people's lives easier by automating tasks or helping users to perform them. IoT devices are used in many different domains as smart home, automotive, smart cities, healthcare, agriculture, wearable, etc. [7]. The great evolution of this technology

allows us to develop increasingly smart devices and truly useful services that a few years ago were unthinkable. But the real potential of IoT comes from the collaboration among smart devices to perform complex tasks. For this to be possible, the next evolution of IoT is to ensure that smart devices can proactively collaborate among themselves [8, 9].

Unfortunately, the possibility of collaboration among smart devices is still far from being realized. Indeed, manufacturers develop their own protocols so that their devices can be seamlessly integrated with each other but not with other brands' devices. This allows manufacturers to save their market share. This also inevitably leads to the well-known *vendor lock-in* problem [10]. This phenomenon implies that if one wants to obtain the maximum benefit from the IoT, (s)he must purchase devices from the same manufacturer to ensure maximum compatibility. Consequently, the interaction between devices from different manufacturers is made more difficult, or they will have to give up certain activities to be assisted by these devices. For this reason, a IoT solution has been developed that is capable of interconnecting different devices by making people's lives simpler and reducing the manufacturer dependency.

In this master thesis, a business plan is conducted in which a company is created with the aim of offering the IoT solution developed to the final consumer. This business plan includes the objectives of the company, the necessary strategies to achieve them, the organizational structure and the required investment. In order to do so, the most important aspects of the subjects studied on the Master Degree in Information and Communication Technology (ICT) are those corresponding to the second semester and more specific to business management. This knowledge will be taken as a reference and will be applied to the solution developed in the master's degree in Computer Engineering previously studied, called *EPSIoT*. In this way, the two Master's Degrees are unified and complemented.

1.1 Motivations

The Internet of Things connects machines and systems to each other through sensors and actuators, so that meaningful information can be gathered from these systems and measures can be taken to improve productivity and human efficiency [11]. We are talking about IoT driving the proliferation of connected devices from about one billion more today to more than 20-30 billion in the next years. In doing so, IoT takes the meaning of interconnectivity to a whole

new level.

While IoT promises a way to reduce waste, costs and inconvenience while increasing efficiency, the greatest attraction of this technological trend is that we have a cleaner, more productive, and greener life. Some examples of such benefits are:

- Smart homes and offices can save energy costs, or modify the indoor environment of a building to suit the tastes and needs of the inhabitant.
- Security through constant surveillance and proactive measures (such as alerting local police) in the event of a security breach.
- Better medical care through remote monitoring of patients and even remote administration of medications.
- Reminders of tasks such as paying utility bills, parking meters, etc.
- Smart street lighting or automatic detection and control of traffic signs.
- Remote monitoring of the assembly line and production system to maximize operational efficiency, reliability and safety in a manufacturing facility.
- Smart cars that can call for assistance if needed help control vehicle speed based on traffic and environmental conditions.

The possibilities and benefits for today and the future are limitless and that is what everyone is excited about (Fig. 1.1). In terms of impact on business, economy, jobs skills and society, the proliferation of devices connected from 1 per person today to say 10 devices per person in the future will open many new opportunities for new businesses and can create an ecosystem around the IoT area. Once the commercial value of the IoT domain is understood, new products, services and revenue models will emerge that will attract investment and thus create jobs in the IoT area. This also has the potential to increase imports or exports of such products and solutions, which in turn could boost economies. It could also lead to the emergence of ancillary or supporting industries, such as the manufacture of smart and connected devices, monitoring and measurement systems.

Due to the many business opportunities offered by IoT in the market, the decision to commercialize an IoT-focused product that facilitates people's

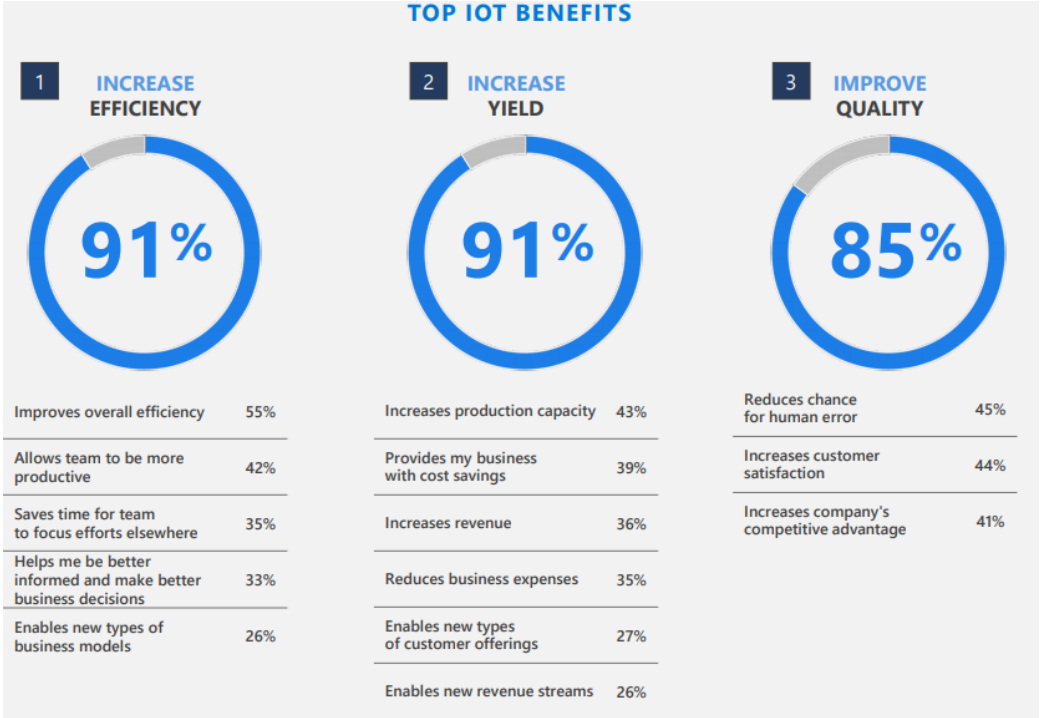

Figure 1.1: IoT Benefits [1]

lives at home, in the office or in any environment, is a clear enough opportunity that can lead to success in this market. IoT devices are created to meet people's needs. In addition, in many cases these devices must collaborate to achieve certain behaviors or adapt to a certain need. However, this collaboration is not always possible due to interoperability problems. These problems stem from the lack of communication standards in the IoT, making it difficult to communicate between devices using different protocols or belonging to different manufacturers, and that is why solutions are needed to solve these problems. That is why the main motivation of this work lies in the extensive business opportunities related to the technology sector of the IoT and the lack of interoperability that currently exists among smart devices. Therefore, this work consists, first, in understanding the current market situation around Io (current state of the art) and, second, in creating our own company by developing a comprehensive business plan.

This document is structured as follows: Section 2 details the different objectives that this work covers; in Section 3 we review some of the most relevant literature. The business plan performed is detailed in Section 4. Finally, Section 5 describes some conclusions and future work.

Chapter 2

Objectives

This work aims to define a viable business plan for the creation of a startup dedicated to market an IoT solution to improve the interconnection of smart devices. In this way, these devices work more automatically and collaboratively, thus facilitating people's lives. Thanks to this collaboration, more complex tasks can be developed or performed in a more optimal way, so that people's lives can be made easier. In addition, the increased interoperability between devices makes it easier for users to acquire new intelligent devices no longer have to worry about different manufacturers or communication protocols so that it can communicate with their current devices. Related to this, the objectives pursued in this master thesis are:

1. **To locate the market niche**: To identify what needs are present and how they can be met by IoT.
2. **To analyze the current situation in the IoT market**. To study the current companies dedicated to similar activities.
3. **To serve as a guide to start a project or create a company**: To achieve greater efficiency in business management.
4. **To know the viability and profitability of the project**: To identify if our business project is viable and what its profitability is going to be.

In view of the proposed objectives, the following section shows the development of the business plan dedicated to the development of a startup within the field of the Internet of Things.

Chapter 3

State of the Art

There are several reports that collect information on the current state of the Internet of Things as far as the ICT sector is concerned, such as those conducted by Business Insider Website [12], Deloitte Company [13], the Forbes Journal [14] or IoT Analytics [15]. One of the latest reports is the one performed by Microsoft (2019 July): Microsoft's new IoT Signals Report [1]. According to this report, the Internet of Things is seen like profitable and critical to business success and is creating opportunities to force more advanced network and cloud technologies.

The IoT Signal Report shows the trends and statistics surrounding the Internet of Things. The report says that IoT is extremely common in the major industries of retail/wholesale manufacturing, transportation, government and healthcare. In this way, the 94% of companies will use IoT by the end of 2020. It also presents the adoption of the IoT in major industries (Fig. 3.1), with retail/wholesale (90%) and manufacturing (87%) leading. It also states that growth shows no signs of slowing and that by the end of 2021, 94% of companies will use IoT.

Almost every company is concerned about the safety of IoT. 97% of companies surveyed are "concerned about safety when implementing IoT". It is noteworthy that despite this concern, the report indicates that security concerns do not hinder adoption. Despite high adoption rates, the report indicates that 47% of companies that have adopted IoT believe that there are not enough skilled workers available at IoT.

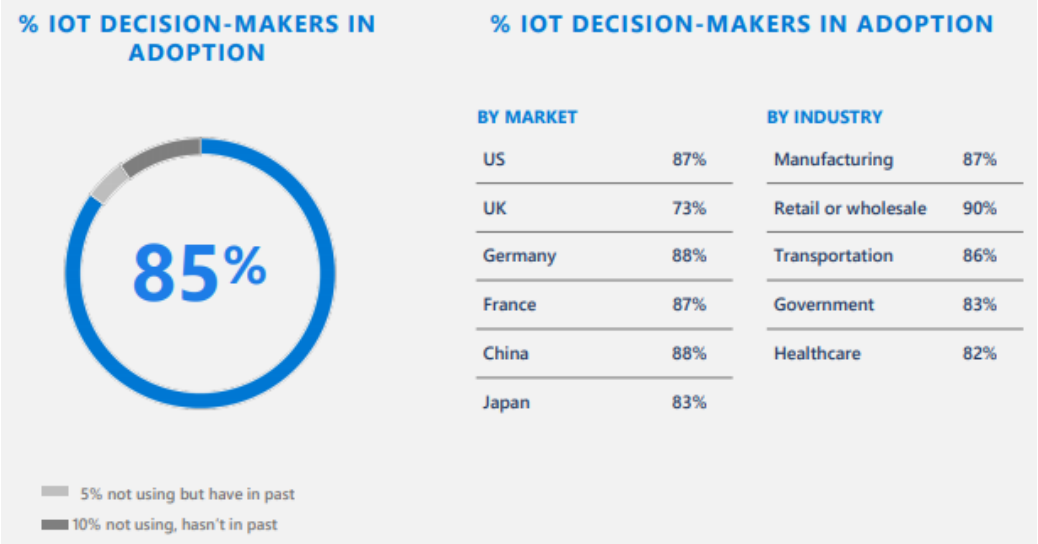

Figure 3.1: IoT Adoption [1]

The full report sheds quite a bit of light on the Internet of things, including the challenges it faces and the main areas in which it succeeds. IoT points to the key findings:

- 85% of those surveyed are in the process of adopting IoT, and three-quarters of them have IoT projects in the planning stage.
- Among IoT users, 88% believe IoT is critical to business success.
- IoT adopters believe they will see a 30% ROI (Return On Investment), including cost savings and efficiency, within two years.
- 38% of IoT users cite the complexity and technical challenges of using IoT as a barrier to promoting their adoption of IoT.
- Lack of talent and training presents challenges for half of IoT users, and 47% say there are not enough skilled workers available.
- Respondents believe that the critical technology drivers for IoT's success in the next two years are artificial intelligence, cutting-edge computing and 5G.
- Nearly one-third of projects (30%) fail at the proof-of-concept stage, often because implementation is costly or the final benefits are unclear.

Now that we have seen the success that the Internet of Things has in the market, we are going to analyze some of the most important startups of 2019. In order to do this, we base ourselves on the report made by [2] which analyzes the 10 most important startups of the year 2019 that work in the field of Internet of Things (Fig. 3.2).

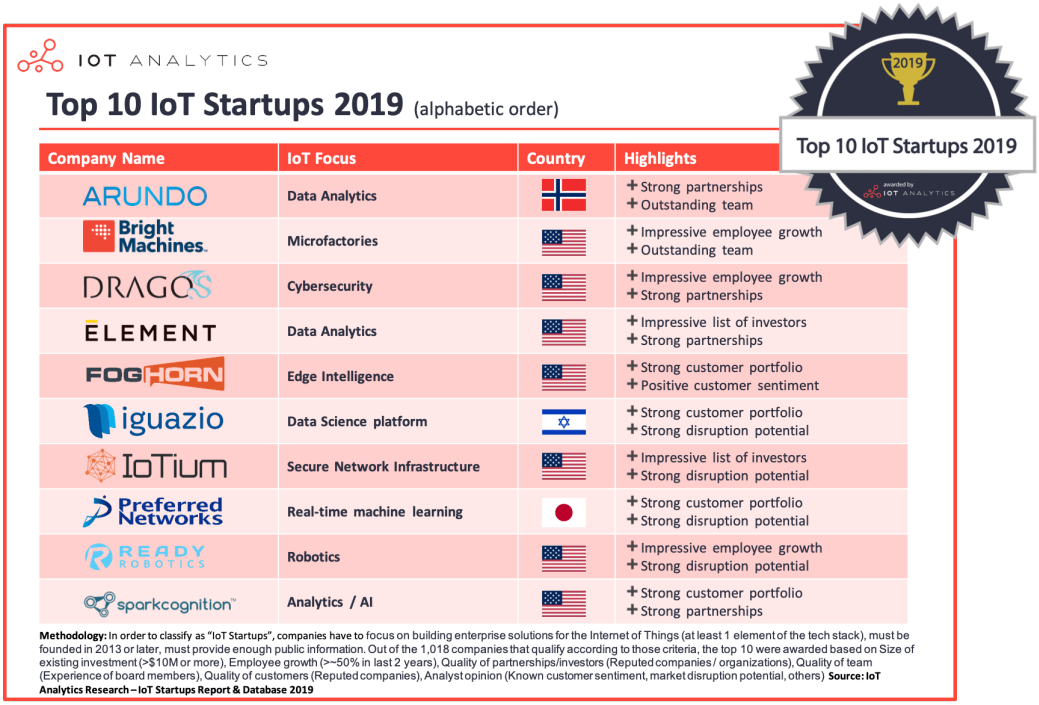

Figure 3.2: The Top 10 IoT Startups 2019 [2]

This report contains companies dedicated to software engineering, middlewares development to improve interoperability, infrastructure performance, cibersecurity and even hardware development. These startups are:

1. **Arundo Analytics (IoT Middleware & Software Infrastructure)**. Arundo Analytics is a hot IoT Startup that provides analytics software for industrial and energy companies. The company has formed several strategic alliances e.g., with Dell Technologies and WorleyParsons. Arundo has also formed a joint venture with DNV GL to provide stream data analytics for maritime companies. The board of directors includes Tore Myrholt, Senior Partner at McKinsey and Thomas Malone, the founding director of the MIT Center for Collective Intelligence. Recently, Arundo launched several applications incl. machine monitoring and fuel efficiency.

2. **Bright Machines (IoT Middleware & Software Infrastructure)**. Bright Machines is currently the fastest growing IoT Startup, having grown from virtually zero at the beginning of 2018 to more than 400 employees a year later (April 2019). The firm focuses on "micro-factories" made up of its software and robot cells as well as new software tools that make manufacturing more efficient. The leadership team is filled with former executives from Autodesk, Flextronics, and Amazon including Amar Hanspal (CEO), Brian Mathews (CTO), Tzahi Rodrig (COO) and Nick Ciubotariu (SVP, Software Engineering). The company recently entered into a strategic partnership with BMW i Ventures.

3. **Dragos (IoT Middleware & Software Infrastructure)**. Dragos is a cybersecurity startup that offers a software-defined security platform for manufacturers. The company has seen a 300%+ growth in headcount the last 2 years, and collaborates with GE, Deloitte, OSIsoft, ThreatConnect, Crowdstrike, and several other companies. The company recently acquired Atlanta-based NexDefense and collaborates with Waterfall Solution for a joint solution.

4. **Element (IoT Middleware & Software Infrastructure)**. Element (also known as Element Analytics) is a fascinating IoT Startup that focuses on industrial analytics software such as Digital Twins, particularly in heavy industries. The company counts an impressive list of investors, including Kleiner Perkins, GE, Honeywell, and ABB. Element partners with Microsoft, Uptake, OSIsoft, and Radix (consulting).

5. **FogHorn (IoT Middleware & Software Infrastructure)**. In recent years, US-based startup FogHorn has gained an excellent reputation with leading manufacturers and oil and gas organizations around the world for its real-time edge computing and analytics software. The company has seen an 89% employee growth in the past 2 years and has secured partnerships with 50+ industrial solution providers, OEMs, gateway providers, and consultants/SIs, including AWS, Google Cloud, Microsoft, Cisco, HP, NTT Data, and more. FogHorn is also a member of LF Edge, an umbrella organization to drive an open, interoperable framework for edge computing to accelerate deployment among the growing number of edge devices. Investors in FogHorn include The Hive, Bosch, Dell, GE, Honeywell, Intel, Saudi Aramco, and Yokogawa.

6. **Iguazio (IoT Middleware & Software Infrastructure)**. Iguazio is a hot startup that provides a state-of-the-art data science platform for various verticals, including Industrial IoT, Smart Mobility, and Telecommunications. The company recently entered into collaborations with NVIDIA, Microsoft and Google. Iguazio markets its Nuclio platform

product as a "serverless" framework for multi-cloud environments and is thus well-positioned for the next wave of cloud computing.

7. **IoTium (IoT Connectivity)**. IoTium is a quickly upcoming IoT startup from the Silicon Valley area that focuses on software-defined network infrastructure in manufacturing and related verticals. The company has seen a 100%+ growth in headcount over the last 2 years and now counts John Chambers, former Cisco CEO, as an investor along with other well-known corporate investors incl. Juniper, Qualcomm, SafeNet and Wind River. The company is also very active in the EdgeX Foundry and recently joined the Siemens' MindSphere partner program as a gold member.

8. **Preferred Networks (IoT Middleware & Software Infrastructure)**. Preferred Networks is one of Japan's IoT hot shots, focused on applying real time machine-learning technologies to new Internet of Things applications. The company has seen a 100%+ employee growth in the last 2 years and now collaborates with world leading organizations incl. Toyota Motor Corporation, Fanuc, and the National Cancer Center. The company is also very active in developing the deep-learning framework Chainer™ together with IBM, Intel, Microsoft, Nvidia.

9. **READY Robotics (IoT Hardware)**. READY Robotics is a rare robotics startup that is looking to benefit from the increasing automation and flexibilization of manufacturing processes around the world. The company emerged from the cutting-edge robotics research at Johns Hopkins University to develop their industrial robotic software called Forge. The company has seen a 150%+ growth in headcount in the last 2 years and is now producing roughly 15 robot systems per month.

10. **SparkCognition (IoT Middleware & Software Infrastructure)**. SparkCognition excels in AI-powered analytics, particularly in manufacturing and related verticals. SparkCognition has seen a 100%+ growth in headcount over the last 2 years. The company has launched Skygrid, a joint venture with Boeing and it has partnered with Siemens as part of its Mindsphere program. The company is also a Google Cloud Technology Partner and works with IBM as a trusted partner.

The boom that the Internet of Things has in the market is undeniable and we have been able to check through the different reports that experts in the field develop periodically. In addition, these data are contrasted with the creation of new startups entirely dedicated to the sector and whose success is becoming more and more a reality. These data are an indicator of the boom

that the Internet of Things is having in people daily lives. If we also bear in mind that one of the main aspects where most work is currently being done is to solve the problems of interoperability between intelligent devices, it follows that the proposed solution, *EPSIoT*, fits perfectly in this market niche. That is why the creation of the startup is motivated, in addition to the business opportunities that the technology sector offers, in addition by the need to increase the interoperability of devices and offer the customer a product that allows him to get the maximum benefit from the IoT.

The following section will show the business plan that will allow us to create our startup and offer the developed product to customers.

Chapter 4

Business Plan

Contents

4.1 Product definition

The previous sections have shown the need to develop solutions that increase the level of interoperability between IoT devices. So thath, the product to be offered to the customer is a solution that allows to improve these interoperability problems. This product is called **Environment Processing System in IoT - EPSIoT**. The product consists of a Raspberry Pi (Fig. 4.1) that is responsible for monitoring the environment where IoT devices are. The cost of this device is between €40 - €60 depending on the version and the selected components. In addition, the Raspberry Pi has an environment that allows you to add and remove devices IoT (Home Assistant (Fig. 4.2)), so that the user has control over the devices that are present in the environment. Once the devices are recognized by the Raspberry Pi, the algorithms developed by us are able to enable communication between them. We have seen at the beginning of this work that traditionally communication between IoT devices is not always easy. This is why, thanks to these algorithms, the interoperability between these devices is improved. With this solution, IoT devices are able to interact with each other, which makes people's lives even easier by being able to perform tasks autonomously and in a more complex way. Because technical details are outside the scope of this master thesis, the logic of the algorithms used is not specified.

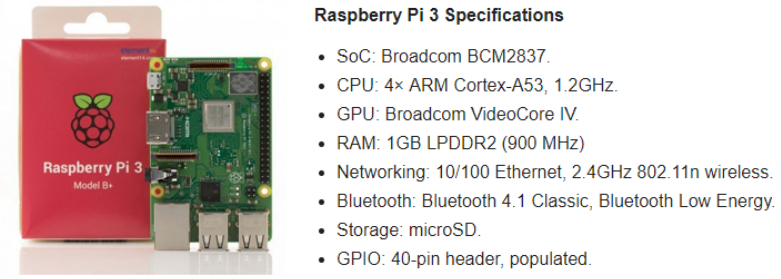

Figure 4.1: Raspberry Pi 3 Model B+

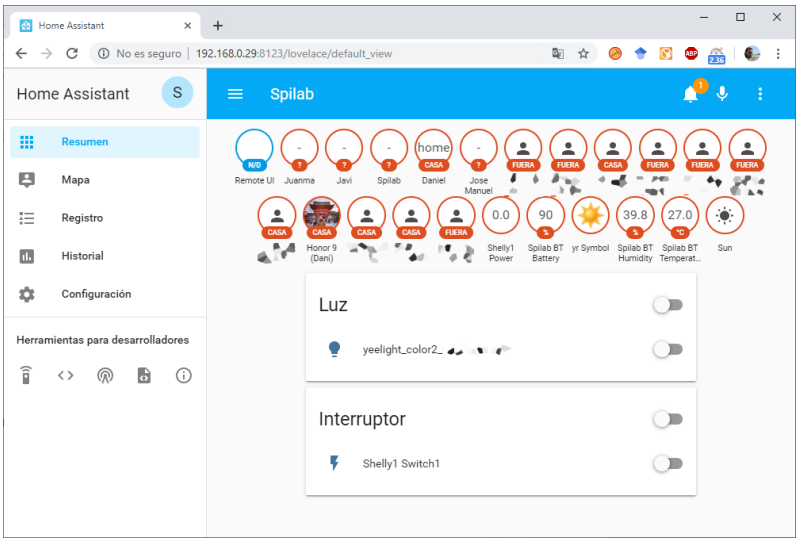

Figure 4.2: Home Assistant Environment

4.2 Business plan structure

During the following steps, a business plan is drawn up, divided into several stages, in which the aim is to create a startup to offer the developed IoT solution (EPSIoT) as well as to provide customers with technical knowledge.

Before starting to carry out the business plan, we must structure what information it will contain. To do this, we will base ourselves on one of the most commonly used models for generating business plans, the different phases of which can be seen in Fig 4.3. In addition, these steps must be followed in a specific order to achieve a quality business plan (Fig. 4.4).

Therefore, we will divide the elaboration of the business plan into 6 phases that will contain all the different steps indicated in the canvas model

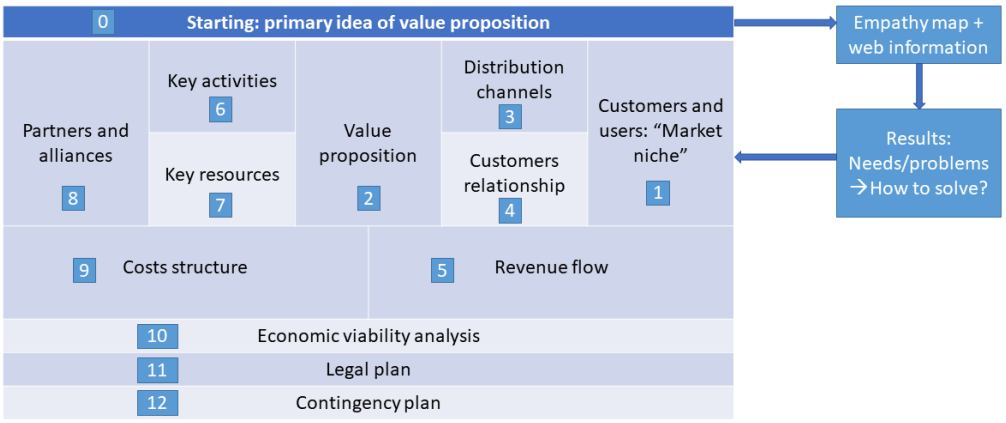

Figure 4.3: Business plan stages canvas

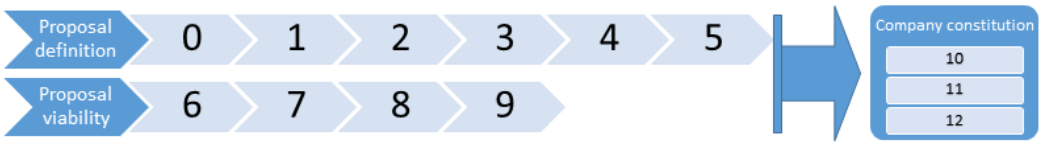

Figure 4.4: Business plan stages sequence

before:

- **Stage 1**: Primary idea of the value proposition. Elaboration of the empathy map and collection of information
- **Stage 2**: Market segment
- **Stage 3**: Distribution channels, customer relations and revenues
- **Stage 4**: Activities, resources, partners and costs
- **Stage 5**: Economic viability
- **Stage 6**: Legal plan, incorporation plan and contingency plan of the company.

4.3 Stage 1: Value proposition

As has been said throughout this document, our startup will be dedicated to marketing an IoT product developed by ourselves. This product is respon-

sible for improving interoperability between IoT devices, facilitating people's interaction with them and thus making their lives simpler.

4.3.1 Empathy Map (EM)

The empathy map is a graphic resource that helps us to clarify how our target audience is and know better our future customers. With an Empathy Map two things are intended:

1. Detecting customer needs/problems
2. Identify ideas for starting to create the value proposition

To perform the empathy map, we will rely on questionnaires and information collected from different websites. In order to make the empathy map as reliable as possible, questionnaires should be made by people interested in this type of products/technology (IoT), and the information on the website should provide knowledge about experiences of other companies or organizations in this sector.

Questionnaires and surveys: The questionnaires and surveys must be focused on achieving the objectives of the startup and create the value needed to offer a quality product to customers. That is why through some of these questions we seek to identify information on the needs of customers, in terms of interaction with IoT devices is concerned:

- Have you ever heard about the Internet of Things (IoT)?
- Do you know what IoT devices are?
- Do you often use IoT devices?
- Do you find it easy to configure IoT devices?
- Do you find it easy to interact with IoT devices?
- Do you think IoT devices help you in your daily life?
- Do you find it difficult to find IoT devices that suit your needs?

- Do you find it difficult to find compatible IoT devices?

The analysis of the answers to these questions will help us to better guide the final product. In addition, it will give us as entrepreneurs a global vision to get the business up and running and get to know our customers' needs as well as possible. Although in a real case these questionnaires must be carried out by people or future customers, in this work we will simulate the results in order to make an estimate of the startup simpler.

Web information: In Table 4.1 some links that we consider interesting for the performance of our startup are shown. This information is related to different associations dedicated to IoT business, last news, some interesting blogs and even cases where the IoT is being marketing.

Associations	**News**	**Blogs**	**Successful Cases**
The IoT Consortium [16]	IoT World Today [17]	Startup Xplore [18]	Mode [19]
The Internet of Things Association [20]	The Guardian [21]	Connected World [22]	SAM Labs [23]
Alliance for Internet of Things Innovation [24]	Computer World [25]	IoT-Now [26]	Sight Machine [27]

Table 4.1: Links of interest on IoT

Although the analysis of the content of these websites has been done superficially due to lack of time, the information gathered on the different websites we can see how the idea presented here is of great interest to the market and society. The data from blogs, newspapers, news, associations or even the competition will help us to offer a quality product for our customers.

Empathy Map design: In Fig. 4.5 the Empathy Map designed with the information regarding to what customers require about IoT is shown. In general terms, the empathy map gives us information that indicates that the technology sector where we are targeting is widely accepted by customers and that they follow its evolution mainly through social networks. In addition, customers prefer personalized solutions according to their needs, and deal with qualified personnel who can solve their problems. There is a high competitiveness in the market, which shows the importance of the sector and the attractiveness of products of this type. Companies in this sector are generally well accepted by customers and it is often not difficult to make alliances with

suppliers or partners. From the startup point of view, on the one hand, the negative points include the lack of experience, the limited capital to start and maintain the company, the lack of initial customers, and, as in any company, the fear of failure. On the other hand, positive points include the innovative character of the product and the ease of use by the customer. In addition, thanks to the information gathered from the questionnaires and the web information, the needs to be covered as well the proposal solution are detailed below.

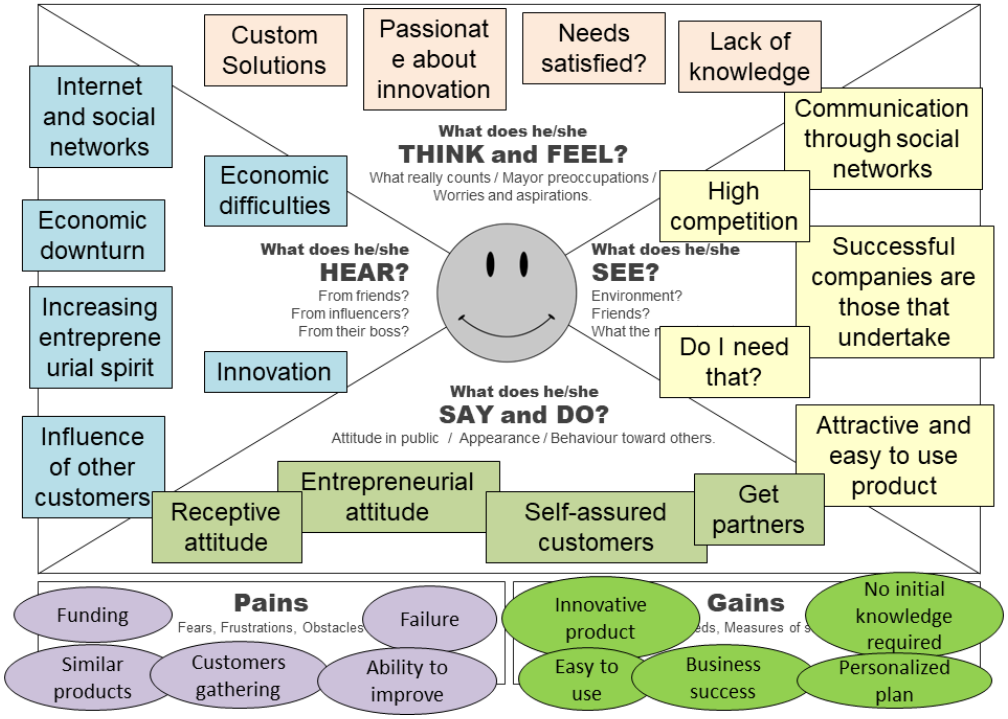

Figure 4.5: Empathy Map

Needs not covered:

- People who have IoT devices and need them to work on the way they want due to interoperability problems or to the complex configuration required.
- Technical consulting on IoT devices according to the customer's needs.
- Need for an ecosystem that manages IoT devices with as less user interaction as possible.

- Existence of companies that offer similar services but not so adaptive to each of the clients.

Solutions to the needs detected:

- Elaboration of specific and personalized plans that increase and improve the vision of the clients and general public of the companies or brands that use our services.
- Personalized attention to each one of the clients.
- Technical advice about IoT devices.
- Advanced marketing through social networks and other means to attract and retain customers.

Thanks to the above information, we can detect the needs of customers and offer them a possible solution. The need for smart devices to work according to people's needs is evident. Therefore, the solution offered is aimed at solving this, but also giving it a personalized character for each customer.

4.3.2 Value proposal

The joint value proposition is born from the empathy map data along with the information gathered from the information on the web. This proposal consists in:

- To conduct a continuous monitoring of the market.
- To offer a personalized attention for the customers being able to adapt the product to their needs.
- To advice from a professional and competent team.
- To provide a high level of knowledge of the environment and the use of social networks as a means of communication.

In view of the proposal presented, we can make a first outline of what our organization will be. The company will have three employees from the beginning:

- 2 Graduates in Computer Engineering (Founders)
- 1 Graduate in Business Administration and Management

The startup focuses on providing an IoT solution to improve interoperability among IoT devices that people have, thus facilitating their daily lives and the interaction with them. In addition, we also offer advice when purchasing IoT devices to fit the customer's needs.

The company was born with the aim of raising the value of the Internet of Things in people's daily lives and promote their use.

The name of the company is related to the work we will perform, which is the sale of our product, called **EPSIoT: Environment Processing System in Internet of Things**. That is why the startup is called "**EPSIoT Solutions**". *EPSIoT Solutions* has taken into account the main idea of expanding the group in Spain and then even expand it to other countries, but all this in the long term.

This name also allows us to name the company and recognize it more easily with the acronym **EPSIoT-S**, which has its own logo 4.6, which has no relationship with other companies that can use those acronyms.

Figure 4.6: EPSIoT Solutions logo

EPSIoT-S will have an initial contribution from its founding partners. Subsequently, its main funding channel will be based on the payment for the provision of its services to clients, although it will also have other channels such as advertising to be introduced on the website, subsidies from regional or national institutions, or donations from third parties.

4.4 Stage 2: Market niche

4.4.1 Market analysis

PESTEL analysis

A PESTEL (*P – Political, E – Economic, S – Social, T – Technological, E – Environmental, L – Legal*) analysis is a tool used by marketing professionals to analyze and monitor macro-environmental factors that have an impact on an company or organization. The result will serve to identify threats and weaknesses, which will then be used to complete a SWOT analysis. In marketing, before any type of strategy or tactical plan can be implemented, an analysis of the situation is essential. Therefore, the PESTEL is part of that and should be repeated in regular stages (minimum 6 months) to identify changes in the macro environment. Organizations that control and respond to changes in the macro environment can differentiate themselves from the competition and create a competitive advantage.

In this way, the PESTEL analysis corresponding with the technological field in Spain can be observed in Fig. 4.7.

The data of the technological environment in Spain are due, among other things, to:

- **Political dimension:**
  - Increase the R&D budget. The technology sector, in which software engineering is found, is one of the most important in research, but the aid and subsidies available in many cases do not cover the investment needed to do quality research.
  - Promote the use of Big Data and automatic learning to analyze citizen data. Mainly for the elaboration of statistics (INE) or to carry out simulations for possible electoral campaigns or to take certain decisions.
- **Economic dimension:**
  - The evolution of the economy is crucial for the performance of software engineering. Research centers and universities need the economy in the sector to grow in order to cope with new projects. In

PESTEL - Strategic profile of the environment in Spain (Technological Sector)	VN	N	HNN	P	VP
POLITICS DIMENSION					
Government stability					
Fiscal policy					
Foreign market					
Social welfare policy					
Defense of competition					
Employment legislation					
ECONOMICS DIMENSION					
Economic cycles					
Trends in PIB					
Interest rates					
Inflation rate					
Unemployment					
Disposable income					
SOCIAL/CULTURAL DIMENSION					
Demographic factors					
Social Conflict					
Lifestyle changes					
Social values and attitudes					
Level of education					
TECHNOLOGICAL DIMENSION					
R&D					
Technological Infrastructure					
New technologies					
Technology transfer					
Protection of knowledge					
ENVIRONMENTAL DIMENSION					
Environmental policy					
Waste treatment					
Energy consumption					
LEGAL DIMENSION					
Labour legislation					
Product safety					
Data protection law					

VN: Very negative; N: Negative; HNK; Have no knowledge; P: Positive; VP: Very positive

Figure 4.7: PESTEL analysis in technological field in Spain

many cases, private and public companies operate on the basis of projects and subsidies that, without a growing productive economy, would be difficult to maintain.

– Recruitment also depends on the evolution of the economy. Recent graduates are looking for an opportunity in this area to enter the world of work and it is necessary that the economy supports them.

- **Socio-cultural dimension:**

  - People's attitude towards technological advances is usually quite positive.
  - In addition, fortunately, the technological aspect is increasingly encouraged within study centers such as colleges or institutes, where students learn a basic notions in technology, which in the world we live, is really important.

- **Technological dimension:**
  - R+D+i policies are encouraged to achieve the best possible developments, even if they are not always possible, especially depending on the company or the product to be developed.
  - The great variety of available technologies is always new news. The range of possibilities to carry out developments in software engineering is really big and powerful.

- **Ecological dimension:**
  - Waste management has always been a problem. Access to certain minerals and contamination when developing devices also indirectly affects software development.
  - Every time the devices use low-consumption components that, on the one hand, extend their useful life, and on the other hand, are environmentally friendly.

- **Legal dimension:**
  - Labour legislation varies depending on the environment in which we move (public and private centres, etc.). The protection of workers in this sector should be more regulated.
  - The protection of knowledge is of great importance with regulations such as intellectual property law or the recent RGPD. Fortunately the developers are aware of these regulations and we take them into account when carrying out a project or processing user data.

This PESTEL analysis will help us define the strengths and weaknesses (SWOT) of our future company.

SWOT analysis

The SWOT analysis helps entrepreneurs to evaluate the problems inside and outside the company. It consists of an assessment of internal competencies such as strengths (S), weaknesses (W), and external competencies such as opportunities (O) and threats (T), where it provides a framework for strategic decision making. Through the SWOT analysis of the business plan, we can better clarify our short, medium and long term strategies. Its use in marketing plans is indispensable, as it is a useful tool for planning and analyzing competition. That is why we have decided to perform a SWOT analysis in our business plan, with the aim of analyzing more clearly both the positive and negative things that the creation of the company could have. This analysis can be seen in Table 4.2.

4.4.2 Target audience

With respect to our target audience, we find ourselves with two different targets:

- On the one hand, customers who already have IoT devices and need to improve connectivity between them.
- On the other hand, customers who need advice on IoT devices to create a specific ecosystem in their home or office.

For the first group, we will offer our product as a solution to improve connectivity between the devices they already own. In addition, we also offer a service to configure them correctly and guide the customer through the process. As for the second group of customers, we offer advice on all types of IoT devices so that customers can create the desired environment, guiding them throughout the process.

4.4.3 Strategies

Within the strategies to follow, we will base ourselves on the different types of strategies (Strategic Clock) studied throughout the different subjects of the

	Helpful (to achieve the objective)	Harmful (to achieve the objective)
Internal origin (product/company attributes)	• Technological innovation • Service & Support • Continuous improvement and updating • Innovative project • Work team made up of young people with ambition • Closeness to our customers, due to personalized work • Good understanding and relationship of the staff • Quality services • Good relationship with our suppliers	• There is no financing outside the creation of the company • Lack of work and business experience in the staff • Lack of recognition in the market, as it is a newly created company that is in the process of being launched • Reduced staff at the start of the project
External origin (environment/market attributes)	• Growing importance within the ICT field • Grants from the Government • Continuously growing IoT market	• Many competing companies • Many of our potential customers already have a consumer preference, that is, a company that satisfies their needs • People can be reluctant to use technology • High rate of innovation • Consumer distrust

Table 4.2: SWOT analysis

Master. The Fig. 4.8 indicates these strategies.

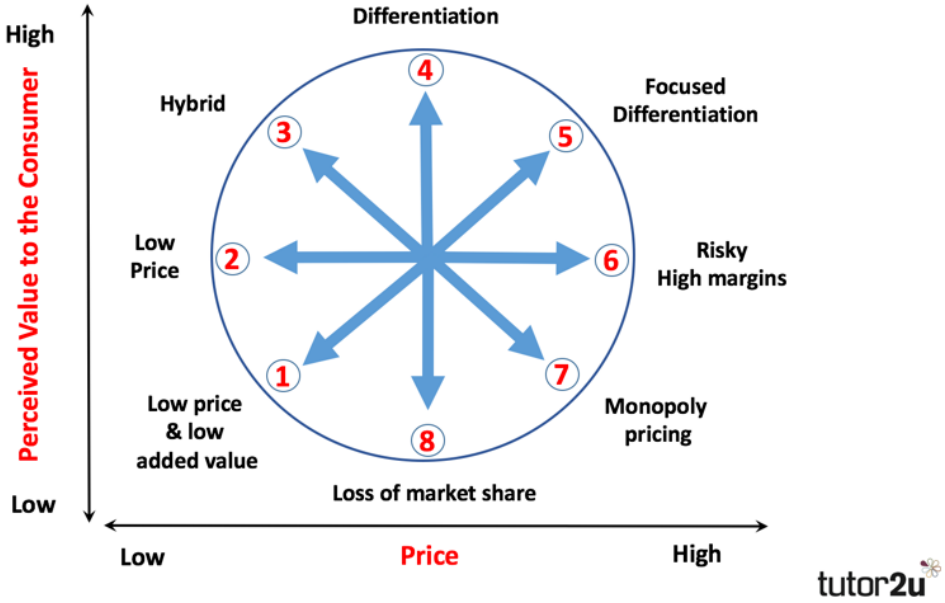

Figure 4.8: Strategic Clock [3]

The choice of one or the other will depend on many factors, but the most important is the one that answers the question: **what are we good at**?

Our organisation is a young company and what it needs first and foremost is to attract customers. We have a team eager to learn and committed to the startup, always ready to give the best of themselves.

In addition, given the multidisciplinary team, we have the advantage that thanks to the combination of the different profiles we get a very important strength and that other companies do not have. Therefore, and answering the question posed above, we are good at combining the skills and abilities that each member of the team has to carry out their work and attract both customers and investors to put them in contact.

For all these reasons, we are going to opt for a "*differentiation*" strategy where we offer an attractive and innovative product that solves the detected needs and that differentiates us from the main competitors with the objective of attracting clients.

4.4.4 Differences with competing companies

As for the analysis of the competitors, at the beginning of this document some of the most important companies within the Internet of Things sector have been shown. There are other companies dedicated to cover the need that we have detected, however, we firmly believe that we can make our company grow little by little and gain a place in the market. Among these companies are those dedicated to the marketing of virtual assistants that can control IoT devices, such as Alexa of Amazon [28] or Google Home [29], but whose behavior requires certain configurations and technical knowledge. In addition, the compatibility of the attendees with IoT devices depends in many cases on the manufacturer. We can also highlight specialized solutions such as the one developed by Mozilla [30], whose objective is to make IoT devices linkable and recognizable, and defining a standard data model and API to be interoperable. This solution is based on free software and although it has a lot of support from the community, it does not offer personalized treatment to customers and like the previous ones, it requires certain technical knowledge for its implementation.

That is why our main differences with the competition are:

- The product developed to improve interoperability between IoT devices is made with completely open source technologies. The innovation of the product lies in the algorithms used to achieve it, and that have been developed by us.
- Personalized content will be offered for each client based on a questionnaire that will allow us to know their fundamental points, and be able to adapt the IoT devices they already have. This is one of our main advantages over our competitors, which will allow us to adjust to what customers are going to ask us, taking into account the services we offer.
- Technical advice on IoT devices is also offered to customers who wish to purchase new devices or create a particular environment in their home, office, or any other place.
- Great presence in social networks where the advertising of our company will be fundamental to make us known. In addition, local social events will be organized where companies will be given the opportunity to showcase their products.

4.5 Stage 3: Customers

In this third phase of creation of the Business Plan, we will focus on how to relate our organization with customers, the distribution and sales channel we will use with them and what will be the expected benefits.

4.5.1 Promotion and sales

As far as promotion channels are concerned, as this is a recently created startup, the most economic channels currently available will be chosen, which will be the following ones:

- Advertisements.
- Word of mouth between current customers and potential customers.
- Promotions in social networks.
- Official website of the company.

Our promotion channel will be direct, from the startup to the end customer. These customers may be individuals or companies that need to implement an IoT solution to improve connectivity between their smart devices or need technical advice. To this end, information will be distributed using digital media such as the Internet, social networks, etc.

As for the management of these channels, it will be essential that employees have a series of basic knowledge about the Internet to carry them out. Special attention is also paid to the feedback received from customers in order to improve the product as their needs change. To this end, surveys will be sent quarterly to them so that we can review the degree of customer satisfaction and how the changes and improvements that we incorporate to the product affect them.

In order to make ourselves known, we are going to carry out a launch campaign to advertise our services. The main reason that we are going to show in this campaign are the competitive differences with the rest of competitors, always seeking to increase the number of customers. To do this we will meet

the three general objectives of any advertising campaign, as is to inform, to describe our product, remember our brand and persuade, to get into the mind of the consumer.

On the other hand, we must highlight the use of Twitter as the main platform for promoting startup, apart from the official website. Here, our promotion will be based on the publication of a tweet each time the product is updated, improvements are included, or news related to it.

4.5.2 Revenues

Broadly speaking, as we have been indicating throughout the document, the main source of income for startup will be the sale of an IoT solution to improve connectivity between smart IoT devices. In addition to this, another source of revenue (benefits) is the technical advice that will be offered to customers.

Derived from this, the forecast of sales derived from this service is established. We have set the selling price of each unit at €275,00. In order to establish this price, we have considered the price of the hardware used, as well as the number of hours spent developing the necessary algorithms. In addition, as mentioned above, we have opted for a strategy of differentiation, so we also think that the product has a fairly competitive price in the market. If we take into account that during the first year we expect to sell a total of 190 units of the service (estimation), then we will obtain a sales revenue of €52.250,00, during the first year. No distinction will be made between the sale of the product and technical advice, but to simplify the entire process, either of the two profit options will be treated as units sold.

In addition, we will get revenue derived from advertisers. To do this, we are going to establish three different price ranges for the advertisers who want to advertise on our website, based on data taken from the budgets of the newspaper El País [31].

The prices for each one, taking into account those established by some consulted means are:

- Robapágina (300x250) = €19/day
- Megabanner PC (728x90) / Mobile (320x250) = €25/day

- Double roba PC (300x600) / Mobile (300x600) = €38/day
- Roba deployable and roba video = €33/day

Bearing in mind that we are starting from a business that has no notoriety on the net, we are going to offer an advertising contracting service during the first two months at 50% of its original price. In addition, we are aware that during our first year of life, it is going to be difficult to occupy our advertising space in its entirety. From the third month, the 50% offer would no longer be applied to the revenue and therefore the revenue would increase.

4.6 Stage 4: Activities and resources

This fourth phase focuses on specifying what are the key activities, resources and partners for our startup, i.e. determining what is the necessary infrastructure to carry out our business project, including its costs (through the cost structure).

4.6.1 Activities

All business models require a number of key activities. These activities are the most important actions a company must take to succeed, and like the key resources (discussed in the next section), they are necessary to create and deliver a value proposition, reach markets, build relationships with customers and earn revenue.

In addition, it should be noted that activities vary depending on the business model. In our case, the key activity of the organization is to offer an IoT solution that improves interoperability between IoT devices.

Based on this, we can divide our activities into several groups:

- **Procurement activities**. As our organization does not need natural raw materials (as if it were a furniture manufacturing company, which would need wood), we will consider the procurement tasks as those aimed

at attracting customers and partners to startup. Within these activities we can highlight those that are dedicated to conducting interviews with each of our potential customers and know their needs. These clients will also be selected on the basis of research activities, so that we can find out which are or are not potential clients for the company.

- **Technology development activities**. Within this type of activities we include all those related to the work of computer development, such as the generation and development of the website to maintain contacts with other companies. In addition to this, we will also include the support work that will be given to members and participants in the IoT solution, in case they need some help or need to solve a problem related to it. We will also highlight the activities dedicated to the development of our website, so that we can meet the new needs that arise to our customers and be increasingly adapted to new trends and technologies.

- **Human resources management and company structure**. Within this group we find all those activities dedicated to the administrative management of the staff of the organization, all the work of recruitment and selection of personnel (interviews, search for talent, etc ...), training and staff development work (favoring the conduct of various courses by our staff so that they specialize in new areas, which will improve the overall quality of our company). Also included will be those activities aimed at training employees in everything related to the prevention of occupational risks, a very important section within the organization. Finally, annual meetings will be held to develop the performance of employees of the organization, so that we can assess them in terms of their work and thus establish the planning of our staff for successive years. Within this group of activities we will also include the activities related to the social benefits that our organisation will bring to society, such as, for example, carrying out voluntary activities, etc...

4.6.2 Resources

As for the key resources of our startup, we can divide them into:

- **Human Resources**
  - *2 Graduates in Computer Engineering.*
  - *1 Graduate in Business Administration and Management (BAM).*

The two computer engineers will be in charge of the project management for the development and maintenance of the IoT solution, the basis of our startup, so it must be especially well attended.

The graduate in BAM will be in charge of the whole topic of management and administration of the startup, although they will count on the help of external collaborators at the time of taking important decisions for the future of the company. In addition, he will be in charge of the accounting and search of means of financing for the company, human resources, searches of new personnel, studies of talent attraction, etc.

Depending on the growth of our organization, the number of staff will increase, with the hiring of more IT specialists, with the aim of breaking down borders and being able to offer the product to a wider market. These first employees, although they are going to have defined tasks within the company, at first they will have to collaborate sometimes in other tasks, since they are such a small staff.

- **Tangible Resources**. Within the section of tangible resources we are going to make the following division:
  - *Hardware*. Within this section we will include everything related to the computer equipment used in the organization, derived from our official supplier Lenovo. We will also include the servers where our business contact website is hosted, in our case, it will be hosted by Amazon Web Services (AWS), which also offers us numerous tools to control the statistics of our website at all times and be able to improve it based on them. In this section we also highlight the establishment of a line with Internet connection, necessary for the development and maintenance of the website.
  - *Software*. As far as software is concerned, we will use numerous programs, among which we would like to highlight first of all the operating system that our computers: Windows 10. In addition, we must also indicate those programs oriented towards the development of the website and to improve the IoT solution, such as Angular, NodeJS and some development environments such as Visual Studio. In addition we will count on typical programs of edition of image, of writing and visualization of files.
  - *Infrastructures*. As far as our company's resources are concerned, it will be located in Cáceres, more specifically in Aldealab, an international reference centre for human development in relation to the intensive use of information and communication technologies. It will be more exactly in Garaje 2.0, which has been conceived as a space for the creation of intellectual capital that will allow

companies dedicated to innovation, knowledge and technology to collaborate with each other and participate in joint projects, objectives that our organisation aims to achieve.

Based on this, our organization will also collaborate with Extremadura Avante, a group of public companies of the Junta de Extremadura that aims to provide services to Extremadura companies in the different phases of their development, so they can be more competitive, so it will act as an accelerator of our organization, promoting our development and growth.

- **Intangible Resources**. As for intangible resources, in order to treat them in a more differentiated way, we have divided them into
  - *Brand image of the organization.* It is the image, from the point of view of the organization that represents the values that the company wishes to transmit to its clients or to the market segment to which it is directed. This image is a great resource of the organization because it is the visible face and the one that is in charge of establishing the first impression that the clients will have on us.
  - *Patents.* New research or products developed by the organization must be established as new patents and registered with the appropriate bodies, so that we can derive benefits from the use of our ideas from other organizations.
  - *Trademarks.* Is similar to the brand image, except that these brands belong to other groups, in our case, as trademarks we use the official supplier of computer equipment, Lenovo, in addition to those that help us in the work of our platform, such as the Points of Attention to the Entrepreneur (PAE) or the Factory of Innovation.

4.6.3 Partners

Joining our recognized software alliance is a long-term commitment, based on a shared vision of our project of synergy and common value. The goal of the alliance is to increase activity to be more successful together.

Let's start from that we will establish an alliance with the manufacturer Lenovo as a supplier of computer equipment. Lenovo is characterized by the manufacture of quality equipment, many of which are intended for use as workstations, providing high performance. Their job, therefore, will be

to provide the company with the necessary equipment to develop the activity. The objective of this alliance is to reduce costs and gain efficiency by acquiring quality equipment at the best market price. For the duration of this alliance our website will have a Lenovo banner and direct links to the website to purchase the latest news.

In addition, an alliance with AWS will allow us to reduce the risks of the web platform, as well as minimize investment costs. AWS has specific plans for new technology-based companies, which allows you to adjust the costs of purchasing services as much as possible. This, together with the great technical support they offer, will make EPSIoT-S have an active 24/7 web platform, thus increasing customer satisfaction. Amazon will take care of everything related to the resources needed to ensure the availability of the web platform and even possible advertising campaigns. On the other hand, what Amazon will get from us will be the commitment to use their services for a minimum period of 3 years, where everything related to the development of the activity will be done through AWS as long as the requirements of the same allow it.

These alliances have as a general objective the reduction of investment costs, the reduction of business risks and the increase of efficiency. It is not ruled out in the future to formalize a new alliance with a software developer specialized in R&D (Research an Development) to help us exploit the capabilities of our product as *HelpSystems* or *SisGrupo*.

4.6.4 Costs structures

As for the cost structure, we will include all the expenses and investments that we will be making in the organization, for this we will use the tangible, intangible and human resources that we believe will be necessary for our business and that have been specified in the previous section and we will identify the costs of these resources and their different suppliers. These information is shown in Table 4.3.

In this table (Table 4.3) we must highlight several points:

- The price of Amazon Web Services is €0 because the first year subscription is free as it is associated with the acceleration program for startups.

	Provider	Price	Units	Total price
TANGIBLES RESOURCES				
Laptop ThinkPad E590	Lenovo	€900,00	3	€2.700,00
Paper sheet 500 A4	Carrefour	€3,00	10	€30,00
Pens/Pencils	Amazon	€1,00	50	€50,00
Deskchair	Amazon	€67,00	3	€201,00
Desktop	Ikea	€60,00	3	€180,00
Amazon Web Services (AWS)	Amazon	€0,00	1	€0,00
Internet connection	Movistar	€45,00	1	€45,00
Office	Aldealab	€300,00	1	€300,00
INTANGIBLES RESOURCES				
Brand image		€144,00	1	€144,00
Computer applications		€1.200,00	1	€1.200,00
Website domain	.es	€14,95	1	€14,95
HUMAN RESOURCES				
Graduate in Computer Science		€1.400,00	2	€2.800,00
Graduate in Business Management		€1.400,00	1	€1.400,00
TOTAL				€9.064,95

Table 4.3: Costs and investments

- The price of the Internet connection is monthly.
- As for the brand image, the price set is the cost of registering the brand.
- The price of the domain in which our website will be hosted is annual.
- Employees salaries are monthly

4.7 Stage 5: Financial activity

Now, we still have to carry out a proper economic feasibility analysis of the business project. To do this, in order to carry out this analysis correctly we will follow the steps shown below.

4.7.1 Balance sheet

First, we need to draw up the provisional balance sheet for the first year, which includes all the assets planned for acquisition at the beginning and during the first year of the startup's activity, as well as all the financing planned for making these investments. The Table 4.4 includes all asset items together with the net worth and liabilities of the organisation. We must mention within the net worth the account of subsidies, derived from a grant obtained from the Junta de Extremadura [32].

4.7.2 Required funding

As for the financing that our startup will use during its first year, we establish the following sections:

- Mainly we will obtain financing derived from the sales of our services to our potential clients, so that a large part of the profits of the first year will be dedicated to finance all the initial expenses.
- We will also use the grant you have been given to be able to finish financing ourselves and have some margin when dealing with new expenses or investments.

ASSETS		**EQUITY AND LIABILITIES**	
NON-CURRENT ASSETS	€8.700,00	**EQUITY**	€9.000,00
Information technology equipment	€2.700,00	Capital	€3.000,00
Computer software	€1.200,00	Capital grants	€6.000,00
Furniture	€4.800,00		
CURRENT ASSETS	**€30.800,00**	**NON CURRENT LIABILITIES**	€30.500,00
Cash	€9.500,00	Non-current payables	€30.500,00
Trade receivables	€6.500,00		
Banks	€14.800,00	**CURRENT LIABILITIES**	€0,00
TOTAL ASSETS	**€39.500,00**	**TOTAL EQUITY AND LIABILITIES**	**€39.500,00**

Table 4.4: Balance Sheet year 0

The required funding for each section is appreciated in Table 4.5.

	Year 0
Funding	€58.250,00
Sales	€52.250,00
Grants	€6.000,00

Table 4.5: Required funding

4.7.3 Income statement (3-year projection)

In Table 4.6 the income statements for the first three years are detailed:

Year 0: The general plan for the first year of the startup is detailed below.

	Year 0	Year 1	Year 2
Operating income	€58.250,00	€63.745,00	€75.219,10
Net sales	€52.250,00	€63.745,00	€75.219,10
Other operating income	€6.000,00	€0,00	€0,00
Grants	€6.000,00	€0,00	€0,00
Operating charges	€50.400,00	€54.000,00	€55.800,00
Employees	€50.400,00	€54.000,00	€55.800,00
Other operating charges	€4.000,00	€4.500,00	€4.500,00
External services	€1.000,00	€1.500,00	€1.500,00
Supplies	€3.000,00	€3.000,00	€3.000,00
EBITDA	€9.850,00	€5.245,00	€14.919,10
Amortization	€1.260,00	€1.260,00	€1.260,00
EBIT	€8.590,00	€3.985,00	€13.659,10
Net Operating Profit (EBIT)	€8.590,00	€3.985,00	€13.659,10
Income Tax	€1.288,50	€597,75	€3.414,78
Net Profit	**€7.301,50**	**€3.387,25**	**€10.244,33**

Table 4.6: Income statement (3-years projection)

- External services. Includes the costs of advertising our organization on different websites and advertising services.
- Amortizations. We have established the cost of depreciation according to the type of fixed assets, so that equipment for information processing and computer applications will be depreciated after 5 years while furniture will be depreciated after 10 years, so the annual depreciation will be €1.260,00 (Table 4.7).

	Amount	Years	Costs/year
Information technology equipment	€2.700,00	5	€540,00
Computer applications	€1.200,00	5	€240,00
Furniture	€4.800,00	10	€480,00
TOTAL			**€1.260,00**

Table 4.7: Amortizations

Year 1: During the second year of the startup we found certain variations in the income statement that are mentioned below:

- Sales. Sales-related revenue increases by 22% as a result of greater industry experience and greater customer knowledge of the startup, which will benefit the company's work.
- Grants. No grants are received this year as the requested grant was received during the first year.
- Employees salary. During the first year there will be an increase in the salary of the employees due to the good results obtained by the startup, this increase will be €100 per employee, being a total increase of €300/month.

Year 2: During the third year of the startup there are also certain variations in the income statement, which are mentioned below:

- Sales. As in the previous year, sales-related revenues increased again, although in this case only by 18%.
- Employees salary. During this third one there will also be an increase in the salary of the employees of another €50 per employee, being a total increase of €150/month.
- External services. In order to improve the advertising of the startup and get more customers, advertising expenses are increased by €500.

4.7.4 Financial deadlock

The annual financial deadlock is the number of services that we must sell as a minimum, to cover all the expenses and costs of our business, that is, in what amount of services sold, our margin and profit is 0.

As mentioned in previous sections, our forecast sales revenue will be €68.750,00, being this derived from a total of 190 units sold during the first year. It should be clarified that since we provide a service, each unit sold corresponds to the sale of the product as well as technical advice (no distinction has been made)

In addition, it should be borne in mind that fixed costs (personnel, depreciation of elements, etc ...) reaches the amount of €49.260,00. On the other hand, variable costs are derived from external supplies and services, amounting to €4.000,00.

With this data we can obtain the variable unit costs per unit sold and calculate the financial deadlock (Table 4.8).

Q (Financial deadlock)	**203**
p (sale price)	€275,00
CF (financial costs)	€51.660,00
CVu (unit variable cost)	€21,05
CV (variable cost)	€4.000,00
Sold units	190

Table 4.8: Financial deadlock

As we can see in Table 4.8, the Financial deadlock is at 203 units sold so at that point our margin and profit is 0. Consequently, the number of units sold is less than necessary to obtain the balance, so we would have some losses. This could be compensated by looking for external sources of funding, raising the price per unit sold or selling more units of the product.

- Below this amount, we will have losses, as the costs will be higher than the revenues.
- Above this amount, we will start to have benefits.

4.7.5 Profitability

Investment project

Payback: The payback period refers to the amount of time it takes to recover the cost of an investment or how long it takes for an investor to hit breakeven. For the payback calculation we will simulate an initial outlay of €16.200,00, corresponding to the costs of information processing equipment, licenses and furniture, as well as the initial capital of the constitution of the company. In addition, we will assume that the annual profitability of the project is 8% compared to other similar initiatives. The data relating to costs and income

will be taken from the profit and loss accounts carried out in previous points. Therefore, the payback summary is reflected in Table 4.10. To calculate it, we must consider the data specified in Table 4.9 and the following variables:

- Cj: Planned charges in the current year
- Pj: Expected payments in the current year
- Qj: Net cashflow in the current year
- A: Initial amount
- k: Profitability
- P: Recovered amount

n (years)	3
A	€16.200,00
k	8%

Table 4.9: Payback data input

t (year)	**Cj**	**Pj**	**Qj**
0			€-16.200,00
1	€64.250,00	€54.400,00	€9.850,00
2	€63.745,00	€58.500,00	€5.245,00
3	€75.219,00	€60.300,00	€14.919,00

Table 4.10: Payback

Therefore, in Table 4.11 we can observe how in the third year the initial disbursement is recovered, and benefits are also obtained.

t	**P**
1	€-6.350,00
2	€-1.105,00
3	€13.814,00

Table 4.11: Payback results for the first three years

NCF: Total Net Cashflow: As for the total net cash flow per committed monetary unit (NCF), indicates that the initial disbursement is recovered and,

NCF	€1,85

Table 4.12: Net Cashflow (NCF)

in addition, for each euro invested, €0,85 is obtained, giving us a return of 85% (Table 4.12).

Dynamic models: NPV and IRR:

In order to evaluate the opportunity cost of the project, we are going to make use of two ratios that offer interesting information in this respect: NPV and IRR. The first difference to mention is the way to study the profitability of a project. The NPV does it in net absolute terms, that is to say, in monetary units, it indicates us the value of the project to date; while the IRR, gives us a relative measure, in percentage.

- NPV: The net present value (NPV) is an investment criterion that consists of updating the collections and payments of a project or investment to know how much is going to be gained or lost with that investment.

NPV	€9.260,30

Table 4.13: Net Present Value (NPV)

- IRR: The Internal Rate of Return (IRR) is the interest rate or return on an investment. In other words, it is the percentage of profit or loss that an investment will have for the amounts that have not been withdrawn from the project.

IRR	€0,35	35,16%

Table 4.14: Internal Rate of Return (IRR)

In view of the above results, we can see how the NPV is > 0, therefore the project is viable and would be accepted. In addition, the result given by the IRR indicates that as it is greater than the reference profitability, the project would again be accepted.

Profit margin	14,75%
ROI	19,52%
ROE	81,13%

Table 4.15: Startup profit margin

Startup

Profit margin: ROI and ROE: As far as the profitability of the company is concerned, we have the results detailded in Table 4.15.

In our case, the profit margin of the starup for its first year is 11,66% (difference between the price of the service, and the operating costs of it). In terms of ROI, which measures and compares the profit or profit obtained in relation to the investment made is 15,80%. On the other hand, the ROE, with a value of 58,93%, is the company's capacity to remunerate its shareholders.

4.7.6 Solvency

In this section we will evaluate your company's ability to meet the payments arising from debts at the time they are due. To do this, we will evaluate both short and long term solvency through debt ratios. The debt ratios indicate the composition of the company's financial structure, establishing relations between long and short term liabilities and own resources.

- **Short-term (S/T) solvency (Table 4.16)**. Our company has an asset of €2,33 for every euro of debt.

S/T Solvency	2,33

Table 4.16: Short-term solvency

- **Long-term solvency (L/T) (Table 4.17)**. The revolving fund or working capital expresses the portion of long-term resources that finance short-term assets. With the provisional balance sheet data for the first year, our company would have a revolving fund of 17.600,00€. The debt ratio indicates how many euros of external financing the company has

Rolling fund	€17.600,00
Indebtedness	3,89

Table 4.17: Long-term solvency

for each euro of own financing. Therefore, our company has €3,89 of external financing for each euro of own financing.

With the calculation of these ratios, we have been able to see the profitability of the company. These will help us to make decisions in the future so that we can continue to improve for our customers and the market. The following section details the steps for the creation of the startup.

4.8 Stage 6: Startup creation

4.8.1 Legal plan

Type of activity

Our company is dedicated to the marketing of a solution developed to improve the interoperability of Internet of Things devices. In addition, we also offer technical advice for those who want to start acquiring IoT devices.

Owners

The company will be constituted by 2 owners:

- Daniel Flores Martín
- Juan Rodríguez Cabanillas [1]

[1] As this master thesis is an extension of a work conducted in the Master Degree, I have decided to include my classmate in the creation of the startup.

Liability

For the constitution of the company, the liability of the partners will be limited in order to protect the personal assets and meet debts only with the assets of the company itself.

Financial needs

As we are a newly incorporated company, we have very limited resources. The initial capital is €3000 (€1500 per each person). Initially we are located in Garage 2.0, as indicated in previous sections, so the economic needs would be mainly those directly related to business activity such as material, information processing equipment, internet connection, etc..

Legal status of the company

In view of the above conclusions, a legal form of "Sociedad Limitada" has been selected for *EPSIoT Solutions*.

We think it is the best solution for small and medium sized companies, with few partners and a fairly tight initial capital (€3000).

In addition, this legal status makes it possible to protect the personal assets of the partners, and the corporate tax allows multiple deductions. Although the formalities of constitution are somewhat complex (deed before Notary and inscription in the Mercantile Registry), we believe that it is the juridical form that more adjusts to our current situation.

In order to make these decisions we have based ourselves on the notes on the subject of Entrepreneurial Initiative as well as on the information provided on portals such as "Extremadura Empresarial" and the CIRCE Platform, as thanks to their guided environments they allow us to clearly see the advantages and disadvantages of each of the possibilities that exist when selecting the legal form of a company.

Image in the eyes of customers and the market

From the very beginning, *EPSIoT Solutions* aims to be a company that complies with Corporate Social Responsibility (CSR). This aims to address customer acquisition as well as accelerate the growth of the company, but always committed to people, the environment and other companies in the sector.

This decision, taken from the beginning in a transversal way, has as reference three strategic principles:

- Good faith towards consumers, clients and society in general.
- Constant dialogue with its stakeholders.
- Transparency of information on its sustainability strategy.

With this commitment we hope to increase sales and achieve customer loyalty:

- Prestige of the brand both inside and outside Spain.
- Customer and supplier loyalty.
- Increased sales and profits.
- Better financial backing.
- Increased motivation of the company's employees.

4.8.2 Plan of constitution of the startup

Administrative procedures

According to the website of the PAE (Point of Attention to the Entrepreneur) [33], in order to perform the creation of a company with the legal form of a Limited Company, the following procedures are necessary:

- **Central Mercantile Registry**: Negative certification of the name of the company. This consists of obtaining a certificate accrediting the non-existence of another company with the same name as the one it is intended to incorporate. Essential requirement for the granting of the Public Deed of Incorporation of companies and other registrable entities.

- **Tax Agency (AEAT)**: Tax identification number. In general, the tax identification number of individuals of Spanish nationality will be the number of their national identity document (ID) followed by the verification code (a capital letter) and for those without Spanish nationality will be the foreigner identity number (NIE).

- **Notary**: Public deed. The deed of incorporation of the company must be granted by all founding partners, whether natural or legal persons, who must assume all the shares. The deed of incorporation must be submitted to the Provincial Mercantile Registry. It must necessarily contain the identity of the partner or partners, willingness to incorporate a limited liability company, the contributions made by each partner and the numbering of the shares assigned in payment, the determination of the specific way in which the administration is initially organised, in the event that the articles of association provide for different alternatives, the identity of the person or persons initially in charge of administration and social representation, and the information about the company (name, activities, street, initial capital, etc)

- **Treasury Departments of the Autonomous Communities**: Tax on transfers of assets and documented legal acts. Taxes onerous asset transfers, corporate operations and documented legal acts.

- **Provincial Mercantile Registry**: Registration of the company in the Registry. The inscription of a company in the Mercantile Registry produces its full legal capacity. In the case of an individual entrepreneur, registration is voluntary.

Traditionally, all these procedures have had to be carried out by going in person to carry out each one of them. Fortunately, with the digital transformation that the administrations are carrying out, these procedures can be done telematically through the Internet. All you have to do is follow the steps detailed in [34] to create the company, indicating the necessary data. Therefore, *EPSIoT Solutions* will be created telematically taking advantage of the facilities that the public administration of the Government of Spain offers us for this.

4.8.3 Contingency plan

A contingency plan is a management tool for the good governance of the organization and also in the current era of Information Technology and communications.

Contingency plans contain the technical, human and organizational measures necessary to ensure the continuity of the business and operations of a project. Such a plan must be prepared to respond to possible unforeseen situations. These situations may respond to crises at certain times, guarantee the safety of assets, solve management problems or avoid human errors.

In our case, the situations that we have covered in the contingency plan are the following

- **Partner leaving from the company**. The leaving of a partner involves the sale of its shares, which, if the possibility exists, will be purchased by the other partners of the company, either using own funds or some other financing mechanism.
- **Loss of qualified employees**. In the event of such a loss, a follow-up strategy will be carried out by the organisation's human resources, who will be responsible for carrying out training programmes for the most capable members of the organisation, so that this position can be filled with the greatest possible guarantee of success.
- **System crash**. In case of a system crash, a list of priorities will be defined for system recovery and for establishing the necessary steps to reboot, reconfigure and recover these systems and networks. In addition, the necessary information sources of the affected systems will be recovered.
- **Liquidation of the company**. In the event that the company is not successful, the organization will provide a liquidation mechanism that allows us to recover most of the money invested, reducing as much as possible the losses of investors.
- **Increase in production costs**. In the case of increases in the cost of production, derived for example from an increase in the minimum interprofessional salary, the company will make use of existing contingency funds to make this type of payment, in the case of not having sufficient funds before resorting to this fund.

- **Loss of a strategic client**. If there is a loss of this type, the company will analyse the TOP of companies similar to that which can be of use to us and through which we can obtain great profits, so that the losses derived from this fact can be reduced.
- **Natural disasters**. Inclement weather, earthquakes or fires are unusual accidents however, be prepared for such incidents, for this reason our startup will have insurance to cover all damages and losses caused by such disasters, so that losses are minimal for the startup.
- **State Restrictions**. In the event that government entities or other regulatory entities make changes in their regulations that restrict to a greater or lesser extent our ability to operate in a particular market, our company will be prepared, as it will have a study that allows us to know the new location that will be as profitable as possible for the company, away from everything related to regulatory restrictions, etc.

4.9 Canvas model

Once all the phases have been completed, we can summarise the entire business plan through the following canvas (Fig. 4.9), which gathers the main ideas of all the work.

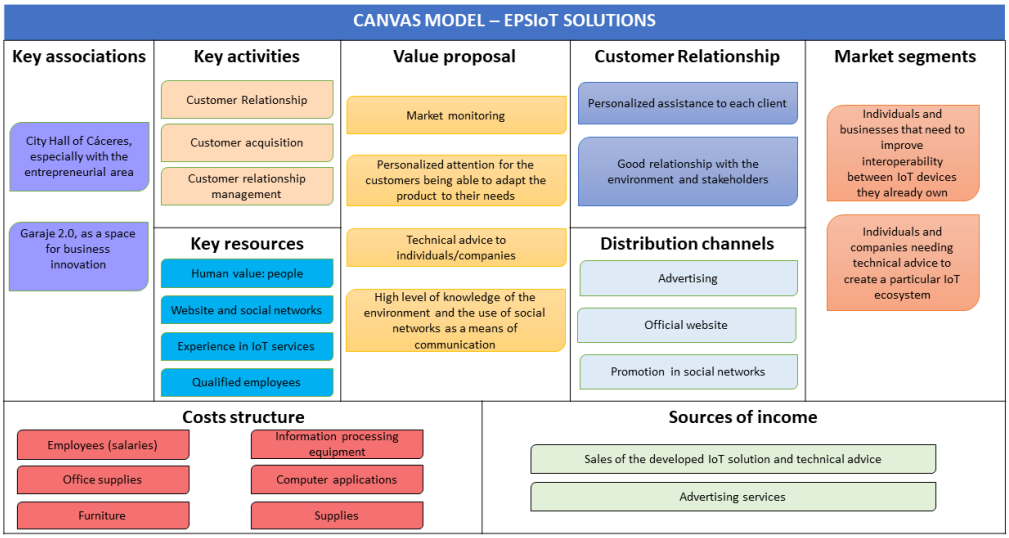

Figure 4.9: Canvas model for EPSIoT Solutions

Chapter 5

Conclusions and Future Work

The Internet of Things is increasingly present in people's lives. Whether for individuals or companies, there are IoT devices that make our lives easier by performing tasks automatically or facilitating their performance. We have more and more intelligent devices such as light bulbs, televisions, clocks, refrigerators, activity bracelets, or any other device that facilitates our daily lives.

There are many companies dedicated to the manufacture and sale of intelligent devices. These devices are usually focused on a specific domain such as the intelligent home, agriculture, automobiles, industry or health care, among others. Unfortunately, interoperability between these devices is not easy, as there is a limitation when the devices belong to different domains and even different manufacturers. Because of this, there is current work focused on addressing these limitations. One of these works was carried out by the author of this master thesis where the interoperability of IoT devices was improved through the development of a product that uses different technologies. It is for this reason that in this master thesis a business plan has been developed to commercialize such a product.

Therefore, in this master thesis has been made a complete business plan, taking as a guide mainly the subjects taken during the second semester where, first, analyzes the market of the Internet of Things in relation to the interoperability of devices, and then make the business plan for the creation of a startup that is dedicated to the activity of selling the product developed, in addition to providing technical advice.

The business plan developed looks promising, but it is necessary to be cautious and carry out a continuous monitoring of the market to know its status. In addition, as a future job, it is intended to make an appropriate marketing plan, which for lack of time has not been included in this work. In addition, we also want to make various adjustments in the calculations made to have a more faithful idea of the chances of success of the startup within the market of the Internet of Things.

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