It's not ~~LIKE~~ a Personal Cloud

It is YOUR Cloud

TABLE OF CONTENTS

INTRODUCTION 1
The Company 1
CLOE 1
Objectives and long term plans 2
STRATEGY OUTLOOK 3
Analysis of the environment 3
The PESTEL Framework 3
SWOT Analysis 5
Analysis of competition 7
Competition in the Five Forces model 7
Business Strategy 8
Business Model Canvas 9
MARKETING PLAN 12
Strategic Marketing Plan 12
Pretotyping 12
Market Segmentation 16
Targeting 16
Positioning 17
Operational Marketing Plan 20
Product Policy 20
Sales Forecasting 22
Distribution 26
Communication 30
Pricing 36
OPERATIONS PLAN 41
Introduction: products and processes 41
CLOE: the physical device 41
CLOE PRO: the enterprise physical device 43
CLOE OS: the operating system 43
CLOE Applications: mobile app and desktop software 45
CLOE.COM: the website 47
CLOE CARE: the maintenance service 48
Factory layout and process planning 49

Initial layout 49
Plant layout for the fully operational phase 51
Aggregate planning and master scheduling 54
Operational strategies 54
Aggregate plan for year 1 54
BOM, MRP and suppliers management 58
The Bill of Materials 58
Suppliers management 58
The MRP 60
Industrial costs 65
Variable costs 65
Fixed costs 65
Lean Management, Quality management and Continuous improvement policies 68
Lean Management 68
Quality management and Continous improvement 71
FINANCE PLAN 75
Cost Classification 75
Manufacturing costs 75
Non-manufacturing Costs 77
Cost Accounting System 78
Cost-Volume-Profit analysis 79
Year 1 CVP 80
Year 2 CVP 80
Year 3 CVP 81
Final CVP for the second and third years 81
Profit and Loss 84
Assets and Liabilitites 84
Assets 84
Equity and Liabilities 85
Explanatory notes 85
Scheme 86
Preliminary Considerations 87
Notes to the financial statements 89
Economic and finantial ratios 97
First Year Ratios 97

Second Year ratios 97
Third year ratios 101
Budgeting 103
Choosing a budget period 104
Budgeting system 104
Master budget 105
Risk assesment and risk management documents 106
Project plan risk identified 106
Credits and liquidity risk management 110
PROJECT PLAN 111
Team culture 111
Organizational Structure 111
Staff to be hired 112
Top responsibilities and KPIs 113
ANNEX - PROJECT MANAGEMENT 115
Creation of the Business Plan 115
Planning 115
Scheduling 118
First year – Cloe development 120
Planning 120
Scheduling 126
RIsk management 129

INTRODUCTION

THE COMPANY

HNS (Hungry Nerds Solutions) is an innovative startup in the technology field that wants to become the Italian leader in *personal cloud devices*. We live in the age of data: huge amounts of data are generated every second from our personal devices and we cannot lose them!

Managing and safeguarding data is an increasingly important and complex task, both for individuals and for enterprises. Our company wants to bring to the market products that make this process easy. We strongly believe that all people have the right to protect their personal data, at an affordable cost.

Our first product will be CLOE, which is the subject of this business plan.

CLOE

CLOE (CLoud at hOme Experience) is a personal Cloud device, which allows users to take advantage of all the benefits of a Cloud in the security of their home environment.

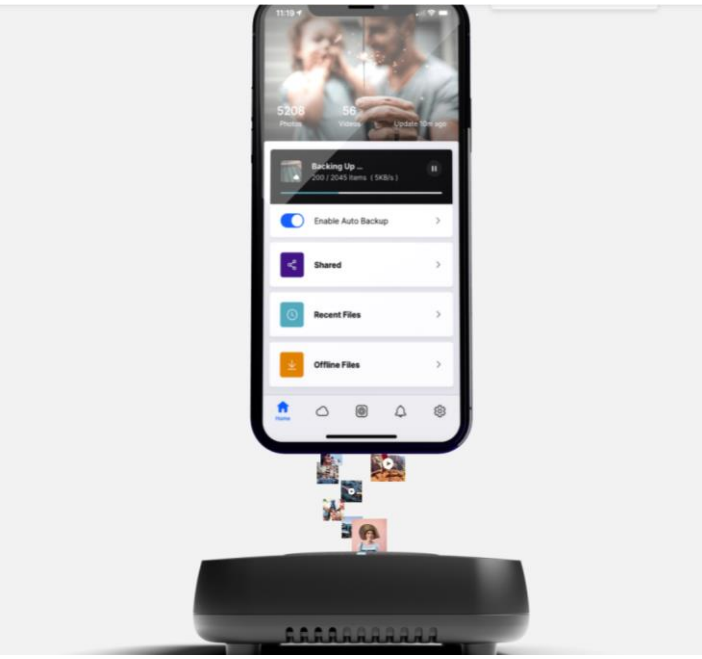
Traditional Cloud Storage Services have a long history of violating user privacy, and due to their centralized nature, a violation can affect millions of users.

The idea is to avoid using third-party clouds to store personal data, thus giving users a complete control over their data and who sees them and avoiding having to pay a monthly subscription.

The files are stored locally on the device and then become accessible (only to the actual owner) anywhere in the world via a mobile or desktop application, quickly and safely.

CLOE will allow users to easily manage their own data organizing it cleverly, to share it with friends and family and to make it available for their work, entertainment or simply for their everyday life.

The only thing the user must do, to be able to store his/her files forever in an efficient and secure way, is to buy the product and place it at home near the modem: *nothing could be simpler!*



CONNECT WITH ANY DEVICE: compatibility issues are old memories, users can download the application on any iOS, Android, Windows or MacOS and start enjoying CLOE.

CLEVER ORGANIZATION: sorting, searching and gathering files and media is now super easy. Just save files in CLOE and let the AI make the magic.

ANYTIME, ANYWHERE: access to files from anywhere in the world using the application in a quick and absolutely safe manner, all the user needs is an Internet connection. Doesn't him/her have access to it? Every single file can be locally downloaded and accessed offline.

SHARING IS CARING: share files and media in an easy and controlled manner. Users can exploit third-parties application, or share files with other CLOE devices, until 4, having also the control on the accesses and the privileges.

DON'T LOSE ANYTHING: through the application, users will have the possibility to automatically back-up their own devices, to save space or simply to avoid losing them, and it will be fast, very fast.

BUILT-IN SECURITY: secure storing, secure authentication and secure connection means secure life.

REVIVE MOMENTS: not only stored media, cast and stream functionalities to Smart TVs or other external devices at home or on the go. How? Of course, securely.

ILLIMITED EXPANDABILITY: connect external Hard Drives to CLOE and enjoy the additional space earned. For free

NO SUBSCRIPTIONS: buy once, use forever.

YOUR HOME, YOUR RULES: stop privacy violation, protect data bringing it back to home!

I NEED MORE: no problems at all, the enterprise edition CLOE PRO allows for increased storage space, additional organization features, enhanced speed and complete streaming possibilities, including 4K resolutions and Master Audio formats

OBJECTIVES AND LONG TERM PLANS

These are the plans for the following years:

- 300.000 sales over the life cycle of CLOE.
- Be profitable starting from the second year.
- Reach 7M of revenues for the third year.
- The development of the new version of CLOE from the fourth year (third year of production), so that it can be launched when CLOE reaches the decline phase.

All these aspects will be covered in the following sections, this is just a summary.

STRATEGY OUTLOOK

We know that the difference between success and failure lies in an organization's strategy. A good strategy enhances the chances of achieving competitive advantage and superior performance against competitors. To create an excellent strategy, it is necessary to use the *AFI framework*, dividing this process into three interdependent tasks (analysis, formulation, and implementation). We will cover these steps in details.

ANALYSIS OF THE ENVIRONMENT

It is critical to conduct a thorough analysis of the firm's external environment to identify threats and opportunities. The external environment consists of all the factors outside the firm that can affect its potential to gain and sustain a competitive advantage.

THE PESTEL FRAMEWORK

The first step is to apply a PESTEL analysis to evaluate the firm's *general environment*, hence the external factors on which we have no direct influence. We have decided to develop our business in our country, Italy. But to be sure of the goodness of this choice it is necessary to perform a PESTEL analysis.

POLITICAL FACTORS

We need to consider all the influences that the government has on our business. First, it is important to say that *political stability* in Italy is above the world average, but it is not very high. Our country is 73rd globally[1], which is not a very satisfactory result. *Bureaucracy* is also a big problem, as Italy has one of the worst bureaucracies in Europe. However, Information Technology is the fourth largest industrial sector in Italy, with approximately 97,000 companies and 390,000 employees[2]. In Italy incentives for startups are increasing, mainly in the technological field.

ECONOMIC FACTORS

The Macro environment factors such as inflation rate, savings rate, interest rate, foreign exchange rate and economic cycle determine the aggregate demand and aggregate investment in an economy. The Italian economic system is a mixed economy (article 41 of the *Italian Constitution*). Economic systems of a mixed type rely on private initiative and on the intervention of the state which coordinates the national economy. The Italian inflation rate at the end of 2019 was 0.6%[3], which is a positive result considering the 1.2% in 2018. Price stability helps the economy grow, long phases of inflation or excessive deflation have negative effects on the economy. Also, the *growth rate* is an important measure, in 2019 the GDP was 0.343%[4], less than the 2018 value, 0.944%. Growth rate directly affect the level of employment. The Italian *employment rate* in December 2019 was 59.2%[5]. It is also well known that the *level of taxation* is very high, with a rate that grows a lot as company revenues increase. The personal cloud market size was valued at $26.80 billion in 2019 and is projected to reach $161.39 billion by 2027[6]. The increasing use of camera-equipped devices, such as smartphones and tablets, has created a huge demand for a secure platform to store digital content. Finally,

[1] https://www.theglobaleconomy.com/rankings/wb_political_stability/#Italy
[2] https://st.ilsole24ore.com/art/SoleOnLine4/dossier/Tecnologia%20e%20Business/2009/smau2009/cronaca-salone/smau-2009-investimenti-informatica.shtml
[3] https://www.rivaluta.it/serie-inflazione-media.asp
[4] https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=IT
[5] https://www.istat.it/it/archivio/237933
[6] https://www.alliedmarketresearch.com/personal-cloud-market

we need also to consider the *currency exchange rate*, that is a critical variable for a company like ours that purchases raw materials from abroad. As will be explained later, we will not only have Italian suppliers, but also Chinese, Japanese, and Indian suppliers. As for the Chinese currency, the exchange rate is currently *1 EUR = 7,84 CNY* (Chinese yuan). As for the Japanese currency, the exchange rate is currently *1 EUR = 131,35 JPY* (Japanese Yen). As for the Indian currency, the exchange rate is currently *1 EUR = 88,39 INR* (Indian Rupee).

SOCIO-CULTURAL FACTORS

A first factor to be taken into consideration is certainly *age*, it is well known that the new generations tend to be more interested in new technologies and often only they can understand them (for example artificial intelligence). This leads us to consider the problem of the *digital divide*, which involves discrimination because a part of the population remains excluded from technologies. The categories of people most affected by the digital divide are those with low levels of education, who are unable to use IT tools. So, there is a great need for solutions that are easy to use, so that they can be used by everyone. It must be considered that the level of education in Italy is not very high compared to the European average, especially if the new generations are not considered. The issues of digital access and equality take on considerable importance today. Other than that, people are afraid that their personal data can be seen by others. And very often they are not comfortable knowing that their data is stored in public clouds.

TECHNOLOGICAL FACTORS

Investments in the technology sector are increasing year after year[7], for example Milan is among the top 20 European hubs for funding received, but there is still a delay compared to countries such as Germany, France, and Switzerland, which have attracted greater investments. As reported by Eurostat[8], the use of cloud computing services (and therefore also cloud storage) is increasing dramatically in Italy, which ranks among the best in Europe regarding this statistic. This increase in the use of cloud services results in a greater knowledge and interest of these technologies by people. However, as previously said we must consider the digital divide, which is not very high, but is still present, mainly due to the lack of broadband connection in some areas of Italy. In fact, the speed of the internet connection in Italy is not among the best in Europe, quite the contrary. But it is also true that in recent years the trend has been changing, with improvements throughout the Italian territory.

ECOLOGICAL FACTORS

The theme of the environment is increasingly important today, and this also happens in Italy. People are becoming more sensitive on this topic, also driven by fear of climate change. Among the most important aspects are recycling and the use of renewable energies. Disposal of electronic waste is one of the key problems of technological progress. As for Italy's performance compared to the European average[9], Italy is a leader in the recycling and recovery of waste, consumes less energy and less raw material, emits fewer greenhouse gases. So, Italy focuses a lot on these aspects. All these aspects encourage the use of environmentally friendly package for Data Storage devices.

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[7] https://www.corrierecomunicazioni.it/digital-economy/2019-record-per-i-tech-investimenti-in-italia-ma-mancano-skill-per-il-futuro/

[8] https://ec.europa.eu/eurostat/statistics-explained/index.php/Cloud_computing_-_statistics_on_the_use_by_enterprises

[9] https://www.agi.it/economia/energia/emissioni_inquinanti_gas_serra_dati_italia-6282838/news/2019-10-03/

LEGAL FACTORS

The data protection and privacy regulations are currently much more stringent in Europe than those in the United States. In fact, in 2018 the EU implemented the General Data Protection Regulation (GDPR), which gives individuals wide-reaching control over their personal data as well as secured protection of these data. GDPR grants all EU residents far-reaching rights concerning their personal data, including the right to access, the right to be forgotten, and so forth. In Italy there is also the GPDP (*Garante per la protezione dei dati personali*), to ensure the protection of the rights of fundamental rights and freedoms and respect for dignity in the processing of personal data. *Personal cloud storage devices guarantee greater data privacy*. In fact, Google, AWS, iCloud, and so on have a long history of violating user privacy, and due to their centralized nature one breach can affect millions of users. It must also be considered that our product must meet the requirements to be distributed with the *CE mark*[10]. The CE mark certifies that the product has been assessed by the manufacturer to meet the EU requirements for safety, health, and environmental protection.

Political	Economic	Socio-cultural	Technological	Ecological	Legal
•Too much bureocracy •IT is the fourth largest industrial sector •Incentives for startups are increasing, mainly in the technological field	•High level of taxation •The personal cloud market size in the world is projected to reach $161.39 billion by 2027 •Currency Exchange Rates for Chinese, Indian and Japanese suppliers.	•Age •Level of education •Digital divide •People are afraid that their personal data can be seen by others •People want to easily manage their data	•Investments in IT sector are increasing •The use of cloud services is increasing •The speed of the internet connection in Italy is low	•Disposal of electronic waste is one of the key problems of technological progress •Italy is a leader in the recycling and recovery of waste •Need of environmentally friendly package for Data Storage devices	•Data protection and privacy regulations are stringent in Europe •GDPR and GPDP for personal data rights •Personal cloud storage devices guarantee greater data privacy. •CE mark

SWOT ANALYSIS

Let us now consider the SWOT analysis, which allows us to define which are the critical factors that guarantee the success of our business. This analysis, like so many others, must be repeated over time. Now let us consider the analysis performed during the launch phase of the business. The first two points to consider derive from internal management and are the strengths and weaknesses. The remaining two points derive from the external environment and are the opportunities and threats.

STRENGTHS

The followings are the main strengths of our company:

- The management is formed by a group of IT engineers with strong knowledge in all aspects necessary for the production and management of our product.
- We have experience in working together and we have a *cooperative culture*.
- None of our competitors are in Italy, this allows us to be closer to our Italian customers and so offer a better service (faster delivery speed, faster assistance and so on).
- We focus a lot on the *quality* of our products.

[10] https://europa.eu/youreurope/business/product-requirements/labels-markings/ce-marking/index_it.htm

WEAKNESS

The followings are the main weakness of our business:

- Strong dependence on hardware manufacturers, as our production is an assembly of hardware components purchased from manufacturers.
- It is necessary to hire highly educated employees (such as computer engineers and researchers) and therefore have a high salary load.
- Some of our competitors can guarantee a high storage capacity at low price because they themselves are manufacturers of hard drives (e.g., Western Digital).

OPPORTUNITIES

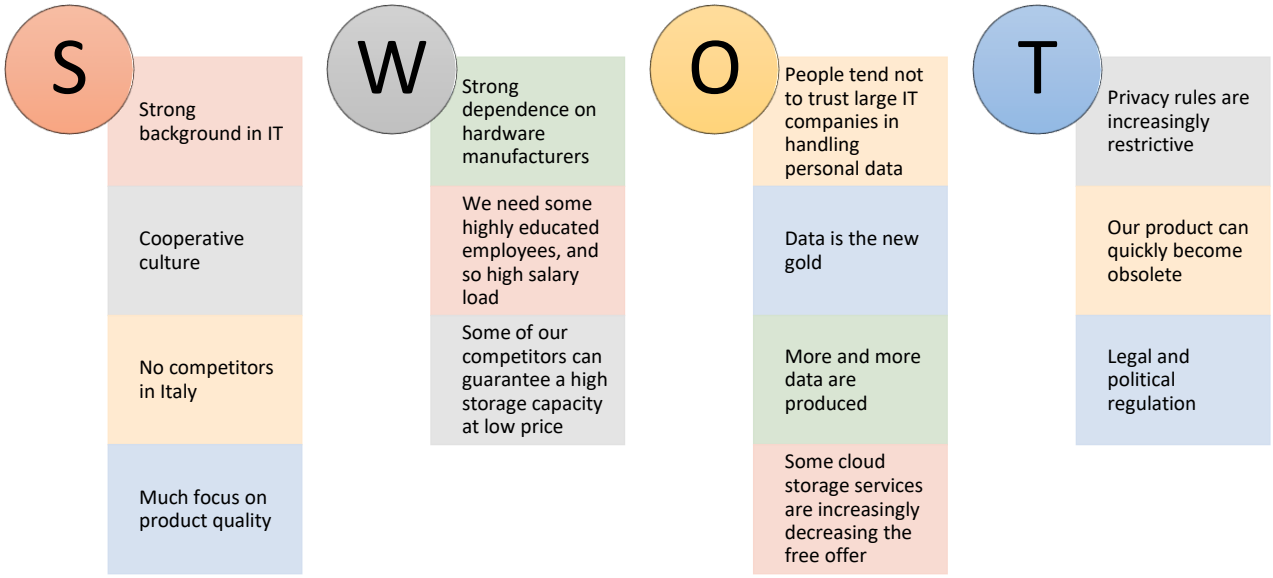
The followings are the main opportunities for our business:

- People tend not to trust large IT companies (such as Google) when it comes to handling personal data. A personal cloud allows customers to feel more confident about the security of their data.
- The need to perform backups from customers' mobile devices is increasing, with an ever-increasing amount of data produced by them.
- In an increasingly technological society *data is the new gold*, and its storage and security are increasingly important. As a result, the data storage market is growing dramatically.
- Some cloud storage services such as Google Drive are increasingly decreasing the free offer, requiring a payment for those services that were previously free. For example, from June 2021 Google Drive will only leave 15GB for the free plan, leading a large portion of customers to enter a paid contract.

THREATS

The followings are the main threats:

- Privacy rules are increasingly restrictive, mainly in Europe.
- In the field of information technology, things change quickly, our product can quickly become obsolete.
- Legal and political regulation.



ANALYSIS OF COMPETITION

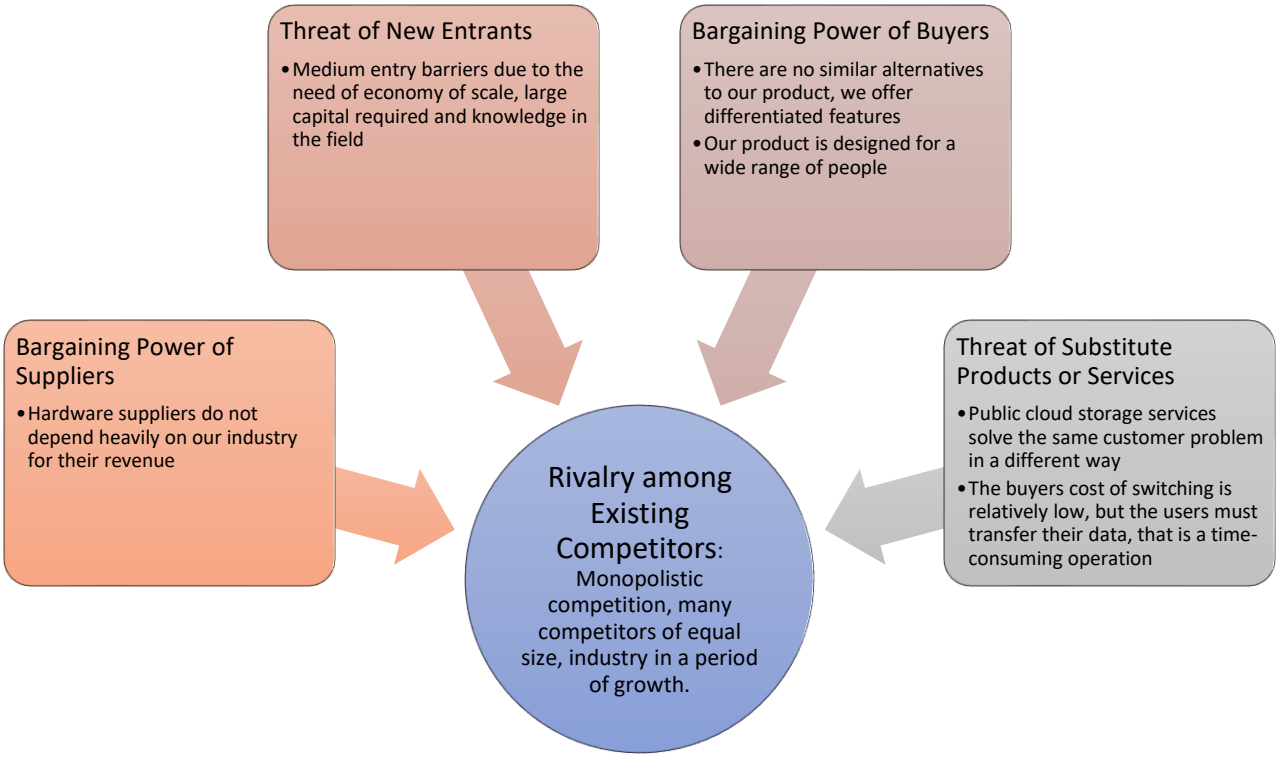
To gain and sustain a competitive advantage it is also necessary to analyze the level of competition within a certain industry. Competitiveness does not only come from competitors.

The industry we want to enter is that of *personal cloud storage solutions*. Those who produce them will be our direct competitors.

COMPETITION IN THE FIVE FORCES MODEL

This is a method for analyzing competition of our business. It considers five forces that determine the competitive intensity and the attractiveness of an industry in terms of its profitability. The stronger the five forces, the lower the industry's profit potential. The weaker the five forces, the greater the industry's profit potential.

We will analyze these forces one by one.



THREAT OF ENTRY

It is well known that in every industry there are barriers that limit the entry of new competitors. The higher these barriers to entry, the smaller the threat for existing players. In our case the entry barriers are due to the need for an economy of scale, the large capital required to start and the necessary knowledge in the sector. In this case the threat of entry is therefore relatively low, also considering that incumbents do not possess referential access to raw material and do not possess proprietary technology.

POWER OF SUPPLIERS

Since we want to produce good quality product, we must rely on good suppliers for hardware components, so suppliers exert a considerable force on our business. Suppliers also do not depend heavily on our industry for their revenues, there are a lot of devices in the world that needs their hardware components.

POWER OF BUYERS

Since our product offers differentiated features compared to competitors, there are no similar alternatives to our product, our product focuses on differentiation. In addition, our product is designed for a wide range of people (our market segments enclose many people).

So, in our case the strength of the buyers is not very high, so buyers cannot threaten us.

THREAT OF SUBSTITUTES

The existence of products outside of the realm of the common product boundaries increases the propensity of customers to switch to alternatives. We need to consider all the product that serves a similar need for customers. In our case we need to consider the companies that offer public cloud storage services. They solve the same customer problem, but in a different way. The buyers cost of switching, regarding the monetary cost, is relatively low, so it is a threat to consider. But there is also to consider that users must transfer their data from one platform to another, which is usually a time-consuming operation.

RIVALRY AMONG EXISTING COMPETITORS

This last force of the Porter's Five Forces examines how intense the current competition is in the marketplace, which is determined by the number of existing competitors and what each competitor can do.

First, we need to consider the competitive industry structure, that in our case is the *Monopolistic Competition*. Indeed, our industry has some obstacle to entry, and firms offer products with unique feature. In this structure, firms that sell a product with unique features tend to have some ability to raise prices. There are many competitors in the industry and the competitors are roughly of equal size. The exit barriers derive mainly from the cost of the production plant.

We have also to say that our industry is in a period of growth, we have just said that the personal cloud market size was valued at $26.80 billion in 2019 and is projected to reach $161.39 billion by 2027[11]. In period of high growth, consumer demand rises, and price competition among firms frequently decreases. Rivals are focused on capturing new demand rather than taking market share and profitability away from one another.

BUSINESS STRATEGY

As we know it is not possible to maximize the value and minimize the cost, so we need to find a compromise. We have decided to follow a *differentiation strategy*, considering the strategic group of low-cost private clouds. We want to offer additional features compared to the competition, and this involves higher costs. To avoid repetition, the value proposition was reported directly with the Business Model Canvas.

Until now we were in the analysis phase, now we are going to formulate our strategy, and in the following sections it will be possible to see its implementation.

[11] https://www.alliedmarketresearch.com/personal-cloud-market

BUSINESS MODEL CANVAS

The Business Model Canvas allows to visually represent how our company creates, distributes, and captures value for our customers. With the Business Model Canvas, all stakeholders can understand the elements that concern the functioning of the company, in a simple and extremely intuitive way.

To create value, a firm needs to answer to several questions. Now we are going to them.

FOR WHOM ARE WE CREATING VALUE? As we will see in detail in the marketing section, the customers of our company can be divided into two main categories: the *self-employed*, who use the product for work purposes, and the customers who use our product for personal use. These differences are mainly related to the amount of use and the required storage capacity.

WHAT VALUE ARE WE OFFERING TO OUR CLIENTS? Our product is different from the competition, we want to offer the best possible product to our customers, to meet their needs. First, our product must store data securely, paying particular attention to the privacy and security aspects. This is even more important when considering the self-employed, who will use the product to store their sensitive business data, such as photographs, code, and other digital products. Another fundamental aspect is access to data, which must take place in a simple and intuitive way. In fact, our customers must be able to access their data through their everyday devices, such as smartphones and PCs. In the modern era it is also essential to allow the sharing of content between users, such as the sharing of photos and music between friends. Our product is designed to allow this sharing, with a limited number of people. The product is also very easy to install, we do not want to waste our customers time, and it is small in size. Having different types of customers, we have decided to produce different versions of the product, to meet their needs more precisely. It must also be considered that having a private cloud allows customers to obtain even better performances, e.g., faster data access when on the same network at home or office. Our product has also a simple but stylish design, with an eco-friendly package and quality materals. It has expandable memory and back-up functionalities.

Most surprisingly, *our product does not require a monthly subscription to use*! Our customer just needs to pay for the device.

HOW DO WE CONVEY THIS VALUE TO THE CUSTOMER? Our product is mainly aimed at a young audience, who can understand the service. As main channels we therefore decided to use a website and social media, to reach the customers and sell the product directly. We will also use retailers as intermediaries, who facilitate the distribution of the product for us. We will cover this in detail later.

WHAT TYPE OF RELATIONSHIP DO THEY EXPECT? It is essential to maintain a relationship with customers, both to guarantee them assistance and to be able to reach them for information on new products. To minimize the need for personal assistance, we have decided to implement both an automatic BOT for replies and a FAQ and guide section on the site. Through the site we want to create a community of customers, to make them feel more involved and to help each other. The presence of a community can also be useful for getting interesting information for new versions of the product. In addition to this, an instruction manual will be provided with the product. The product will obviously be covered by a guarantee which must be at least 2 years in Europe. In addition to the two-year warranty, there is also an optional CLOE CARE warranty, a supplementary one-year warranty that allows you to replace some components such as the plug-in cable for a certain number of times.

WHERE DO THE REVENUE STREAMS COME FROM? The cash flows derive mainly from the sale of the product, both direct and indirect. But there are other revenue streams as well. The first is given by the fact

that personal data can be shared with *four* other people; it is possible to increase this number upon payment. Another source of income comes from CLOE CARE. Finally, there are also the gains due to the repair of the devices when no longer under warranty.

WHICH COST WILL WE INCUR? Let us now consider the main costs of our business. Surely, we must consider the creation and management of the website, the OS and the application to access personal data through personal devices. Another fundamental cost is certainly the procurement of hardware components, necessary to physically produce the product. Along with this we must mention the production plant. We also need some employees, both for production, for channel management (e.g., social media manager), and for R&D. We must also consider the need for a storehouse, where to store the products produced.

WHICH ARE THE KEY RESOURCES IN WHICH WE SHOULD INVEST? The main resources in which we need to invest are certainly the website, the mobile application, and the PC application. In addition to these we have the production chain and the staff, who must be well trained, with particular attention to solving customer problems. Other key resources are social media.

WHICH KEY ACTIVITIES ARE NECESSARY? Among the main activities we have the production and distribution of the product, the management and maintenance of the website, the OS, the mobile app, and the PC application. Solving customer problems is also an important activity, such as managing social media.

WHAT ARE OUR KEY PARTNERS TO GET COMPETITIVE ADVANTAGE? The main partners to consider are certainly the hardware manufacturers. We also need to allow our customers to pay with their credit cards on the site, so credit card companies will be key partners. We must also consider as partners the retailers and app stores in which we are going to distribute the mobile applications. Finally, the applications will be developed by an external company, so we must also consider this company as a key partner.

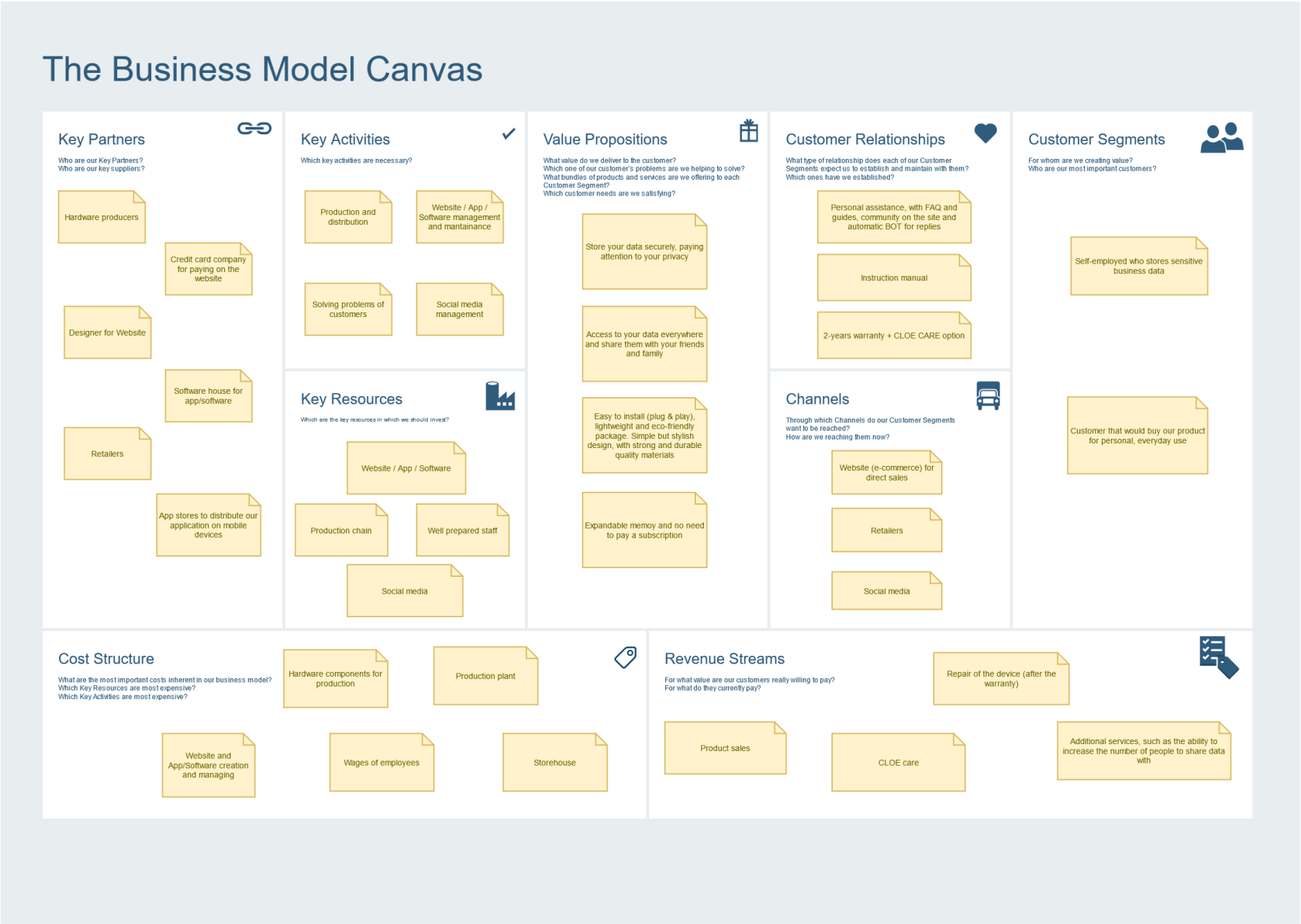


Figure 1 - Business Model Canvas

MARKETING PLAN

STRATEGIC MARKETING PLAN

PRETOTYPING

WHAT IS PRETOTYPING? Pretotyping is a set of tools, techniques, and tactics designed to help to validate any idea for a new product quickly, objectively, and accurately[12].

According to Alberto Savoia, the founder of pretotyping, there is a general law that dominates the market: the *Law of Market Failure*. This means that most new ideas will fail in the market, even if competently executed. As a startup company with a fairly innovative product in mind, failure for us is just around the corner and we must do everything in our power to prevent it.

Obviously, the goal of our company is for our idea to be successful, but before we invest time and money in producing this new product, we need to make sure it is worth it, that is, that someone is actually interested in buying it.

THE IDEA Our idea, as has already been presented, is to make a Personal Cloud device. This device, along with its software, allows the owners to store their files securely, access them from anywhere in the world and share them with their friends and family. All of this is made possible without having to pay a subscription fee and having to entrust files to a large company.

MARKET ENGAGEMENT HYPOTHESIS Now that the idea is fixed, it is important to clarify what the basic premise is and how we expect the market to engage with it, namely the *Market Engagement Hypothesis*.

Our idea came from a simple observation: the number of users of Cloud Storage services is increasing every year, mainly because of necessity – we produce more and more data and we want this data to be accessible wherever we are. However, not all users are happy with the service that is currently available to them.

Part of them, in fact, would like to be able to have more storage space without having to bind themselves to a monthly or annual subscription. Plus, these services are offered by large companies that have a history of violating their users' privacy and hacker attacks, so not all users trust them, and part of them would prefer a private and more secure solution.

XYZ HYPOTHESIS Our market engagement hypothesis is too general as it is, we need to try to "say it with numbers" in order to make an objective and testable hypothesis. Our *XYZ hypothesis* is as follows:

> ***(X:)At least 20%*** *of* ***(Y:)people who are using Cloud Storage services*** *are not satisfied with the storage space at their disposal and* ***(Z:)would be happy to pay about 200 euros in a one-shot payment for a Personal Cloud device*** *rather than paying an annual subscription to a Public Cloud Company.*

This hypothesis is for sure less vague, but testing it is still definitely infeasible as we do not have the necessary means, time and money. We need to implement what's called hypozooming, which is “zooming in” our hypothesis to a smaller and local scope. In this way *Y*, a description of our target market, becomes:

> ***(y:)people in our network who are using Cloud Storage services***

[12] https://www.pretotyping.org/

Therefore, in order to test our hypothesis locally, we created a survey[13] that we sent to our friends and family, asking them to share it in turn to their connections.

TESTING THE INITIAL LEVEL OF INTEREST The survey we created was intended to test our *xyz hypothesis* and assess the *Initial Level of Interest* (ILI) in our product. In just a few days, we collected more than 300 responses and we were able to obtain promising results.

The survey was divided into three sections:

- A first section included general questions to collect profile information about the participants
- The second section included questions regarding the Cloud Storage service they were using (if any)
- Finally, the third section contained a small presentation of our product and some questions about it

We present below some of the results gathered from the survey.

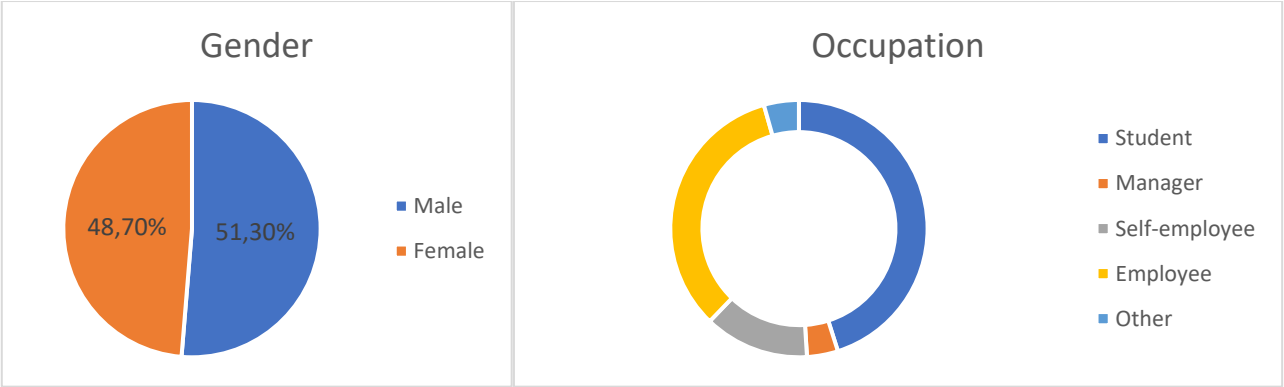


Figure 2. ***Profile information about the participants in the survey***

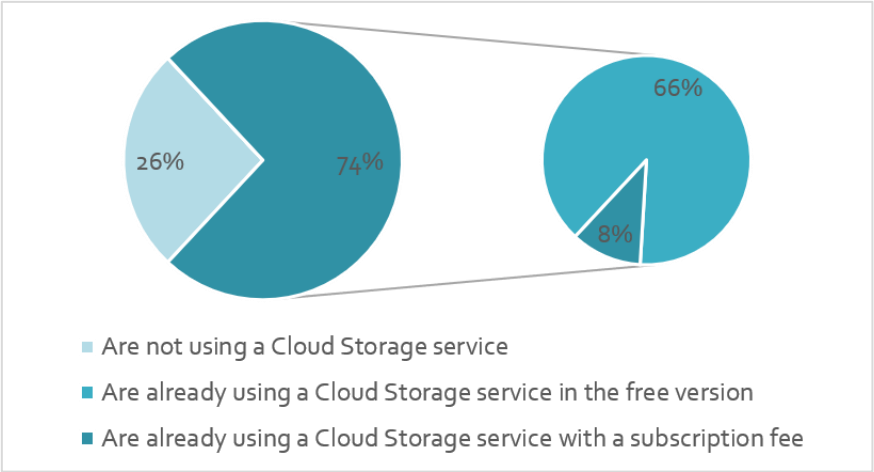


Figure 3. ***Usage of Cloud Storage services***

Figure 3 shows what emerged from the survey: most respondents are currently using a Cloud Storage service to store either their personal files or their work-related files (or both). This is not new to us, we know that such services have now become basically essential for many people.

[13]The survey, in Italian, can be found at: https://forms.gle/piaNUd6KSGx1LArn8

What is interesting is that only a small portion of them is currently taking advantage of the paid version of the service. The subsequent questions allowed us to investigate the issue further; *are they using the free version because it's already enough for them, or is there some reason holding them back from using the paid version?*

We have been able to find out that, although they are not completely dissatisfied with the service, most people would like to have more storage space (Figure 4). So, *why don't they pay for more space?*

One reason seems to be that the majority of them don't like having to pay a subscription (monthly, yearly, etc.) but would instead prefer to be able to pay in a lump sum.

Another fact to note is that a large percentage of them said that they do not completely trust the company to which they have decided to entrust their files, and that they are afraid that some malicious person might get access to them.

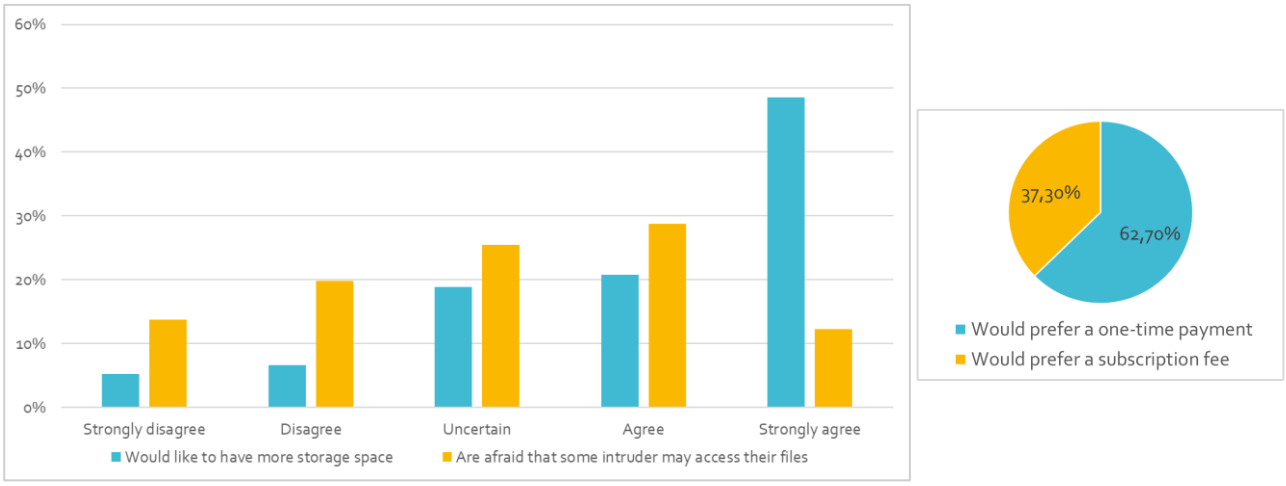


Figure 4. ***Participants satisfaction with the service they are currently using***

After reading a description of our product, the participants were asked the crucial question: *"Would you buy our product?"*. As seen in Figure 5, the results were encouraging; most people expressed their willingness to buy our product – with 10.30% saying "Definitely yes" and 47.40% saying "Probably yes". In addition, only 12.10% said they didn't want to buy it, leaving us with 30.20% of "undecided".

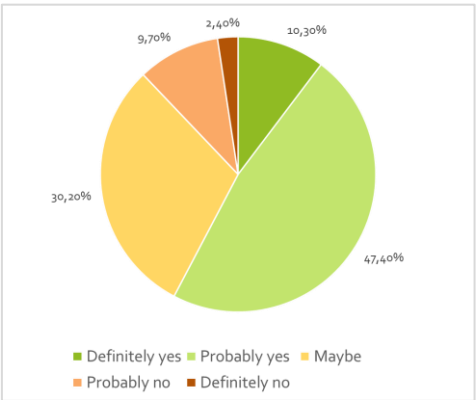


Figure 5. ***Participants' interest in purchasing our product***

People were also asked how much they would be willing to pay for the product. Responses varied widely, but the average expected price was around 200 euros (as seen in Figure 6).

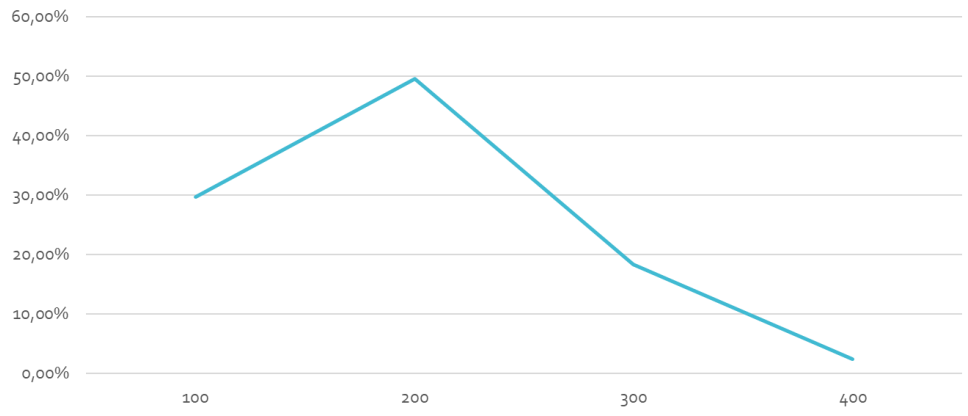


Figure 6. ***Expected price for the product***

What we have been able to notice is that those who are not currently using Cloud Storage services (and therefore are less familiar with this type of technology) are also less interested in purchasing our product and couldn't accurately predict a reasonable price for it. But not only the small percentage of people who are currently using a paid service are interested in purchasing CLOE, in fact even the majority of people who are using a free service seem intent on switching to our product.

In any case, the results obtained confirmed our hypothesis and even exceeded it. For this reason, we believe our previous assumption is reasonable.

At the end of the survey we also asked participants what they thought were the essential features of the product. In this way, we were able to identify which are the main features we should focus on and invest in more, and which are instead additional benefits.

THE "FAKE DOOR" TECHNIQUE While filling out the questionnaire, people were asked to optionally enter their email, knowing that we could contact them in the future for product updates. So, after two months from the survey, we decided to put into practice the pretotyping technique called "fake door".

What we did was send an email to everyone who had left us their contact information announcing the launch of the product on the market. The email contained the link to our website, on which it would have been possible to purchase the first limited available copies of CLOE.

Actually, those who clicked on the link were brought to a specifically created web page stating that the first units of CLOE were already sold out, but that it was possible to put themselves on the waiting list to buy the units produced later on.

It is important to note that at that time the product was yet to be developed but, by suggesting that it was already available, we were able to understand how many people were actually interested in buying it.

As a result of the survey, we had emails from 167 people. The mentioned link was visited by almost all of them (163 people), and 138 of them, around 83%, left their contact information to get on the waiting list.

Although this result is not surprising, because most of the people who had left their email had already expressed an intention to purchase our product, it allowed us to give even more value to our hypotheses. In fact, signing up on the waiting list by indicating, among other personal data, the email address and a phone number requires a certain level of "*skin in the game"* that somehow is an evidence of interest in our idea.

MARKET SEGMENTATION

WHO WILL OUR CONSUMERS BE? First, it is important to say that since the product our company is going to offer is a technological one, it will be intended for consumers who are comfortable with new technologies. This does not mean that they must be experts in the field, but they should at least be familiar with smartphones, computers, and the use of cloud storage services. In a sense, this puts a limit on the age of our target market, as youngsters and most likely elders will not be interested in purchasing our product.

In any case, as we are experiencing the digital transformation, this market covers a large portion of the entire population and it includes a heterogeneous group of people. Therefore, it is important for us to analyze the market in order to identify customer segments with common needs.

In our opinion, the most fitting method for customer segmentation in our case is a combination of both behavioral and psychographic criteria. As for profile variables, we do not think they can contribute significantly to differentiating our customers' needs.

Basically, within the market we can identify two large segments based mainly on the lifestyle of our customers and the consequent use they would make of our product.

The **first segment** includes all those self-employed workers and freelancers (e.g., photographers, video editors, programmers, artists, etc.) who would make heavy usage of our product and would need to store large amounts of data, not only for personal use but also for their clients. Large storage space is paramount for these people, and privacy is critical, as a security breach could compromise the trust of their clients and consequently their work.

The **second segment**, on the other hand, includes all those people who would buy our product for personal, everyday use. In this case, supposedly not much storage space is needed, and the usage of the product would be lighter. Privacy is still an issue, but not as critical as with the previous segment, and the possibility to share files with family and friends is paramount instead.

These two large segments could, of course, be somewhat subdivided in turn into smaller segments. However, we think this might not be profitable for our company since the customers' needs within a segment are already relatively homogeneous.

TARGETING

WHICH SEGMENTS WILL WE SERVE? Once we have identified what the market segments are, it becomes critical for us to decide which and how many of them we want to compete in. As we know, there are four generic target marketing strategies, but we think that not all of them are suitable for our company.

Implementing an undifferentiated marketing strategy may seem very attractive at first, as it is certainly cost-effective to only need to develop a single product and marketing strategy. However, the line separating the two market segments is quite clear, so it would be wiser to choose a strategy that is committed to meeting the diverse needs of our customers.

A completely opposite approach would be to opt for customized marketing. This way we could try to vary our offerings based on each customer, so that we can meet their needs at 100%. This alternative, though, would be very expensive to the point that it would no longer be profitable for our company. Moreover, we

think that our product does not accommodate to a high level of customization, because there are not many components that can be changed to obtain, for instance, higher performance or more storage.

As an alternative, we could choose to focus on just one segment, practicing focused marketing. In this case, surely, we could save resources and focus our attention on developing one product and one marketing strategy only. Nevertheless, both segments are potentially very profitable, so choosing just one to serve could be a risk. In fact, it is true that we would save something in terms of resources, but we would lose a large slice of the market and, consequently, many profits.

In conclusion, the target marketing strategy that seems best suited to our company is **differentiated marketing**. With this type of strategy, the goal is to design a different marketing mix for each of the two segments, so that we can best meet the needs of our clients.

The basic idea is to have a single product to which different components can be applied to offer different performance and storage depending on the segment it is aimed at. In particular, we will be proposing two versions of the product (CLOE and CLOE PRO), the first for “family use” and the second for more work-related use.

In this way we can also leverage the economy of scope, as we would be using the same machineries and materials for most of our production.

Also, direct promotion to the two segments will be different; in fact, it will be crucial to focus on the specific needs of the individual segment to better engage customers and increase our sales.

POSITIONING

WHAT POSITION DO WE WANT TO TRY TO OCCUPY? In order to decide what position we want to try to occupy in the market we have to consider three variables: the customers, the competitors and our company itself.

As far as **customers** are concerned, the question we need to ask ourselves is *"What is important to them?"*. First and foremost, our customers are looking for a quick and easy solution to store their files securely and relatively permanently, so that they don't lose them, and they can access them wherever and whenever they want.

Also, privacy is more and more of a concern these days, and people are becoming more cautious about entrusting their files to big companies. In this sense, customers want their files to be accessible only by those they have given access to, safe from potential hackers and “snoopers”.

When it comes to **competitors**, first we need to ask ourselves, *"Who are they?"* and, subsequently, *"How can we differentiate ourselves from them?".* In fact, not only do we need to be able to identify who we are competing with for customers, but also how we can achieve a differential advantage.

By analyzing the companies that are currently on the market, we can divide our competitors into two large groups, one formed by the "indirect" competitors and the other by the "direct" ones.

To the first group belong all those services like Google Drive, Microsoft OneDrive, Dropbox, and so on, which offer personal storage solutions on their public clouds. All of these services have in common that they do not involve a one-time purchase of a physical product, but instead require the payment of a monthly or annual subscription in return for some storage space. The subscription fee varies from service to service and

obviously increases with the amount of storage required; in general, they all start with a free plan for very little storage and can go up to more than €100 a year for more space and the ability to share files with other people.

"What makes us different from these companies?" First, our product requires a one-time purchase, which will then allow our customers to make use of the service for a lifetime. Additional storage space can be added as needed (and without limits) by connecting external storage devices to our product, without the need to pay an additional fee. Furthermore, our customers' sensitive files and data are not stored on a public cloud (which is more susceptible to hacker attacks) but are instead stored directly on their personal at home device, over which they have full control.

	Cloe	Google Photos/One	iCloud
Secure Data Privacy	Yes	No	No
Local, Personal Storage	Yes	No	No
Smart Organization	Yes	Yes	Yes
Face + Image Recognition	Yes	Yes	Yes
Easy Upload for SD Cards + Hard Drives	Yes	No	No
Duplicate Photo Management	Yes	No	No
Annual Cost	$0	$119.88/year for 500GB+	$119.88/year for 500GB

Figure 7. *CLOE* comparison with *indirect* competitors

The second group, on the other hand, includes all those companies that have recently tried to offer a product similar to ours, without however gaining so much ground on the market. We believe that the partial failure of these companies is probably due to a not very effective marketing strategy. In fact, these companies may not have made the most of the differential advantage they had and, as a result, may not be seen as valuable in the eyes of customers.

Many of the products these companies offer are either too expensive or do not offer software support in terms of file management applications compatible with various devices, ability of sharing files with other users, etc. The high cost is often due to a very high storage space (even too high if we consider a personal usage of the device), while the lack of software support is often due to the fact that these products are designed having in mind experts in the field. Moreover, quite often these products have an unattractive design, are chunky, and are not intended to be placed in plain sight in the home (for instance, on an entry table, next to a vase of flowers).

Our product, as we have already mentioned, is designed for everyday use by non-experts in technology. It must have a pleasing design, it must be affordable, and, most importantly, it must be easy and intuitive to use. In this sense, all the software needed to manage file storage and sharing must be developed and made available on a variety of devices.

In conclusion, what is it that makes **our company** unique? We are innovators who want to make something as technological as the cloud simple and accessible to everyone. We care about our customers and their needs, but most importantly, we care about their privacy. In fact, we want their files to be stored securely and we want them to have direct control over their personal cloud and the permissions to access it.

Figure 8 shows a perceptual map of the market in which we will place the product. The results show that personal clouds are grouped into four clusters: the high-cost-public-cloud group, the low-cost-public-cloud group, the high-cost-private-cloud group and the low-cost-private-cloud group.

Figure 8. ***Perceptual map***

It must be said that directly comparing private and public clouds in terms of cost is difficult because on one hand we have a single purchase while on the other we have a subscription. For this reason, the high-cost/low-cost comparison is intended to be between products of the same type, based on customer perceptions.

Our product, CLOE, would be positioned in the low-cost-private-cloud group, in which other brands are present, but, as already mentioned, they have failed to take advantage of the market.

Since, as mentioned in the Business Strategy chapter, our strategy is a **differentiation** one, CLOE will not necessarily need to have the lowest possible price in the market. We want our product to be affordable for our customers, but they will still need to pay for the features that makes us unique and that build our value.

WHAT IS OUR POSITIONING STATEMENT? It is important for our company to have a slogan that effectively and concisely conveys the product's desired stature.

We wanted to encapsulate our product's value proposition and the differential advantage in a simple and easy to remember statement. The statement had to be clear, consistent, credible, and competitive.

We asked ourselves*, how is our company different from others? What are we offering our customers that ideally no one else is offering? How do we want to be remembered? What idea do we want to pop into our customers' minds as soon as they think of our product?* Eventually, we were able to come up with the following statement:

It's not LIKE a Personal Cloud, it is YOUR Cloud

OPERATIONAL MARKETING PLAN

PRODUCT POLICY

WHAT IS OUR PRODUCT? The product our company wants to offer is not just about the physical device. In fact, along with the item customers will actually place in their homes, we offer the software that will allow them to manage their stored files and to share them with whoever they want. Also, we offer a website through which they can receive information about the product and request customer service.

Thus, our product is a mixture of tangible and intangible components. As for the **tangible components**, we have the actual device, this sort of "*magic box*" that customers will have to physically purchase and place in their home near their modem. This is what our customers are likely to identify as our product, but one thing that may be less obvious in their eyes is indeed the "*magic*" behind the device's functioning.

This is where the **intangible part** of our product comes into play. The device is not a simple hard drive, but it is a special kind of minicomputer with a large memory. This computer must be able to store files and communicate via the Internet with the user's different devices. All of this is enabled by the presence of an operating system developed specifically for the device and various software that the customer can install on their PC, smartphone, tablet, and so on. Moreover, as mentioned above, the experience associated with visiting our website is an important part of our offering.

HOW CAN OUR PRODUCT OFFERING BE BEST DISTINGUISTHED FROM OUR COMPETITORS? In order to push potential customers to buy our product rather than that of one of our competitors, it is essential for us to have something that is distinguishing in a unique and distinctive way.

As is customary, in order to better understand the nature of our offering and how we can implement **product differentiation**, we thought in terms of the different levels of the product, as shown in Figure 9.

At the most basic level, there is the **core** benefit we offer with our product, which is the ability to store files on a personal cloud. Since cloud storage solutions have been available for a few years now, we do not think our product differentiation is happening at the core level. In fact, we may not be offering a breakthrough in the technological world, but it's the way we offer this service that is somehow innovative.

Around the basic benefit is the "actual product" the consumer purchases; it is at this level that **actual** differentiation occurs. At a glance, our product stands out from those of our competitors because of its style. In fact, usually producers in this market are focused on functionality and they lose sight of the fact that the product must be placed in customers' houses and must therefore be pleasing to the eye. Our product is not bulky and unsightly, rather it has a simple and stylish design, a small size and clear lines. Customers also have the option to choose the color they prefer (between *black* and *white*) for the body of the product. What's more, it is made of strong and durable quality materials, which allow it to be lightweight compared to its competitors.

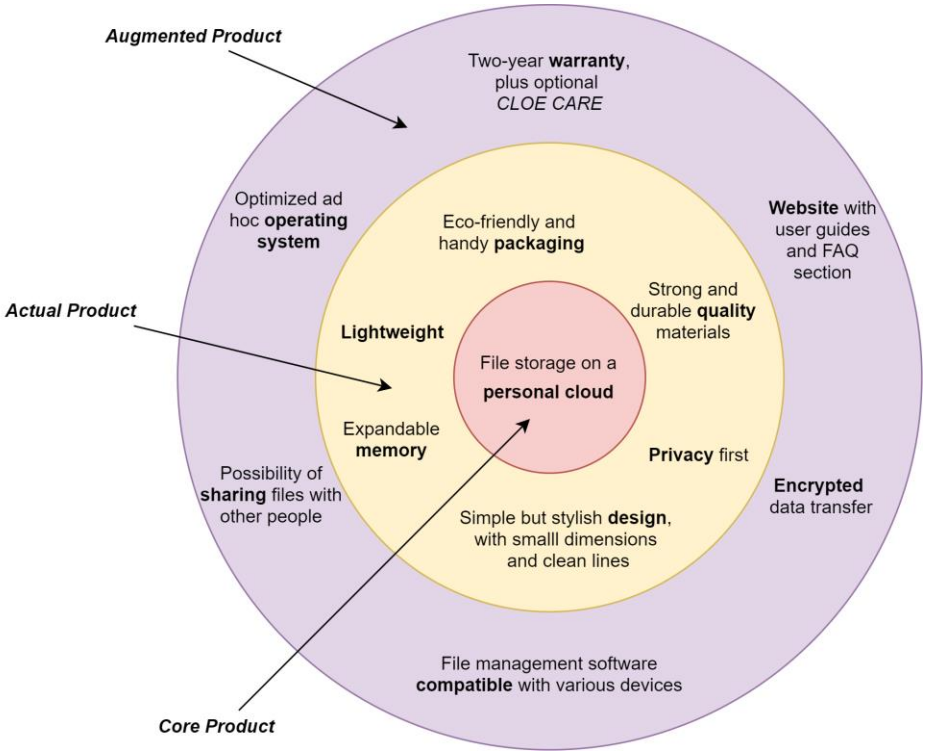


Figure 9. ***The three levels of our product***

Even the packaging of our product must not simply contain it, but must aim to represent our offering and our values. It must have a minimalist and fashionable design, but above all it must be small and made with eco-friendly materials, to reduce the impact on the environment as much as possible. Indeed, as a company, we believe that environmental issues are critical and can no longer be neglected.

In addition to the aesthetic aspect of the product, it is important to emphasize how privacy is a key feature. At the basis of our offer is the guarantee that our customers' files will be stored in a safe place inaccessible to unauthorized persons.

Also, customers will be able to choose from several options when it comes to the basic storage capacity, and if this is not enough, they can always expand the memory unlimitedly with external hard drives or SD cards.

At the third level of product, we find the "**augmented** product", which is all that set of benefits that are not strictly necessary but will still make customers happier to buy our product rather than another. Among these benefits we find a software support compatible with various devices that lets you manage your stored files and safely share them with other people – any data transfer is indeed encrypted.

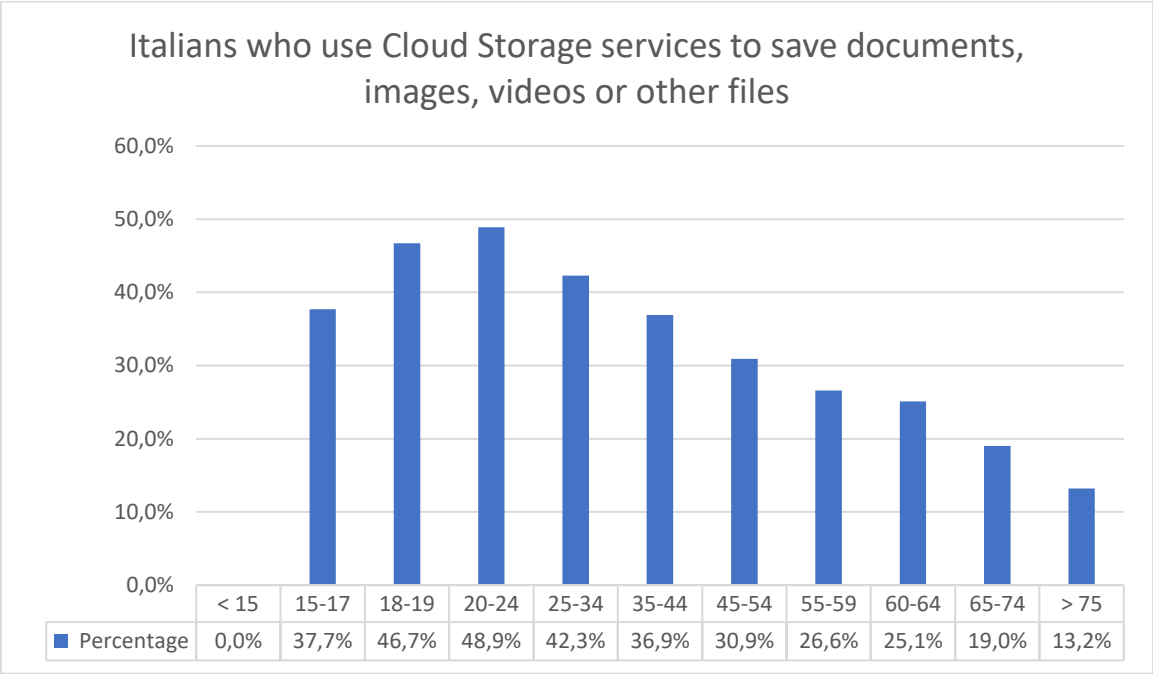
Moreover, the operating system is proprietary, which means that it has been designed specifically for our device and therefore allow us to achieve the best performance. The operating system will also be equipped with an artificial intelligence that will allow organizing files and folders intelligently, in order to retrieve them and present them in the best way possible.

To accompany our customers even after the purchase, we will design a clear and easy to use website, which will contain all the information about our product and FAQ sections. In addition, any unexpected malfunctioning of our device will be protected by a two-year warranty included in the price, or by the subscription to the additional *CLOE CARE*.

SALES FORECASTING

HOW MANY SALES WILL WE MAKE? In order to be able to forecast how many sales we will make over the life cycle of our product, it is important to first understand how big the market is.

As mentioned in the section on Market Segmentation, our target audience are those people who are already familiar with technology in general and, in particular, with the concept of Cloud Storage. In the following, we will attempt to quantify in some way this group of people.



	< 15	15-17	18-19	20-24	25-34	35-44	45-54	55-59	60-64	65-74	> 75
Percentage	0,0%	37,7%	46,7%	48,9%	42,3%	36,9%	30,9%	26,6%	25,1%	19,0%	13,2%

Figure 10. ***Percentage of Italians who use Cloud storage services by age group***

A 2019 ISTAT (*Italian National Institute of Statistics*) survey regarding Internet access and usage[14] found out that about 30% of the Italian population uses Cloud Storage services to store their files. This translates – again according to 2019 data – to more than 15 million users. Figure 10 shows the percentage distribution of users by age group; as expected, the percentage is higher in the middle and lower at the extremes.

The question now is, *how many of these people might want to buy our product?*

[14] http://dati.istat.it/viewhtml.aspx?il=blank&vh=0000&vf=0&vcq=1100&graph=0&view-metadata=1&lang=it&QueryId=22998&metadata=DCCV_ICT

Following the assumption made in the Pretotyping section, supposedly 20% of these people are dissatisfied with the service they are currently using, partly because they would like more storage without having to pay a subscription fee and also because they don't like to entrust their data to big companies.

This brings us to about 3 million users who may want to purchase CLOE. However, another important fact to keep in mind is that most people who would purchase CLOE would not buy a *per capita* unit, but would instead buy one to share with the entire household.

In recent years, Italy has witnessed a trend towards an increase in the number of families and them becoming smaller. In 2019, the number of households was 25.7 million, with an average number of members of 2.3[15]. Following this statistic, the number of devices potentially purchased drops to about 1.3 million; this number, in any case, equates to potential buyers only.

It is important to note that not all people like change, so many of them may continue to use the service they are currently using even if they are dissatisfied. In addition, even if our product has some features that make it unique and set it apart from the competition, some people may still turn to our competitors and choose to buy one of their products.

That said, and considering that CLOE could also be purchased by people who aren't currently using a Cloud Storage service and therefore don't appear in the previous count, we expect to reach more than 300 thousand sales over the life cycle of the product (about 25% of the potential buyers previously calculated).

An estimate of how these sales will be spread over the product lifecycle can be found in the next section.

PRODUCT LIFE CYCLE

For the purposes of business planning, we can think of our product as a living organism. In fact, just like any other living being, the product will go through some stages of life, from its birth to, unfortunately but inevitably, its death.

The classic product life cycle (PLC) has four stages: *introduction, growth, maturity and decline*. How long these stages last and how many sales are made in them varies from product to product and it is what we will try to estimate in this section.

As should be clear at this point, CLOE is a technological product and as we know the technology industry is constantly moving and evolving. This means that we must be prepared for the fact that in a few years CLOE may become outdated. On our side we have the fact that CLOE is in any case an innovative product, somewhat new to the market, and that the software and its components can be updated in step with technological progress. Given that, we expect our product to reach the decline stage in no more than 5 years.

Figure 11 shows the product life cycle graph with its different phases that will be described in detail below. Please note that whenever we talk about years we are referring to years since the product launch (in this chapter we do not take into consideration the time needed for product development).

Also, for simplicity's sake, the number of sales we refer to is the aggregation of CLOE and CLOE PRO sales. We expect the percentage of CLOE units sold to be 80% and the rest to be CLOE PRO units.

[15] https://www.istat.it/it/files//2019/12/C03.pdf

INTRODUCTION (1 YEAR) This initial phase represents the period when we will first introduce CLOE to the market. Because we are a startup company and our product is quite innovative, this stage will not be so short; in fact, we anticipate a one-year duration.

During this early stage, we are prepared to experience losses, since customers will not yet know the product (so sales will be limited) and promotion and development expenses will be high.

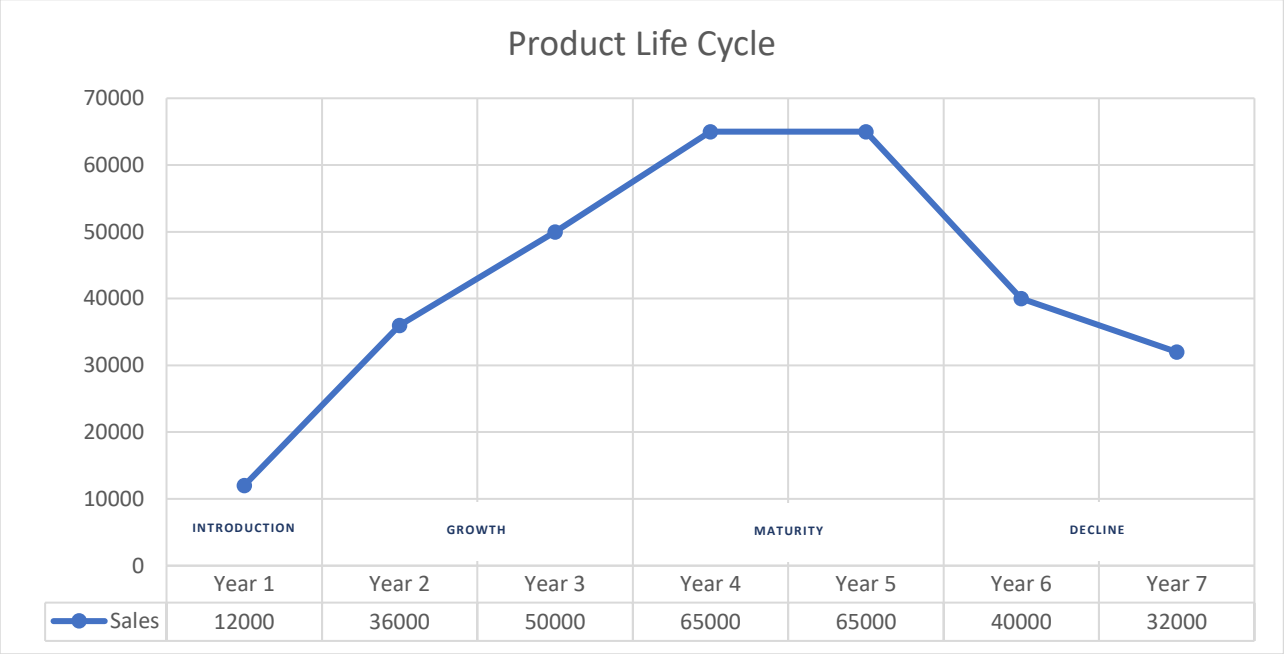


Figure 11. *CLOE's Life Cycle*

This is the time in which our company will need to invest in marketing campaigns to build awareness, so that customers will become more and more familiar with the benefits our product has to offer.

Another big part of our investment will go to R&D, so that we can improve the product, correcting any potential problems right away.

As far as distribution is concerned, as will be explained in more detail later on, we will initially opt for a producer-direct-to-consumer one, using our website. In fact, at this stage retailers will be reluctant to accept our still unfamiliar product, so it will be crucial to haggle with them and convince them towards the end of the first year.

Below, in Table 1, is a month-by-month forecast of the sales we will make during this first year.

Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
Sales	200	200	300	550	850	1000	1200	1250	1300	1550	1600	2000	**12000**

Table 1. *Detailed sales forecast for the first year*

GROWTH (2 YEARS) Starting in year two, sales and profit trends will start to be sloping upward, because the combination of product quality and targeted marketing will gradually build sales volumes.

During the growth stage, strategic emphases will change. In fact, the goal will no longer be to make people aware of the product, but to build as much market share as possible by stressing on the benefits that follow the purchase of our product.

In these years, the competition will get tougher as other companies will attempt to offer the features that we offer. It will be critical for us to maintain differentiation in order to penetrate the market and build brand preference.

At this stage we will have already established agreements with multiple retailers; this will allow us to broaden our distribution and have an advantage over the competitors in this field.

Higher volumes usually mean lower unit costs, which mean higher profits. However, we will have to manage growth carefully; this will involve keeping costs under control and building capacity only when necessary to meet demand.

MATURITY (2 YEARS) After two years of nearly linear growth, we expect our product to reach maturity. This means that sales, after reaching their peak, will stabilize resulting in a flat profit trend.

Some of our competitors will exit the market during the growth stage, but us and those who will have "survived" will still have to fight for market share (a market that will begin to be saturated). Other companies may try to increase market share by lowering their prices and increasing their advertising, and it will be paramount for us to have built a strong brand image in the earlier stages.

Our mature product will continue to generate significant cashflow because of customers' word of mouth, well-understood manufacturing processes and efficient distribution channels.

In general, products could be in the mature stage for a long time. However, as previously mentioned, we think this phase will only last around two years for CLOE, due to the evolution of technology.

DECLINE After five years, sales and, consequently, profits will begin to decline. This decline will be due to a fundamental shift in the marketplace, since new technologies will have emerged.

It will be impossible for us to keep CLOE on the market by simply upgrading its components and its software, therefore the only viable option will be to gradually exit the market.

In any case, our company's idea is not to disappear along with our product. Since we foresee the arrival of the decline, already by the end of the second year part of the profits will be allocated to the development of a new product. As of now, it is difficult to predict how much and how the technology will evolve in these years. However, in due course our experienced researchers in the field will put all their efforts into finding a new idea for a product.

We know that new product development is expensive, risky, and time-consuming, but we are aware of CLOE's statistically programmed obsolescence, so we are prepared to have to support this process in the future. The entire seven-step process for new product development will take no more than 3 years, so that the new product will be launched when CLOE is in decline. To this end, the milestones we need to accomplish are:

- to have generated new ideas and to have screened them by the end of the third year of CLOE production;
- to devote the fourth year of CLOE production to testing the new concept and analyzing the business, thus estimating the sales, costs and profits that will be made with this new product;
- develop the product throughout the fifth year of CLOE production, so that commercialization can take place in year 6, at the same time as the decline of CLOE.

More detailed information about the R&D staff and the amount of money we will invest in that area can be found in the Staff to be hired and Cost Classification chapters, respectively.

DISTRIBUTION

CHANNEL STRATEGY AND MANAGEMENT

In order for our company to market itself effectively, it is important for us to make decisions about the delivery of the product and its related services.

Ideally, we would like our product to always be available in the right quantities, in the right locations, and at the right time when our customers want to buy it. This is obviously not fully possible, but making good decisions about distribution channels is a step in that direction.

First of all, it is important to remember that our business model is a **B2C** (*business-to-consumer*) one. That is, individual customers – and not other businesses – are the end-users of our product. This model, in any case, can be applied in different ways and with different distribution channels; selecting the most effective distribution channel is one of the key strategic decisions our company has to take.

WHAT WILL OUR DISTRIBUTION CHANNEL BE? In general, there are four alternatives for consumer distribution channels, from shortest to longest: *producer direct to consumer, producer to retailer to consumer, producer to wholesaler to retailer to consumer* and *producer to agent to wholesaler to retailer to consumer*. Before stating what our decision is, let us examine a few factors.

First, we are going to address **market factors**. *Will our buyers have expectations about how our product is supposed be sold?* We think the vast majority of our customers will prefer to buy CLOE online rather than locally. This is because our clientele is presumably familiar with the Internet and technology in general, and also because purchasing goods and services online has become a common practice among many people around the world.

Indeed, in 2019, an estimated 1.9 billion people worldwide purchased goods online[16] and this number is constantly and impressively growing, without seeming to slow down any time soon. In addition, 63% of shopping occasions begin online[17]. This means that no matter where customers are finally making the purchase, their customer journey is starting online and, therefore, it is crucial for us to have a strong online presence and for our product to be available online.

However, although online shopping now almost matches in-person shopping experiences, some people may still want to visit a store in person to get a closer look at the product, so it would be nice for it to be also available in physical locations.

Where will our customers be located? Since, as previously mentioned, our company is based in Italy, at least initially our buyers will definitely be Italian. This means that our customer base will be fairly concentrated geographically within the borders of our peninsula. Later, if possible and strategically convenient, we will consider expanding our market to other countries.

[16] https://www.statista.com/statistics/251666/number-of-digital-buyers-worldwide/

[17] https://www.thinkwithgoogle.com/feature/path-to-purchase-search-behavior/

Next, we need to consider **producer factors**. To begin with, it is important to note that we would like to have some control over the price that will be charged to our customers. We do not want our customers to have to pay too much, and we also do not want our product to be over-discounted in order not to damage our brand image.

This means that it would probably be better for us not to have to rely on intermediaries and thus leads us to a question: *will we as a company have the adequate resources to perform the channel functions?* Unfortunately, the answer to this question is no, or rather, not entirely. In fact, we think we have the resources we need only as long as sales volume is limited. As the demand for our product grows, it will become critical to rely on intermediaries and to widen our distribution channels.

As far as **product factors** are concerned, CLOE does not have any specific characteristics that require a particular type of distribution channel. The product is neither large nor complex, nor it is perishable or difficult to handle; it can be easily distributed with even long channels.

Finally, we need to look at **competitive factors**. *Do our competitors control any of the distribution channels?* As we have already mentioned, none of our competitors are located in Italy. This means that, in order for an Italian customer to purchase one of their products, it is required to use an online store and to wait for not so short shipping times. This somehow gives us an advantage over our competitors on every distribution channel we potentially choose.

All that being said, we have come to the conclusion that the best solution for us is to adopt a **producer direct to consumer** channel for the first year of market introduction, and then move to **a producer to retailer to consumer** later on.

The reasoning behind this choice was as follows. As explained more fully in the Sales Forecasting section, during the first year of production we expect to have a low volume of sales. This leads to two points.

On the one hand, we have that the profits are not going to be high, so it is undesirable for us to have to somehow share them with intermediaries. On the other hand, it will be easier for us to manage the entire sales and physical distribution process on our own by having a limited number of orders.

Also, in the introductory period, retailers won't be aware of our product yet, so we would have to bargain with them for shelf space and some control over price. Later on, our product will be known and the growing demand from our customers will allow us to get better deals with retailers.

WHAT WILL THE DISTRIBUTION INTENSITIY BE? The second channel strategy decision we need to make is the choice of distribution intensity. *Do we want an intensive, selective, or exclusive distribution?*

After the first year during which our product will be available **exclusively** online on our website, we want to achieve as much market coverage as possible. In fact, we will have the means to produce on a larger scale and, having gained popularity, the demand from our customers will have gone up.

During this period we will adopt a **selective distribution**. We do not want our product to be available in every outlet possible, but only in a carefully selected group of outlets that respect our decisions and are in agreement with the ideas of our company.

Figure 12 shows some of the outlets that we will contact to work out a deal. They are the most important electronics retail chains in Italy. It is worth mentioning that all these outlets offer both physical stores located throughout Italy and a website, from which customers can order products from the comfort of their home.

In this way, from the second year onwards, CLOE will not only be available on 7 websites (ours and those of the retailers), but will also be available in almost 1500 points of sale across the country, meaning roughly one point of sale every 200 km^2.[18]

Figure 12. ***Outlets in which to distribute CLOE***

PHYSICAL DISTRIBUTION

What has been said so far concerned the choice of the correct distribution channels to provide product availability to customers in a cost-effective manner. However, the choices to be made do not end there.

We also need to focus on the physical distribution, that is how to actually move our goods from the production plant to possible intermediaries and to the end consumer in an efficient way.

The key elements of the physical distribution system will be analyzed in detail below.

CUSTOMER SERVICE It is essential for us to set customer service standards that are feasible and that reflect reality. In fact, what customers usually value is the consistency of the standards set rather than their speed. This means that it is useless to claim that we can deliver orders in 48 hours, when we do not have the means to do so or anyway when we cannot guarantee it most of the time.

Especially in the early years, when we won't have perfected the order cycle yet and when our customers' demand will plausibly fluctuate, flexibility will be the key. In this sense, it seems reasonable to us to guarantee customers a delivery within 5 working days, and to keep them updated throughout the entire process of preparation and shipment of the order.

[18] The surface area of Italy is around 300 thousand km^2; Unieuro has more than 500 stores, Euronics has 420, Trony has 200, Expert has 140, MediaWorld has 117, and Comet has 110.

Later on, if the production process is optimized and we are able to shorten this time, we will modify our guarantee and notify all of our customers about this important achievement.

ORDER PROCESSING *How will orders be handled?* First of all, it is worth noting that we will receive two different types of orders. In fact, we will have on the one hand the small orders made directly by customers on our website and on the other hand the bulk orders that retailers will make us to replenish their outlets and warehouses. While the former will be frequent and at an irregular pace, the latter will be less frequent and at regular intervals agreed upon by the different retailers.

In the first case, once the order is received through the website, our workers will have to prepare the package for shipping. CLOE, inside its packaging, will be placed in a box suitable for transportation. We do not want to use a low-cost container because bumps in transit could ruin our product, but we also do not want to spend all of our distribution budget in boxes.

A compromise between robust containers and affordable ones are simple double-wave cardboard boxes, suitable also for heavy and fragile products. The cost of each box of this kind is €0.34[19].

In the second case, we will have large planned orders, which will only happen twice a month for instance, and will include a large number of units. For this kind of orders, it is not desirable to prepare products in individual boxes, both for the waste of time of having to close (and open) them one-by-one, and for the huge waste of carboard which, once again, does not go down well with our environmental policy.

The solution is to use Gaylord-style containers with slotted foam or carboard dividers in which bulk-shipped products can be palletized and which hold approximately 240 unit each. The price for each of these containers is €6.32[20].

TRANSPORTATION As for means of transport by which our products will be moved, we have decided to opt for road mode. This is in fact the most flexible means of transport that will allow us to ship CLOE directly to the customer's home for orders placed on our website, and to the retailers' warehouses for bulk orders placed by them.

The main disadvantage of this type of transport is the impact it has on the environment, issue that, as we have already mentioned, is important for us. However, the future is "*green logistics*"[21], for which even road transport will involve the use of environmentally friendly vehicles and sustainable solutions.

In any case, we think the best solution is to outsource the transportation activity to a carrier company. This in fact will allow us to achieve greater flexibility and cost containment, since we won't have to invest in our own fleet of trucks and manage all the related transport logistics. Moreover, the carrier company assures us fast delivery in 24/48 hours, which is perfectly compliant with our customer service standards.

Agreeing with a carrier company costs us €5.54 per shipment for the small orders received directly from our customers and €35.72 per bulk shipment[22]. In both cases, the carrier company offers discounts as the

[19] https://www.sempreponte.it/scatole-cartone-2-onde
[20] https://fireflycomputers.com/setup-deployment/green-bulk-shipping/
[21] Aktas, E., Bloemhof, J.M., Fransoo, J.C. *et al.* Green logistics solutions. *Flex Serv Manuf J* **30,** 363–365 (2018). https://doi.org/10.1007/s10696-017-9301-y
[22] https://paypership.it/quanto-costa/

number of shipments increases, for instance with 1000 or more shipments per month we will get an 8% discount.

Figure 13 shows the costs we expect to incur for distribution. The assumption we have made is that, of the total projected sales, 28% will come from the website and the remainder will be the result of orders from the six retailers with whom we will enter into agreement.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
TOTAL FORECASTED SALES	12000	36000	50000	65000	65000	40000	32000
Products sold online	12000	10080	14000	18200	18200	11200	8960
Products sold to retailers	0	25920	36000	46800	46800	28800	23040
Orders received (240 units per order)	0	108	150	195	195	120	96
TOTAL EXPECTED DISTRIBUTION COSTS	65.280,00 €	60.484,32 €	82.466,00 €	107.205,80 €	107.205,80 €	67.204,80 €	53.763,84 €
Total cost of containers	4.080,00 €	4.109,76 €	5.708,00 €	7.420,40 €	7.420,40 €	4.566,40 €	3.653,12 €
Containers for small orders	4.080,00 €	3.427,20 €	4.760,00 €	6.188,00 €	6.188,00 €	3.808,00 €	3.046,40 €
Containers for bulk orders	- €	682,56 €	948,00 €	1.232,40 €	1.232,40 €	758,40 €	606,72 €
Total cost of shipping	61.200,00 €	56.374,56 €	76.758,00 €	99.785,40 €	99.785,40 €	62.638,40 €	50.110,72 €
Shipping for small orders	61.200,00 €	52.516,80 €	71.400,00 €	92.820,00 €	92.820,00 €	58.352,00 €	46.681,60 €
Shipping for bulk orders	- €	3.857,76 €	5.358,00 €	6.965,40 €	6.965,40 €	4.286,40 €	3.429,12 €

Figure 13. ***Table of expected distribution costs***

The costs just shown, in any case, do not take into account employee wages and inventory costs, which will be examined in the Operations Plan chapter instead. Below, however, we are going to outline what our strategies are regarding inventory control and warehousing.

INVENTORY CONTROL Since holding large inventories is very expensive, it is critical to find a balance between the costs and the need to have products in stock ready to be sold.

Especially for the first few years of production, before the product matures, customer demand may fluctuate and deciding to hold too much inventory could result in an economically prohibitive choice. Therefore, what we would like to implement is the **JIT** (*Just-In-Time)* inventory system.

This management strategy will allow us to reduce the inventory levels required, increasing the efficiency of the entire production process. So what we will do is try to produce only what is needed based on sales forecasts and customer orders. In any case, when necessary we will store our products in a small warehouse near the production plant.

As far as retailers' orders are concerned, since they are scheduled and periodic, we can organize our production and the subsequent storage and shipment of products accordingly. Once products are delivered to retailers, it becomes their responsibility to manage the warehouse and inventory of their stores.

COMMUNICATION

HOW WILL WE COMMUNICATE OUR VALUE IN THE MARKETPLACE? After deciding what kind of value we want to offer to our customers and how to deliver it to them, we also had to make a series of decisions regarding how to communicate that value to our potential buyers.

Arguably, this set of choices has never been as critical as it is nowadays. In fact, while it is true that thanks to the evolution of technologies the possibilities for communication are now almost endless, this means that customers are constantly inundated with a flood of marketing messages and it becomes difficult for a company (especially a startup like us) to get the right message to its destination amidst all this noise.

In any case, there are two major classes of communication techniques: *offline* and *online* ones. In our opinion, what is best for our company is to use a variety of **online communication techniques** and no offline ones. We will explain below the reasons that led us to this choice.

First of all, in recent years Internet and social media usage has grown dramatically throughout the world and also in Italy, where online advertising reached 38% of total media in 2019[23]. This means that, right behind television, the Internet is the means of communication that can likely reach more Italians.

Another advantage of online marketing is that its effects are easily measurable. In fact, while most offline techniques only allow you to have coarse-grained estimates of the increase in sales, tools like *Google Analytics* or *Hootsuite* allow you to track in a fine-grained manner how well your online marketing is doing.

Moreover, compared to offline advertising, online solutions tend to be more affordable. So it will be easier for us to reach our target audience without investing such a large amount of money.

Regarding our target audience, thanks to online marketing techniques we can select specific people to whom we want to address our message(s). The risk with traditional techniques, instead, is that you do not have control over who actually will see the advertisement, so that it may be shown to people who are not interested, resulting in a waste of money.

Obviously, online marketing also has some disadvantages that however do not weigh as much for us. One of the biggest drawbacks is probably that it is completely dependent on tech: it will not reach any of our target audience that do not use technology. Yet, given the nature of our product, we think the totality of our audience uses technology on a daily basis, whether it's their smartphone or PC.

In any case, it is also important to note that, as our product becomes available in retailers' stores, they may decide to include it in their own advertising campaigns, which very often include offline techniques such as flyers, billboards, and TV commercials.

That said, since we want to use different online communication tools, it is important for us to coordinate them in order to deliver a clear, consistent, credible and competitive message. To this aim, we need to adopt an **integrated marketing communications (IMC)** system.

In addition, since we should always avoid wasting company resources, we will need to carefully plan and evaluate marketing communications. As anticipated in the Product Life Cycle section, we plan to pursue three different marketing strategies over the overall production time.

For each of these strategies we have chosen to adopt, we must make communication decisions (such as identifying target audience(s), setting the objectives of communication, create message(s), selecting the promotional mix and setting the promotional budget), and evaluate their effectiveness and performance. This is what we are going to do below.

FIRST STRATEGY: CREATE AWARENESS During the first year of production, all of our marketing efforts must be put into getting the product known to the audience. In fact, no one will buy a product they have never heard of, so it is critical to make all potential buyers aware of CLOE's existence and its features.

As is customary, the first step in implementing integrated marketing communications is to identify who the **target audience** is. When we analyzed the market (see Market Segmentation section), we identified two

[23] https://confindustriaradiotv.it/investimenti-pubblicitari-2019-nielsen-polimi-e-previsioni-2020-iab/

major segments, so one idea might be to target the two different audiences with two different campaigns. However, we think this is not the wisest choice at this point in the product lifecycle.

Indeed, at this early stage it is not very important to emphasize the different benefits that CLOE brings to different segments of people; the most important thing is to generally get the word out about our product to as many people as possible. This also allows us to limit costs, a benefit not to be underappreciated in this first period of low profits (or none at all).

Therefore, our target audience is all those living in Italy between the ages of 16 and 65 (referring to the ISTAT 2019 survey, Figure 10) who habitually use Internet and technologies.

As a second step, we need to identify what the **objectives of the IMC campaign** are. Following the above strategy, the goal is to increase awareness among our target market so that almost 100 thousand people know our product at the end of the first year of production.

Then, we need to find a way to translate our value proposition into an **advertising message**. The idea is to create a series of graphics and a short video showing the main features of CLOE, together with our slogan: *"It's not LIKE a Personal Cloud, it is YOUR Cloud".*

Asking a graphic designer to create for us 10 or more designs and infographics for our ads and posts on social media will cost us €200[24], while a video maker will charge us €2000[25] for a 30 seconds commercial.

As for the **promotional mix** we are going to use, as already mentioned, we will make use of a combination of online techniques. Specifically, we will leverage our website, our business pages on Facebook and Instagram and the ads on these platforms. These are indeed the most popular social media among people in our target audience, with 2.23 billion MAUs (*Monthly Active Users*) on Facebook and 1 billion on Instagram[26].

What is more, in 2019, Facebook along with Instagram (since from April 2012 they both belong to Facebook Inc.) generated close to 69.7 billion U.S. dollars in ad revenues.

In terms of the design of our website, we will ensure that the presentation, usability and user experience of navigation are taken care of. In addition, we will adopt a number of tools and techniques to ensure that our webpages rank high on search engines; thank to SEO, indeed, it will be possible to get conversions from users researches as well.

Now the question is, *"how much should we invest in marketing communications?"*. When setting the **budget** to devote to advertising there are generally 4 methods to follow: the *percentage of sales* one, the *competitive parity* one, the *affordability* one and the *objective and task* one.

We decided to exclude the first method because in this first period the sales will not be many, but this does not mean that we will have to invest little in advertising, on the contrary this will probably be one of the most money demanding periods. We also decided to exclude the second method because we do not think the competitors had the right strategy and therefore it might be counterproductive for us to follow in their footsteps.

[24] https://www.designhill.com/pricing/advertisement-design?services=contest
[25] https://www.samueleschiavo.it/quanto-costa-un-video-professionale/
[26] https://buffer.com/library/social-media-sites/

As for the third method, while it is true that containing costs is important for any company and especially for us as a startup, it is also true that it is useless to give ourselves limits a priori because these may not allow us to achieve our goals. That said, we decided to use the last method that seems the most efficient and logical one. So, before stating what is the budget we need to allocate to advertising, let us examine what tasks are required to achieve our goal.

First of all, we must say that we need to hire a social media manager, i.e. a person responsible for managing and monitoring our social media pages and boost our online presence. Next, we need to consider the ads.

When we talk about online advertising, there are a few metrics to consider when evaluating the performance of a certain campaign. These metrics are:

- The cost per mille (CPM), namely the amount an advertiser pays per one thousand impressions (people who will see the advertisement)
- The click-through rate (CTR), in other words the number of clicks the advertisement receives divided by the number of impressions
- The conversion rate (CVR), that is the percentage of clicks on the advertisement that resulted in a conversion (for instance, a purchase)

According to a 2019 WordStream study[27], the average CPM for Facebook (and Instagram) ads is €3.28. Still according to that study, the average CTR is 0.90%. This means that for every €3.28 we spend, we can reach 1000 people and, on average, 9 of them will visit our website.

However, not every visit to our website will necessarily turn into a sale. In fact, since the average CVR is 9.21%, roughly only 1 out of the 9 people who visit our website will proceed with a purchase.

In any case, in this first phase our goal is to reach people, so to simply show them our advertisement. The fact that some people will click on the ad, visit our website and buy our product is just a very much appreciated side effect.

To achieve the goal of our IMC campaign, in the first year of production we will therefore have to invest €39000 or €3250/month on average (actually the investment will not distributed equally among the 12 months, we will spend less in the first months and more in the last ones). This, considering the average CPM, should allow us to reach more than 10 million people, about 100 thousand of whom will visit our website, and lead to just under 10 thousand sales.

Taking into account the fact that it is estimated that about 13% of sales come from word of mouth[28], at the end of the first year we estimate to have made 12000 sales (as already mentioned in the Product Life Cycle section).

Figure 14 summarizes the costs of the campaign and an estimate of its effectiveness. Please note that the salary of the social media manager will be listed in the Finance Plan chapter.

[27] https://www.wordstream.com/blog/ws/2017/02/28/facebook-advertising-benchmarks
[28] https://www.invespcro.com/blog/word-of-mouth-marketing/#:~:text=Did%20you%20know%20word%20of,brand%20recommended%20by%20a%20friend

TOTAL EXPECTED COMMUNICATION COSTS (YEAR 1)	41.200,00 €
Online Advertising	39.000,00 €
Facebook and Instagram ads	39.000,00 €
Content Creation	2.200,00 €
Graphic Designer	200,00 €
Video Maker	2.000,00 €
TOTAL EXPECTED GENERATED SALES	12000
Generated from Online Advertising	10000
Generated from Word of Mouth	2000

Figure 14. *Expected costs and generated sales for the first year of production*

SECOND STRATEGY: EXPANSION During the second and third years of production, our marketing strategy will focus on increasing sales volume. In fact, thanks to the previous marketing campaign and word of mouth, our product will now be known in the market.

It is important to emphasize the fact that our strategy is in any case a **consumer pull** one: our goal is to communicate directly with customers and have the resulting demand persuade intermediaries to stock units of our product. That is also why, as already mentioned, we are waiting until year two to make our product available in retailer stores as well.

For this IMC campaign it will be essential to stress the benefits that our product provides to those who buy it, both in the classic version intended for family used and in the PRO version aimed at the self-employed. That said, we will have two **target audiences** corresponding to the two segments we identified in Market Segmentation.

The **objective** will be to increase the volume of sales by 300% over the course of two years, thus increasing from 12000 annual sales to 50000.

Regarding the **advertising message**, for this campaign we will make use of two different messages, one for regular CLOE and the other one for CLOE PRO. Each message should list the benefits of the variant it refers to by directly addressing the segment for which the variant was intended.

For instance, the advertising message for "standard" CLOE will focus on storing personal files (such as vacation photos, for example) and the ability to share these files with friends and family in a secure, but above all, easy and user-friendly way. Instead, CLOE PRO's advertising message will feature the variety of file formats that can be stored, the privacy guaranteed, and the performance.

As for the **promotional mix**, basically we will still make use of our social pages and Facebook and Instagram ads. In addition, we will ask an Italian YouTuber with more than a million followers who reviews technology products to make a video for us, along with an article on his blog and with posts on his social media. We will also contact the owners of two tech-related blogs to include a review of our product.

Once again, we will use the *objective* and *task* method to choose the **budget** for this IMC campaign. So let us analyze the costs of the tasks that will allow us to achieve our goal.

The youtuber will ask us €3500 for the realization of the video and related content[29], while the two content writers of the tech-related blogs will charge €400 each[30].

Both the youtuber and bloggers will leave a positive review for our product. The two blogs and the YouTube channel have a total following of 5 million people, but obviously not everyone will see the video and/or read the articles.

We can estimate that only 0.75% of the visitors will actually be interested and want to learn about our product. Then, since 67% of people are influenced by the reviews they read online[31], we can deduce that more than 26 thousand people will buy CLOE (or CLOE PRO) as a result.

In addition to this we will continue our advertising campaigns on Instagram and Facebook, for the detailed calculations of which please refer to the previous strategy.

Another important factor to consider, in addition to word of mouth, is the fact that retailers to whom we give CLOE will also want to advertise the product. We have no control over these advertisements, but nonetheless the effect they will have is to increase our sales. We think each retailer will contribute 5% to our total sales with their campaigns including flyers, billboards, TV spots and online advertising.

Figure 15 then shows the costs we will incur for communication during year 2 and 3 of production. Please note that, once again, no salaries are shown in the table.

TOTAL EXPECTED COMMUNICATION COSTS (YEAR 2)	49.800,00 €		TOTAL EXPECTED COMMUNICATION COSTS (YEAR 3)	46.400,00 €
Online Advertising	46.800,00 €		Online Advertising	42.900,00 €
Facebook and Instagram ads	46.800,00 €		Facebook and Instagram ads	429.000,00 €
Content Creation	3.000,00 €		Content Creation	3.500,00 €
Graphic Designer	200,00 €		Graphic Designer	- €
Video Maker	2.000,00 €		Video Maker	- €
Youtuber	- €		Youtuber	3.500,00 €
Bloggers	800,00 €		Bloggers	- €
TOTAL EXPECTED GENERATED SALES	36000		TOTAL EXPECTED GENERATED SALES	50000
Generated from Online Advertising	12000		Generated from Online Advertising	11000
Generated from Word of Mouth	5000		Generated from Word of Mouth	7000
Generated from Retailers' Advertising	10000		Generated from Retailers' Advertising	15000
Generated from Content Creators	9000		Generated from Content Creators	17000

Figure 15. ***Expected costs and generated sales for the second and third year of production***

THIRD STRATEGY: MAINTAINING THE ENGAGEMENT During the maturity period, our product will be well known to the audience and the volume of sales will be large and steady. The problem during this phase will be that many of our competitors (some even new to the market) will try to take a slice of the market from us. For this reason, our goal will be to maintain audience engagement and stand out from competitors who will be offering products similar to ours.

Once again, let us go over all the steps involved in planning an IMC campaign. In terms of **target audiences**, we will revert to targeting a single audience in this phase (as with the first strategy). In fact, at this point the different benefits that the two versions can bring to different segments should be well understood by the public, so there is no need to create two different promotional campaigns.

[29] https://www.digitalmarketing.org/blog/how-much-does-influencer-marketing-cost
[30] https://www.upreports.com/blog/how-much-content-creation-cost-2020/
[31] https://moz.com/blog/new-data-reveals-67-of-consumers-are-influenced-by-online-reviews

Then, the **objective of the IMC campaign** is defined as follows: to keep the number of sales (more or less) constant over the two years, thus limiting the effect of competitors' presence in the market.

As for the **advertising message**, this will also be unique as will our target audience. What we are going to do is leverage *comparative advertising*, so we can send the message that we are better than our competitors, since we have been in the market for longer and because what they are doing is trying to mimic our offering.

Finally, with regard to the **promotional mix** and the methodology by which we will set our communications **budget**, these will be similar to those of the above strategies. Therefore, in order not to be repetitive, we will not analyze them again.

PRICING

HOW WILL WE SET THE PRICE OF OUR PRODUCT? Like any company, our ultimate goal is obviously profit, and in order to generate a profit it is important to choose the best price for our product, considering different factors such as input costs, competitors and the value perceived by our customers.

We believe all three factors are important and should be taken into consideration when deciding what price to set. In general, we would like the price of CLOE to reflect the value of the product, i.e., the benefits it brings to the customers who purchase it, rather than simply being a function of input costs (which, however, will obviously have to be taken into consideration). In this sense, we are going to adopt an **integrated approach**, considering both value-based and cost-based pricing.

Recalling that there are two versions of our product, the standard and the PRO version, the prices that these will have on the market are as follows: CLOE (standard) will cost €199.99, while the PRO version will be priced at €259.99. Below are all the considerations that led us to this choice.

First of all, let us consider how much it **costs** to produce one unit of CLOE and one unit of CLOE PRO. As calculated in the Cost-Volume-Profit analysis section of the Finance Plan, we estimated for CLOE a direct unit cost of €112.90, while for CLOE PRO a direct unit cost of €149.30.

In addition to the direct cost per unit, we also have fixed costs that are calculated at roughly €404k for the first year of production and €411k for the second year.

If we were to use a cost approach, we would have to divide fixed costs by sales volume and add the result to the direct cost per unit thus obtaining the full cost per unit. This volume, however, is only an estimate that, no matter how accurate, could also not reflect reality and this is the main problem with this type of approach.

YEAR 1 (of production)	CLOE	CLOE PRO		YEAR 2 (of production)	CLOE	CLOE PRO
Direct costs (per unit)	112,90 €	149,30 €		Direct costs (per unit)	112,90 €	149,30 €
Fixed costs (total = 404.404,52 €)	323.523,62 €	80.880,90 €		Fixed costs (total = 410.954,84 €)	328.763,87 €	82.190,97 €
Expected sales	9600	2400		Expected sales	28800	7200
Cost per unit				Cost per unit		
Direct costs	112,90 €	149,30 €		Direct costs	112,90 €	149,30 €
Fixed costs	33,70 €	33,70 €		Fixed costs	11,42 €	11,42 €
Full costs	146,60 €	183,00 €		Full costs	124,32 €	160,72 €
Possible Markups				Possible Markups		
20%	175,92 €	219,60 €		20%	149,18 €	192,86 €
30%	190,58 €	237,90 €		30%	161,61 €	208,93 €
40%	205,24 €	256,20 €		40%	174,04 €	225,00 €

Figure 16. *Full costs per unit*

In any case, calculating the full cost per unit can be useful as a starting point as it gives us an indication of the minimum price necessary to make a profit. Figure 16 shows these calculations.

The Finance Manager also performed the break-even analysis for us considering a 40% markup, along the lines of what Apple does for new product launches. We will treasure this information in subsequent considerations as well.

Regarding **competitors**, although our strategy is a differentiation one as mentioned previously, it is important for us to keep an eye on their prices in order to align with the market we will be positioning ourselves in.

In Italy, our direct competitors are mainly two, Synology Drive and WD - My Cloud Home, which cost respectively €159 and €199. In any case, however, these products do not offer the set of features we do and so we believe we might as well charge more because we provide the customers with more benefits.

In addition to direct competitors, we must also consider indirect ones like Google Drive and OneDrive, as mentioned several times. A subscription to these services for 1TB of storage costs around €120/year and so, to make our product worthwhile for customers, we think CLOE should cost less or about the same as two years of subscription (even if the lifespan of our device is even longer).

After that, we go on to consider perhaps the most important factor for us: our **customers' perception of value**. It is essential that the price we set is in line with the idea customers have of our product, indeed the price should be neither too much higher nor too much lower than the price they expect. If we set a price too high people might be unwilling to make such an expenditure, but instead a price that is too low might ruin their perception of our company and product[32].

Thanks to the survey we created in the pretotyping phase we were able to find out that most of the people who were interested in buying the product were willing to pay €200 or more for it, so any price around that amount should be in agreement with customers perception.

Furthermore, since price perception are so important to customers, we should adopt some techniques of psychological pricing. In particular, we will need to make sure that our prices end in “9.99” because, as has now been proven many times, in the minds of buyers this makes a huge difference compared to the “round” amount.

In addition to the above factors, we should also take into account another important fact: from the second year of production onwards our product will also be sold through **intermediaries**. Typically, retailers in the electronics industry have a margin that varies between 3% and 7% (and rarely exceeds that percentage)[33].

What we want is to have control over the price of CLOE and, in particular, we want the price to the public to be the same regardless of whether the purchase is made on our website or in one of the retailers' stores. Since retailers will also rightly want to make a profit, we will sell them CLOE and CLOE PRO at reduced prices, €187 and €243 respectively, so that they can make around 7% margin.

[32] Higher prices usually lead people to a perception of higher quality. **Ariely, D.** (2008) *Predictably Irrational*, London: HarperCollins Publishers.

[33] https://www.allianceexperts.com/en/knowledge/what-is-a-reasonable-margin-for-your-distributor/

This reduction in price also reduces our profits to some extent, but this choice is justified by the fact that retailers make bulk orders and, above all, by the fact that this way we can be consistent in the eyes of customers.

ULTIMATELY, WHAT IS OUR STRATEGY? Since we are launching a new product in the market, its price should align with our promotional strategy. At this point, after presenting our strategies and plans in terms of product, distribution, communication and pricing, we can say that our strategy is **rapid skimming**.

What we have in fact is a combination of (relatively) high price and high promotional expenses, with the aim of generating right from the start high levels of product awareness and knowledge and returns on investments.

ESTIMATES OF PROFITABILITY

WILL OUR COMPANY BE PROFITABLE? At this point, a question obviously arises: *is the choice we have made for the price of CLOE right? Or rather, will this choice lead our company to generate some profit?*

A key number in determining whether a company is profitable or not is definitely the net profit, but this will be calculated in detail in the Finance Plan once all costs and all income are aggregated.

What we are going to calculate below is instead the **gross profit**, an important indicator of profitability for companies that are selling physical products. To be more precise, this value will indicate how profitable our product is.

In order to calculate this value and the gross profit margin we will use the following formulas:

$$Gross\ Profit = Sales\ Revenue - Cost\ of\ Goods\ Sold$$

$$Gross\ Profit\ Margin\ (\%) = \frac{Gross\ Profit}{Sales\ Revenue} * 100 = \frac{Sales\ Revenue - Cost\ of\ Goods\ Sold}{Sales\ Revenue} * 100$$

Figure 17 shows the calculations performed to calculate gross profit for the first two years of production. Please note that, coherently with the rest of the documentation, we have estimated that the number of CLOE PRO units sold represents 20% of total sales, and that (from year 2 onward) the sales at retailers represent a total of 72% of the sales.

As the calculations show we have for the first year a 27% margin and for the second year a 35% margin. These margins are not extremely high, but nonetheless in our opinion they indicate that our company is profitable.

Obviously, every company's dream would be to have a margin of 50% or more, because that would mean keeping a lot of profits compared to the cost of the product. This often remains just a dream, however, because there are many factors to consider.

First of all, gross profit margins are specific to the industry in which a company moves; some industries have sky-high margins while others have to settle for a few percentage points. In terms of the industry in which we operate, the electronics one, companies average a gross profit margin of 36%[34]. This means we align almost perfectly with our industry average.

[34] 2019 data, https://www.readyratios.com/sec/ratio/gross-margin/

ESTIMATES OF PROFITABILITY (YEAR 1)		ESTIMATES OF PROFITABILITY (YEAR 2)	
Total Sales	**12000**	**Total Sales**	**36000**
Website sales	12000	Website sales	10080
CLOE	9600	CLOE	8064
CLOE PRO	2400	CLOE PRO	2016
Sales at retailers	0	Sales at retailers	25920
CLOE	0	CLOE	20736
CLOE PRO	0	CLOE PRO	5184
Sales Revenue	**2.543.880,00 €**	**Sales Revenue**	**7.274.203,20 €**
From Website sales	2.543.880,00 €	From Website sales	2.136.859,20 €
CLOE	1.919.904,00 €	CLOE	1.612.719,36 €
CLOE PRO	623.976,00 €	CLOE PRO	524.139,84 €
From Sales at retailers	- €	From Sales at retailers	5.137.344,00 €
CLOE	- €	CLOE	3.877.632,00 €
CLOE PRO	- €	CLOE PRO	1.259.712,00 €
Cost of Goods Sold	**1.846.564,52 €**	**Cost of Goods Sold**	**4.737.434,84 €**
Direct Costs	1.442.160,00 €	Direct Costs	4.326.480,00 €
CLOE	1.083.840,00 €	CLOE	3.251.520,00 €
CLOE PRO	358.320,00 €	CLOE PRO	1.074.960,00 €
Fixed Costs and Overheads	404.404,52 €	Fixed Costs and Overheads	410.954,84 €
Gross Profit	**697.315,48 €**	**Gross Profit**	**2.536.768,36 €**
Gross Profit Margin	**27%**	**Gross Profit Margin**	**35%**

Figure 17. *Profitability estimates for the first and second year of production*

Another fact to keep in mind is that gross profit margins can be lower for startup companies. This is because usually the initial expenses are high and it takes time to develop some efficiency in operations and thus reduce costs.

Already from the first to the second year of production, the margin increases by 8%, and we expect this to be the trend for the coming years as well. In fact, even if fixed costs were not to decrease in subsequent years, improvements in the production plant will make the entire process more efficient, thereby reducing the cost of a unit of product, while keeping the same price to the public.

ESTIMATES OF DEMAND ELASTICITY

Having reached this point, it is appropriate to make some considerations about demand and its elasticity. In particular, we would like to estimate how much the demand would vary in response to a variation in price.

In general, we believe our customers are quite price insensitive because our product is not a primary good, rather it is something that people decide to buy because they need to solve one of their problems: store their data securely and without space limitations.

This means that when people decide to buy CLOE, they do not do so on impulse and out of sheer necessity, but because they recognize the value of the product and the benefits it offers. That said, most people may be willing to pay the price we have chosen for CLOE or even more.

In addition to that, our product is not easily replaceable because there are currently no other products that offer all of CLOE's features. In this sense we have a real differentiation and, thanks to a suitable marketing campaign, also a perceived differentiation.

Since at the moment CLOE has not yet been launched on the market, the only data we have available are those of the sales forecasts, calculated on the basis of the market size and of the factors illustrated in the previous chapters such as positioning, distribution and communication, and the market research carried out at the beginning of our project work.

Thanks to the latter, what we were able to ascertain is that most people were willing to pay around 200 euros for our product, with some of them willing to pay even more (mainly those who said they use Cloud Storage services to store work-related files) and only a small portion willing to pay less (mainly those who are not currently using any Cloud Storage service).

While it is difficult to calculate elasticity using the formula

$$\varepsilon = \frac{\Delta q/q}{\Delta p/p}$$

because of the lack of accurate data, what we can do is estimate it qualitatively. Given all the considerations we made up so far, we think that the elasticity of demand for CLOE will be in modulus slightly greater than 1 ($|\varepsilon| > 1$).

This means that we expect a price increase to reduce the demand, but not by a much greater percentage. In fact, we think that, since our customers are supposedly price insensitive and our competitors do not offer a product with exactly the same features, the demand will vary quite linearly with the variations in price.

A plot of the estimated demand elasticity trend can be seen in Figure 18.

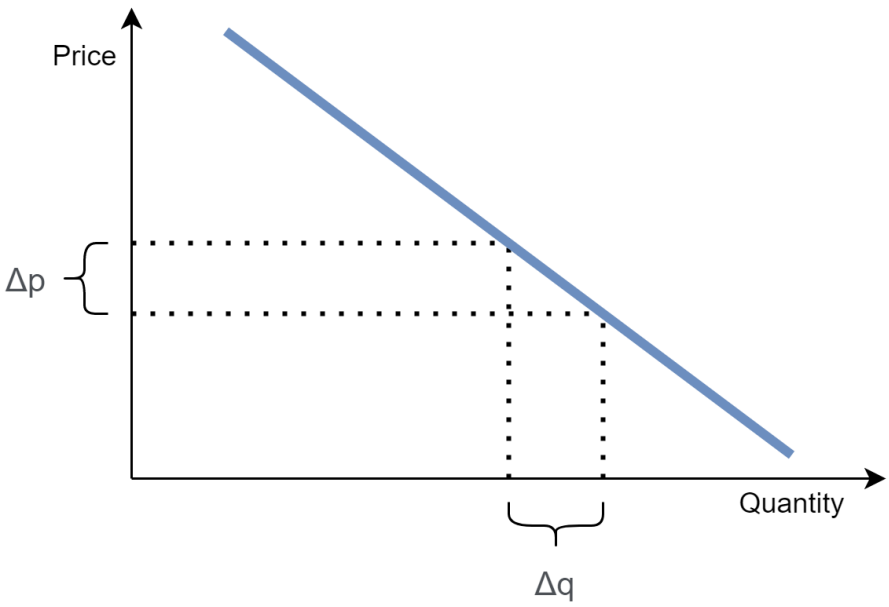


Figure 18. ***Estimate of demand elasticity (Δq is slightly greater than Δp)***

OPERATIONS PLAN

In this chapter the planning for the firm's production capacity is discussed, presenting first the needed processes and the requirements of every single part of the overall proposed value, then reporting in detail the factory organization and the plant layout that suits best the production processes for our products and trades-off best the efficiency needed to optimize the output rate and the flexibility required to face-off expected and unexpected demand fluctuations.

Moreover, we will describe the main production plans of the firm, from a higher level of aggregation until a week-to-week bases plan, showing how we intend to regulate capacity with the goal of minimizing production costs and so maximizing the created value.

These plans are shown in detail later, but two very important points are here clarified:

- Every production plan is not intended to be immutable; they represent our production strategy for the beginning of our startup. Anyway, they will be periodically updated when new data is available, in order to ensure that the plan is still valid, or in order to change and correct it so that to continue to achieve low and sustainable production costs.
- Every production plan will take into considerations possible demand fluctuations and the countermeasure adopted according to the chosen strategy.

Eventually, we will report the supplier management strategy, discussing then the quality requirements and certifications that we want to achieve for our product, also explaining the policies and the continuous improvement culture we would like to implement.

INTRODUCTION: PRODUCTS AND PROCESSES

As already discussed in the previous chapters, our business is the composition of tangible and intangible factors that are jointly needed in order to deliver value to customers. Each of them is crucial for the correct working of the final product, or to make it worthy and valuable to customer's eyes.

For this reason, the following plans will concern all the components and services that we provide, explaining in detail the physical and technical functioning and requirements of each of them.

CLOE: THE PHYSICAL DEVICE

As already described, this is the main component of the proposed value, and it represents the most important tangible factor.

DESCRIPTION

CLOE is a small-sized autonomous device that must be able to provide all the functionalities and capabilities of an ordinary public storage cloud. CLOE must be equipped with all the needed hardware for this purpose: CPU, RAM memory, bootstrap ROM, SSD storage, internal bus, PCB and Network Interfaces; together with silent cooling fans and input DC Power System. The body is made of lightweight plastic, but it must be resistant against possible small accidents (fallings, hits, shakings…), and it should not be able to be broken in small sharp pieces ingestible by children.

The connectivity is given through the Ethernet Network Interface and the 802.11ac WIFI 6 Interface, and a Bluetooth one is provided for the system setup.

In order to guarantee the correct coupling of CLOE with the home router, a RJ45 cable with double clamps is provided, so that to have a solid physical connection with it. The cable is not a single point of failure since the provided wireless interface.

The expandability of the storage space is guaranteed through a USB port in which the user can connect any other hard drive device, and through an integrated SD Card reader.

All the sharing, security and connectivity details are described in the OS and the APP sections.

CUSTOMIZATION LEVEL

As better described in the Marketing section, the product will be available in different colors: it means that an ATO customization level is applied for this product.

PRODUCTION PROCESS

In order to create the device, all the components in the description paragraph are required. Since it would be too costly to produce ourselves hardware components with comparable performance w.r.t. the ones of the big high-tech companies, they will all be bought by external suppliers.

Thus, the production process for CLOE is the following:

1. PROVISIONING: the needed components are ordered from the suppliers on the bases of the forecast sales. The provided customization is implemented here, buying the right number of the source components based on the sales forecasts (e.g., if the forecast for the month of June is 60% White CLOE and 40% Black CLOE, the provisioning of the plastic body will be made accordingly).
2. ASSEMBLY: the fabrication step is basically an assembly line, once all the components have been provided, they are put together to create the final product.
3. HW TESTING: the realized product is tested in order to ensure the correct working of the various hardware components and to be sure about the safety of the product (e.g., no overheating). These requirements are further discussed in the quality management paragraph.
4. OS INSTALLATION: EPROMS are burned with the bootstrap configuration and the OS is flashed into the system.
5. PRODUCT TESTING: the final product is tested to verify the functional and non-functional requirements.
6. DISTRIBUTION: once assembled, CLOE is distributed according to the strategies described in the dedicated section of the marketing section.

REQUIREMENTS AND CONSTRAINTS

CLOE HW assembly is an easy operation that does not require highly specialized people, on the contrary it can also be performed by low-skilled workers. The entire process could be ideally fully automatized, anyway at least for the most delicate operations the machine intervention is required.

For what concerns the main constraints, the production and assembly of the product cannot start until the basic tools are available (workers, machines, production plant) and until the first version of CLOE OS, the first version of the APP and the website have been released.

CLOE PRO: THE ENTERPRISE PHYSICAL DEVICE

This product is a differentiated version of CLOE specifically conceived for entrepreneurs and self-employed people.

DESCRIPTION

Differently from the standard version, CLOE PRO is equipped with more performing hardware components, doubled storage space and improved software functionalities, specifically designed to the office work.

In order to do so, an enhanced version of CLOE OS is deployed, removing the limit on the number of people that can access a file, boosting up the backup functionalities, providing a more work-oriented organization of the file system and expanding the range of file formats supported for the casting on external devices.

CLOE PRO has bigger dimensions than CLOE.

CUSTOMIZATION LEVEL

The customization level is the same as CLOE, the customer can decide the color he/she wants.

PRODUCTION PROCESS

The production phases for CLOE PRO are basically the same of CLOE, this means that the majority of the machinery and workforce exploited for CLOE can be used also for CLOE PRO, so that to reduce set up costs.

REQUIREMENTS AND CONSTRAINTS

Same as CLOE

CLOE OS: THE OPERATING SYSTEM

This is the core software of CLOE and CLOE PRO, on the design and implementation of it the most important aspects to consider are: privacy and security, intelligent organization, shareability, ease of use, backup possibilities. In this chapter these features are described in terms of functional and non-functional software requirements of CLOE OS.

DESCRIPTION

CLOE OS is a closed-source proprietary Operating System, it is designed to interact with the user exclusively through the provided interfaces, i.e., the mobile and desktop official APPs.

PRIVACY AND SECURITY: All the stored files, independently from the specific format of it, must be ciphered for privacy purposes. Only authorized users can access the data, and nothing can be sent/received without the user permission, neither by HNS. The authentication process and all the other security mechanisms are described in the CLOE APPLICATIONS paragraph.

INTELLIGENT ORGANIZATION: CLOE and especially CLOE PRO must be equipped with AI capabilities, so that not only to provide the users with a file system structure similar to the ones of the most famous Mobile Operating Systems, but also to support intelligent auto-organizations of files, directories, backup directories and media. The latter should be organized in an interesting and easy-to-retrieve way, in a manner similar to the ones used by big public cloud platforms for media management (e.g. Google Photos).

SHAREABILITY: The OS must provide easy ways to share files and media with other people. This means that not only they will be able to be transferred using the conventional third-party instantaneous-messaging applications (like WhatsApp or Telegram), but also to be accessed by other users through their CLOE applications, prior the conception of such a permission by the owner user. Each file can be shared both in read-only and in read/write mode, within the aforementioned constraints. The shareability is referred also to the possibility for the users to cast their content on their private devices (e.g., smart TV), for this purpose CLOE can directly output the most common media formats like .avi, .mkv, .mp3/4, .ac3, .gif, .jpg, .png, .webp etc. CLOE PRO has a wider library of supported formats, including high-quality ones typical of content creators like DTS MA, 4K videos, FLAC…

EASE OF USE: The two main requirements for this goal are the following:

- Plug and Play connection mechanism to the home router. This can be done exploiting standard Point-to-point coupling protocols.
- User-friendly interfaces of the applications.

BACKUP POSSIBILITIES: A key point in CLOE is the backup: users must be able to safely save files from external devices to CLOE and between different CLOE devices. In order to guarantee that, the OS should autonomously provide synchronized and shared folders in which all the files of user specified directories are backed-up in an asynchronous manner, like what is done by Google Backup and Sync. Moreover, the OS must be coded so that to exploit the presence of other CLOE devices: if coupled, they can use one another to replicate user specified files/directories, also enhancing the overall availability. Eventually CLOE OS should provide easy and relatively fast data migration possibilities.

DEVELOPMENT PROCESS

The development process of CLOE OS is the one required to introduce a special purpose software starting almost from scratch. The main phases are the following:

1. PRE-PROCUREMENT: the first phase is to provide the development team with the basic hardware and software tools that they will need in order to start the OS creation.
2. REQUIREMENTS DEFINITION: starting from the high-level requirements defined in the “description” paragraph, the low-level needs are analyzed and all the use-cases are listed. A mock-up of the M2M interface that will communicate with the APPs is defined.
3. PLANNING: here all the requirements are translated into solutions, so that to accommodate all of them. Then, the architecture is designed with the goal of maximizing the non-functional requirements.
4. PROTOTYPING: as much better described in the quality management chapter, the main quality strategy is to detect errors/imperfections as soon as possible; for this purpose, a massive test on the prototypes is here conducted as soon as the APIs will be developed.
5. PROCUREMENT: further needed hardware and software resources listed in the phases 2 and 3 are here provided. For example, now the team is equipped with testbeds, platforms, software environments, IDEs… This phase should be parallelized as much as possible with the phase 4.
6. DEVELOPMENT AND TESTING: the OS is coded as conceived during the step 2. Continuous testing is performed in order to immediately prevent possible failures.
7. FINAL TESTING: another massive test phase is performed to be sure the system to meet the requirements. Alpha and Beta testing steps will be conducted.

8. MAINTEINANCE AND UPDATE: this step will be performed after the completion of CLOE OS and in a continuous manner; the team will continue to work in order to improve non-functional requirements, solve bugs and errors, modernize the software and so on. The updates will be freely made available to users as far as they are compatible with their product.

This process is needed to be completed before the product launch: it must be precisely scheduled with the attention not to jeopardize the requested quality. It could take until a year to complete and it is a very important component of the set-up costs of HNS.

REQUIREMENTS AND CONSTRAINTS

The OS planning, developing and testing will require highly specialized workforce, organization in teams, and several real and virtual resources. Costs are very high in the setup phase, but they should be lower after the completion of the first version of CLOE OS, anyway the whole process must be undertaken very carefully since any error on a phase could have dramatic consequences on the following ones, leading to a considerable raise of costs.

The process can start as soon as the basic tools are provided and the workforce is hired. Several phases of this process are burst point for many other processes (e.g., production or applications creation), so a careful scheduling is needed (the accurate scheduling effort has been performed by the PM in the relative section).

CLOE APPLICATIONS: MOBILE APP AND DESKTOP SOFTWARE

DESCRIPTION

CLOE Mobile App and CLOE Desktop App are the only tools provided to users in order to interact with CLOE and represent the most important offered services. The main requirements are the same of the CLOE OS, i.e. privacy and security, intelligent organization, shareability, ease of use, backup possibilities. In this paragraph they are practically planned client-side.

PRIVACY AND SECURITY: The customer exploits Bluetooth in order to have the first coupling with CLOE and connect it to the home network. From that moment on Bluetooth is no more used due to its unreliability. After the coupling with the home router, the user can register ONE and ONLY ONE account and it will be the only one that can access to the CLOE device. The account can also be used from other client devices after a successful 2FA (password + SMS or fingerprint/face identification if available). Once logged in, the user can access to all its files and interact with them, every operation is performed through SECURE SSH END-TO-END connection between the client and CLOE (no relay server is used) and all the exchanged information is encrypted and verified. These mechanisms protect the user from any possible man-in-the-middle attack and also the data in case of theft of the physical device, since there will be no way for eventual robbers to access the data. Finally, the administration user can request, from the applications, to remotely block or reset CLOE.

INTELLIGENT ORGANIZATION: As discussed for CLOE OS, CLOE exploits the AI in order to cleverly organize data and show it in a user-friendly, easy-to-find way. Based on the file extension and context, CLOE discriminate media files from the work ones, organizing them in a different way. This organization will be exploited by the application in order to show to the user files according to the specified policy.

SHAREABILITY: The applications must provide an intuitive interface to quickly and easily share files with family and friends, both copying and sending it through external applications, and through a CLOE-to-CLOE connection. In this case, the user allows other registered accounts (those accounts must be coupled with

other CLOE devices, see PRIVACY and SECURITY) to access its own files. Privileges are managed by the owner in a file-to-file bases, and for each of them he/she can decide the SINGLE accounts that can access it and the MODALITY (read only, read + write request, read + write). Media files can be broadcasted as explained in CLOE OS: the application will show the relative icon ( ).

EASE OF USE: The applications must be intuitive and catchy, but without hiding too much the more advanced features, like the permissions management for the sharing or the backup mechanism.

BACKUP POSSIBILITIES: Backed-up folders from external devices are shown in CLOE through a dedicated directory in the "Devices" tab of the main menu, in a similar manner as implemented in Google Drive. CLOE handles automatically conflicting updates through different client devices exploiting partial locks, like it is done in Microsoft applications, moreover it allows the local download of a copy of each single file so that to have it available remotely even if there is no way to setup the internet connection. There is no way to access remotely a file if no connection is available and it has not been downloaded locally. Eventually, every time a file is accessed by a client device, it is temporary locally copied and updates are performed as soon as they end and an internet connection is available.

CUSTOMIZATION LEVEL

The applications will be highly standardized for anyone, anyway the AI will be able to show files in different manner to the different users based on the file type and the typical owner-app interaction.

The customers can choose the interface theme among a set of predefined ones.

DEVELOPMENT PROCESS

The process is basically the same needed for the OS development, anyway the application is basically an interface, so it will need less work and maintenance with respect to CLOE OS. For this reason, we decided that:

- The back end and the business logic aspects will be handled by the OS team, that will provide optimized private APIs and Drivers (with hidden and obfuscated implementations) to interact with CLOE OS.
- These will be given to an external supplier that will develop the front-end applications. This partner will be sporadically re-engaged for application updates/maintenance.

Hence, from the beginning a procurement phase is needed in order to find the most suitable partner for the application development.

REQUIREMENTS AND CONSTRAINTS

The choice of the partner is in charge of the Management of HNS, the personnel and the assets needed for the API generation are the same of CLOE OS, thus they will be shared, prior ensuring workforce and hardware efficient utilization. The application development process can start as soon as the prototyping phase of the OS is concluded, so that to provide the software suppliers with the skeleton of the OS (Drivers and APIs, even if the actual implementation is still not ready).

The subcontracting of CLOE APP development has been chosen due to the budget savingbut we must take into consideration the risks of delays in case of insolvency of the supplier.

CLOE.COM: THE WEBSITE

DESCRIPTION

CLOE.COM will be the virtual business card and portfolio for the product, to provide customers with synthetic yet comprehensive description of the proposed value and to transmit them the degree of reliability of HNS.

The website will be composed mainly by 3 parts: the Front-end, the CLOE Community and the E-commerce platform.

FRONTEND: mainly aimed to present the value we propose through CLOE to our customers, it must be simple, elegant and well designed. The focus must be on the gain the customers will achieve by purchasing CLOE and on the catchy design of the product.

CLOE COMMUNITY: thought to be a communication medium between beginners and expert CLOE users and HNS personnel (as better described on the previous chapters), it must be easy to use and highly interactive so that to implement a real mean of exchange of information between users and troubleshooting.

E-COMMERCE PLATFORM: from CLOE.COM customers can order and buy the proposed product. The platform needs to exploit all the web-level security solutions for safe transactions, be compatible with the most diffused payment platforms (like PayPal), and support the purchasing by the most famous credit cards brands. An important issue is to provide the users with a visual interface that inspires trustworthiness and a high availability and reliability of the platform.

In order to ensure availability and the ability to handle high workloads at relatively low costs, we decided to partner with an external hosting company through a pay-per-use contract to fulfill such requirements. Of course, the partner will be chosen among the ones that are able to handle such constraints at professional level.

DEVELOPMENT PROCESS

The planning, development and testing of the website requires a process very similar to the one presented for CLOE OS, but the highly modifiable nature of it could allow for more agile approaches.

In order to comprise costs and avoid the pre-procurement phase, the resources used for the website creation (personnel and machines) are in common with the CLOE OS team, anyway the collaboration with external graphic designers and web media connoisseurs will be needed.

The main phases will be:

1. REQUIREMENTS DEFINITION
2. BACKEND AND LINK PLANNING: in this phase the behavior of the server is defined, with special attention to the availability and the workloads it will have to face. Then, the structure of the website is defined, designing all the hyperlinks that will be provided to users.
3. PROTOTYPING AND TESTING
4. FRONTEND DESIGN AND IMPLEMENTATION
5. FIRST PUBLICATION to anticipate the launch of CLOE
6. BACKEND IMPLEMENTATION AND TESTING
7. FINAL TESTING AND FINAL RELEASE

The whole process can last even several months, and at least the first 5 points are needed to be completed before the launch of CLOE in the market.

REQUIREMENTS AND CONSTRAINTS

The website creation needs medium-high skilled IT developers and engineers, but also the collaboration of the external partners is crucial to ensure a modern and catchy design combined with high efficiency and scalability, thus the power of such suppliers will be pretty high, as better analyzed in the Strategy Section.

The process can start as soon as the resources are ready, and it is a burst point for the production beginning.

CLOE CARE: THE MAINTENANCE SERVICE

DESCRIPTION

CLOE CARE is the premium customer care service that consists of repair and assistance beyond the warranty lifespan. Operationally, CLOE CARE is composed by both manufacturing and service aspects, more precisely:

- Plant, machines and workforce for the physical fixing. These resources could be partially taken from the main production plant as far as the best efficiency is achieved.
- Collection and delivery logistics, which will oversee external companies as explained in the Distribution chapter of the Marketing Section.
- Help center, mainly integrated with CLOE.COM.

PROCESS

CLOE CARE, as well as CLOE and CLOE PRO, needs daily manufacturing operations and so it is an integrated part of the production planning (consumes materials, needs inventory…). Every incoming device must be subjected to the following process:

1. PRODUCT DIAGNOSIS: finding of problems/errors/broken parts (if any) of the product to repair. The output of this phase should be a deeply detailed report of the found problems.
2. COMPONENT PROVVISIONING (if needed)
3. REPAIR: on the bases of the found problems, the product is repaired or substituted. Repairs could require the disassemble of the product, the substitution of components and/or the reconfiguration of the software.
4. TESTING: very important phase in order to ensure that original problems are solved and that no new one has arisen. A faulty outcome of this phase should be considered on a par with a defective product.
5. DELIVERY

REQUIREMENTS AND CONSTRAINTS

While the phases 2 and 3 can be performed by low-medium skilled workers, provided with standard procedures, the steps 1 and 4 need expert personnel and accurate analysis so more expensive resources. In CLOE CARE very important issues are success and responsiveness: in order not to be considered as a poor quality service, the whole process cannot last more than few weeks but it is crucial for the customer that the returned product is problem free.

FACTORY LAYOUT AND PROCESS PLANNING

In this chapter the planned factory layout and the scheduling of the cycles of the processes will be presented. As we could appreciate on the previous chapter, we intend to offer to our customer a very standardized product, with low level of customization that mainly affects the choice of input components. For these reasons, the layout and the processes should be highly product-based, trying to maximize the efficiency of production and minimizing overhead costs.

This approach anyway has a major drawback, i.e. the low level of process flexibility which means high costs in case of discrepancies between production volume and market demand. If it is true that this issue can be faced (our chosen strategies will be presented on the aggregate planning chapter), on the other hand the startup nature of our company does not allow us to have confidently accurate sales forecast, and we could potentially be exposed to dramatic demand fluctuations at the beginning of the product (and company) lifecycle.

That's why we decide not to undertake all in once the initial investment, evaluated as definitely too risky, but to begin the production with a lightweight plant layout that could guarantee higher flexibility and responsiveness in case of demand fluctuation, and progressively invest on further assets in order to achieve the goals previously specified. The final layout will be a real production line capable to ensure the largest profits on periods of high and low-variable demand. The increase of production capacity will be achieved mainly through the re-design and automatization of the process for an optimized output rate and the minimization of waste rather than increasing the plant volume if not necessary. This point will be better discussed in the lean management chapter.

INITIAL LAYOUT

Before discussing the description of it, an important point should be clarified: this layout is intended to be the one that will be exploited **as soon as it will be possible to start production**. Indeed, before it will be, setup times and investments will be required as better described in the PM section: hence from now on in this section we will refer to year 1 to indicate the **first year of production and selling**, not the first year in absolute from the moment in which this business plan will be delivered.

As already introduced, for the first year of production we cannot afford to have a fully functional production line, since it would be too poorly flexible for our purposes, thus too risky. That's why we decided to introduce ourselves in the market with a **hybrid layout mainly batch manufacturing** oriented but also with features typical of group technologies, as the fact that similar processes have been designed to produce both CLOE and CLOE CARE. This approach will be translated into the following features:

- Items will be moved along the production line in batches, whose slot size will be proportional to the number of received orders and predicted forecasts.
- The work will be mainly manual until the automatization process will end. At the beginning we could exploit the possibility for overtimes and temporary workforce in case of sudden peaks of the demand, of course taking care of our personnel morale as leading philosophy.
- Delivery of products, logistics and procurements will be organized in small-medium size lots: this will surely determine higher costs for this first period but it is crucial not to make the customer wait too much for the product.
- We expect very low demand for CLOE CARE services during the first year of production, thus it will be organized mainly as a **professional service**. Also this aspect could cause higher costs but will allow

us to have a close relationship with customers meaning an enhanced word-of-mouth advertisement, consistently with what discussed in the Strategy and Marketing sections.

- The layout will be organized into cells so that to *make it easier to shift capacity temporarily and to add or subtract capacity*[35], in which workers will have the possibility to work in teams. The big difference of backgrounds and skills between very different groups (e.g., testers and assemblers) will not allow for task rotations, on the contrary this approach can be exploited between similar workstations.

PROCESS PHASES AND TAKT TIME

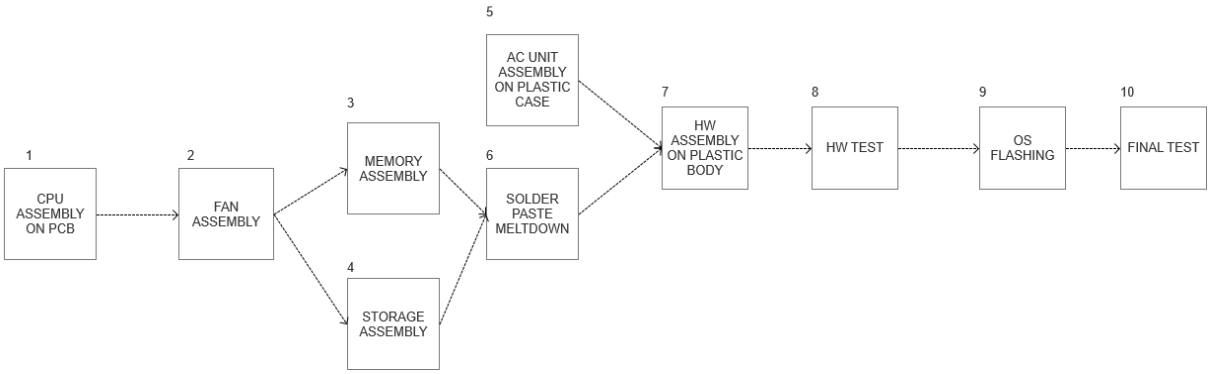


Figure 11. CLOE production process

In the figure 11 all the needed phases in order to create a fully working CLOE product starting from inventory components are reported. In the initial plant, the expected time needed for each phase is the following:

PHASE	1	2	3	4	5	6	7	8	9	10
TIME (sec)	75	120	75	75	150	75	75	1800	1200	3600

Table 2. time of production

According to these estimates and the average daily sell forecast for year 1 of production that is equal to 33 units/day, considering only 1 shift of 8 hours/day, we find that:

$$takt_{time} = \frac{available_{time}}{daily_{output}} = \frac{28800s}{33} = 872.72s$$

Note that the takt time is lower than the time needed for the phases 8,9 and 10: it means that these steps need to be parallelized in more than 1 workstation, so that to minimize the idle time. According to those considerations, we obtain the following results:

STAGE	1	2	3	4	TOTAL
PHASES	1->7	8	9	10	-
REQUIRED WORKSTATIONS	1	3	2	5	11
TOTAL TIME/WORKSTATION (sec)	645	600	600	720	7245

[35] Operations Management, 14th Edition by Stevenson, McGraw Hill Education 2021

Table 3. time and workstation allocation

From the previous table, we can compute the Idle Time that is:

$$Idle_{time(\%)} = IT = \frac{W * C - \sum T_i}{\sum T_i} * 100\% = \frac{675s}{7245s} * 100\% = 9{,}32\%$$

Which means that the mathematically computed efficiency delay of the process is 90,68%. The process here analyzed is very efficient, anyway the lack of automatization could create sensible fluctuations of the expended time in each phase of the process, thus threatening the reached efficiency; moreover it will be impossible to reach such an efficiency level at the beginning of production, since we have to consider necessary learning phases and running-in periods, thus for the first months it is reasonable to estimate an efficiency delay of about 80-85%.

On the bases of the computed workstations, we can allocate the resulting workforce:

1. 3 people are needed to handle the operations on the first workstation (phases 1-7)
2. The HW testing is not automatized, so at least 1 operator per workstation is needed (3 in total)
3. Same for OS Flashing, leading to other 2 workers needed.
4. The final testing needs 2 operators.

Based on this estimates, the initial personnel is composed by 10 people, this number could increase in time according to the requested output and the chosen flexibility strategy (see aggregate plan)

PLANT LAYOUT FOR THE FULLY OPERATIONAL PHASE

At the beginning of the **year 3 of production** we expect to have a fully automatized plant, ready to ensure the maximum level of efficiency, which means higher volumes to face the demand growth and peak and benefits on costs due to the minimization of wasted times and the exploitation of the economy of scale.

The planned layout will be a pure **production line** in which automated processes live in symbiosis with the human intervention of products and machines. The flow will be the one typical of assembly lines, seeking for the best possible efficiency and quality but best effort flexibility.

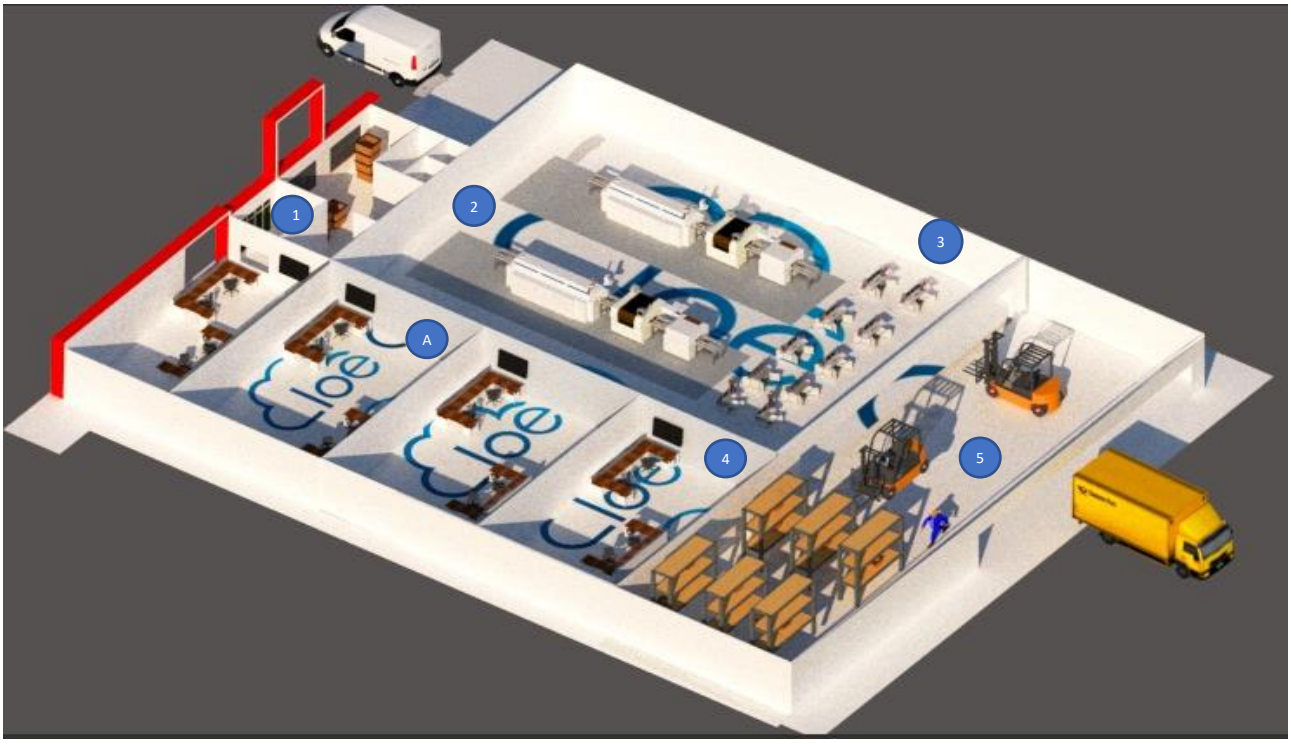
As we know, it is impossible to obtain the best from efficiency, flexibility and the lean principle of little (or no) inventory storage. That's why, as we better explained in the aggregate planning and in the lean management chapters, we decided not to renounce to the inventory as countermeasure against possible demand fluctuations in our (by nature) inflexible production process. The final factory layout will be characterized by:

- Full capacity production of standard items
- The process is completely arranged on top of the product flow, trying to pace a specific output rate.
- Sequentially arranged resources.
- Highly automated work but still need of human intervention. No temporary workers, minimization over possible of overtimes
- Delivery of products, logistics and procurements organized in medium-large lots, to minimize unvaluable costs.
- Standardization of services, including CLOE CARE which will be re-engineered in order to maximize efficiency (so minimize customer wait time) and learn standard procedures on the bases of the

experience maturated during the first year. CLOE CARE will be structured as a **mass service**, and will exploit the benefits of the RFID tracking as we will explain in the quality management chapter

- The plant layout will be fully **product-based**, in which workers must handle simple but very repetitive tasks. Moreover, it will be important to let workers rotate between the various required tasks and let them work (when possible) in pairs or very small groups at each stage in order to avoid alienation and concede small breaks to them without letting a stage uncovered.

The final plant will be similar to the one here reported, this picture has not the purpose of showing how exactly our plant will be structured, but only to understand the line that the product will be submitted to, from the raw components to the final delivery.



A. Administration of processes and monitoring
1. Inventory of raw components
2. Assembly line
3. HW testing and OS flashing
4. Final Testing
5. Inventory of final products and delivery

PROCESS PHASES AND TAKT TIME

The production process is the same shown in figure 11. Anyway, because of the tool changes, the time required for some operations are now lower, indeed they are estimated to be:

PHASE	1	2	3	4	5	6	7	8	9	10
TIME (sec)	15	20	15	15	35	30	30	1650	1200	3400

Table 4. time of production

Considering the average daily demand of the maturity period (see Sales Forecasting) we expect to have 178 daily orders, from which we derive that:

$$takt_{time} = \frac{available_{time}}{daily_{output}} = \frac{28800s}{178} = 161.72s$$

Again, we will need to parallelize the slowest phases in more than 1 workstation. The results we obtain are:

STAGE	1	2	3	4	TOTAL
PHASES	1->7	8	9	10	-
REQUIRED WORKSTATIONS	1	11	8	22	42
TOTAL TIME/WORKSTATION (sec)	160	150	150	155	6410

Table 5. time and workstation allocation

From the previous table we derive:

$$Idle_{time(\%)} = IT = \frac{W * C - \sum T_i}{\sum T_i} * 100\% = \frac{310s}{6410s} * 100\% = 4{,}84\%$$

which means an efficiency higher than 95%. In this case, the obtained pace will be much more stable due to the automatization of the various stages, anyway it is very important to remember that the cost of such efficiency is a very low degree of flexibility: the abrupt slowdown of a workstation can congest the others generating a lot of WiP and huge efficiency losses. To this aim, as we will discuss in the aggregate planning chapter, it is very important not to change capacity output to face demand fluctuations and, as better discussed in the quality chapter, the continuous real-time monitory of equipment is crucial to avoid breakdowns.

For which concern the workforce, we will need:

1. 6 people on the first workstation, to manage machines and move pieces along adjacent phases
2. 3 people to manage the automatized HW Testing (phase 8)
3. 8 people for the OS Flashing, one per workstation
4. 9 people to manage the 22 workstations of Final Testing, also in charge of storing products in the outgoing inventory and load trucks.

AGGREGATE PLANNING AND MASTER SCHEDULING

OPERATIONAL STRATEGIES

In this chapter we discuss the policies implemented in order to match demand and supply, in terms of quantity and time, both for what concerns the first period of production of our company and when we will reach the maturity in terms of plant and processes.

INITIAL PERIOD

As already discussed in the factory layout chapter, at the beginning we expect to have a very flexible (yet quite inefficient) production chain. Thanks to this and the high variability of actual demand with respect to the predicted one, we intend to assume a **reactive** approach, altering capacity when and if needed, **chasing** the level of demand itself, more in details:

UNEXPECTED INCREASE IN DEMAND:

- LOW TO MEDIUM: use of the inventory, overtimes and/or part-time workers if needed.
- MEDIUM TO HIGH: part-time workers, backordering. No sub-contracting due to risky exposition of proprietary technologies (e.g., CLOE OS)
- VERY HIGH: new workers, increase of shift numbers, discussion with Marketing and Finance Managers about possible pricing strategies.

UNEXPECTED DECREASE IN DEMAND:

- LOW TO MEDIUM: production for the inventory, if necessary slack times
- MEDIUM TO HIGH: slack times, suspension of furnishing if needed.
- VERY HIGH: discussion with Marketing and Finance Managers about possible pricing strategies, if needed temporary stop of production and selling from the inventory

FULLY OPERATIONAL PHASE

On the contrary, once finalized the factory layout, we will not afford anymore to have highly reactive strategies due to the high setup costs we would incur if we frequently change the output rate and the capacity at each demand fluctuation. That's why we intend to adopt a **proactive** approach, trying to **level** the rate of production and to change it as few times as possible, exploiting the inventory and the backordering to face demand fluctuations.

AGGREGATE PLAN FOR YEAR 1

Here it is the aggregate planning for year 1 of production (Initial layout) according to 3 possible strategies: chase demand, level production and mixed (mainly chase) and through a try-and-error approach we found a configuration that achieves low costs of production. Note how much the chase demand strategies are more suitable for our initial highly flexible environment. The sales forecasts have been discussed in the relative chapter of the Marketing section.

The assumptions are the following:

- The cost per unit of the regular worktime is 15€/unit (1500€/period * 10 workers *12 periods/12000 output units, see process phases)
- “” “ “ “ overtime is 17.5€/unit (20% more than regular time)
- Additional workforce: 20€/unit (including hire costs)
- No subcontracting due to company policy
- Inventory: 1€/unit*period
- Back orders: 25€/unit
- Regular workforce cannot produce more than 1000 units/period
- Overtime workforce cannot produce more than 250 units/period
- Extraordinary workforce cannot produce more than 500 units/period
- The aggregate planning does not take into consideration possible changes in the workforce that could be generated by the progresses of the initial investment. Thus, it could require to be updated several times during the year

PURE LEVEL APPROACH:

PERIOD		1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
SALES FORECASTS		200	200	300	550	850	1000	1200	1250	1300	1550	1600	2000	12000
REGULAR	OUTPUT	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	12000
	COST	15000	15000	15000	15000	15000	15000	15000	15000	15000	15000	15000	15000	180000
OVERTIME	OUTPUT	0	0	0	0	0	0	0	0	0	0	0	0	0
	COST	0	0	0	0	0	0	0	0	0	0	0	0	0
ADDITIONAL WORKERS	OUTPUT	0	0	0	0	0	0	0	0	0	0	0	0	0
	COST	0	0	0	0	0	0	0	0	0	0	0	0	0
OUTPUT 2 FORECAST		800	800	700	450	150	0	-200	-250	-300	-550	-600	-1000	0
INVENTORY:														
BEG. INVENTORY		0	800	1600	2300	2750	2900	2900	2700	2450	2150	1600	1000	
FINAL INVENTORY		800	1600	2300	2750	2900	2900	2700	2450	2150	1600	1000	0	
AVG INVENTORY	VALUE	400	1200	1950	2525	2825	2900	2800	2575	2300	1875	1300	500	23150
	COST	400	1200	1950	2525	2825	2900	2800	2575	2300	1875	1300	500	23150
BACK0ORDERS	VALUE	0	0	0	0	0	0	0	0	0	0	0	0	0
	COST	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL COST														203150

The production cost of this strategy is quite high because it is not suitable for handling the constant change on the projected demand. Moreover, it would require a huge inventory (on the month 6, the inventory level would be almost 3 times the sales!).

On the contrary, on the next table we try to apply a pure chase demand strategy: costs are much reduced, but now we will need massive overtimes and additional workers that could cause burnout, together with the problem of back-ordering. That is why we tried a third mixed approach, mainly chase based but that tries to mitigate the disadvantages of this latter one, further comprising costs

PURE CHASE APPROACH:

PERIOD		1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
SALES FORECASTS		200	200	300	550	850	1K	1.2K	1250	1.3K	1550	1.6K	2K	12K
REGULAR	OUTPUT	200	200	300	550	850	1K	1K	1K	1K	1K	1K	1K	9100
	COST	3000	3000	4500	8250	12750	15000	15000	15000	15000	15000	15000	15000	136500
OVERTIME	OUTPUT	-	-	-	-	-	-	200	250	250	250	250	250	1450
	COST	-	-	-	-	-	-	3500	4375	4375	4375	4375	4375	25375
ADDITIONAL WORKERS	OUTPUT	-	-	-	-	-	-	-	-	50	300	350	500	1.2K
	COST	-	-	-	-	-	-	-	-	1000	6000	7000	10000	24000
OUTPUT 2 FORECAST		0	0	0	0	0	0	0	0	0	0	0	0	0
INVENTORY:														
BEG. INVENTORY		-	-	-	-	-	-	-	-	-	-	-	-	-
FINAL INVENTORY		-	-	-	-	-	-	-	-	-	-	-	-	-
AVG INVENTORY	VALUE	-	-	-	-	-	-	-	-	-	-	-	-	-
	COST	-	-	-	-	-	-	-	-	-	-	-	-	-
BACK-ORDERS	VALUE	-	-	-	-	-	-	-	-	-	-	-	250	250
	COST	-	-	-	-	-	-	-	-	-	-	-	6250	6250
TOTAL COST														192125

MIXED APPROACH (MAINLY CHASE):

PERIOD		1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
SALES FORECASTS		200	200	300	550	850	1K	1.2K	1250	1.3K	1550	1.6K	2K	12K
REGULAR	OUTPUT	200	200	350	800	1K	1K	1K	1K	1K	1K	1K	1K	9.6K
	COST	3000	3000	5250	12000	15000	15000	15000	15000	15000	15000	15000	15000	143250
OVERTIME	OUTPUT	-	-	-	-	-	-	-	250	250	250	250	250	1250
	COST	0	0	0	0	0	0	0	4375	4375	4375	4375	4375	21875
ADDITIONAL WORKERS	OUTPUT	-	-	-	-	-	-	-	-	-	200	500	500	1.2K
	COST	0	0	0	0	0	0	0	0	0	4000	10000	10000	24000
OUTPUT 2 FORECAST		0	0	50	250	150	0	(200)	0	(50)	(100)	150	(250)	0
INVENTORY:														
BEG. INVENTORY		0	0	0	50	300	450	450	250	250	200	100	250	
FINAL INVENTORY		0	0	50	300	450	450	250	250	200	100	250	0	
AVG INVENTORY	VALUE	0	0	25	175	375	450	250	250	225	150	175	125	2300
	COST	0	0	25	175	375	450	250	250	225	150	175	125	2300
BACK-ORDERS	VALUE	-	-	-	-	-	-	-	-	-	-	-	-	-
	COST	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL COST														191425

MASTER PRODUCTION SCHEDULE FOR MONTHS 1,2,3

The result of the disaggregation of the previous aggregate plan is the Master Scheduling. Here we report the Master Production Schedule for the first 3 months of production relative to the CLOE product. Note that, we are referring to the first months after the starting of production, **not the next three months from now**. For the sake of simplicity, we assume that the sales forecast relative to each month can be split into equal parts along the weeks.

- The regular lot size of the MPS is fixed to 100 units for the first 2 months.
- The lot size for month 3 will be increased to 175, to face the increase of demand and to be consistent with the aggregate plan.
- Hence the lot size policy is basically a lot-for-lot ordering, in our context it is important to ensure flexibility and adopt a chase demand approach.

BEGINNING INVENTORY=0	MONTH 1				MONTH 2				MONTH 3			
WEEK	1	2	3	4	1	2	3	4	1	2	3	4
FORECAST	50	50	50	50	50	50	50	50	75	75	75	75
CUSTOMER ORDERS	0	0	0	0	0	0	0	0				
PROJECTED ON-HAND INVENTORY	0-50 +100= 50	0	50	0	50	0	50	0	100	25	125	50
MPS	100		100		100		100		175		175	
AVAILABLE-TO-PROMISE INVENTORY (UNCOMMITTED)	100		100		100		100		175		175	

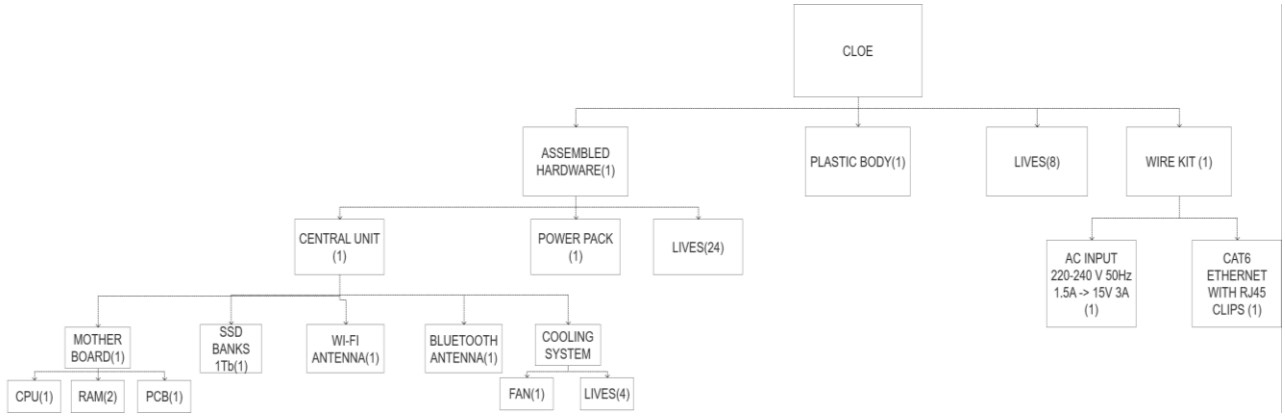
The MPS is consistent with the aggregate planning, since:

- The requested production output in each month in the MPS is equal to the projected one in the AP
- The final inventory after month 3 will be 50, exactly as planned in the AP
- The production amount in each period is feasible according to the production capacity (33 per day for the first period, see plant layout chapter)

BOM, MRP AND SUPPLIERS MANAGEMENT

In this chapter we will discuss the Bill of Material and the policies about suppliers that are intended to be input of the MRP, which will be reported afterwards.

THE BILL OF MATERIALS



In this picture we show the required components and materials for one unit of CLOE. All the leaf nodes represent a component that will be externally purchased from our suppliers, the relative parent nodes are instead produced by our company, according to the assembly process presented on the relative chapter.

SUPPLIERS MANAGEMENT

Here we precisely describe the requirements of the supplied parts we need for the production of CLOE, specifying for each of them the expected cost and lead time. All the suppliers we are looking for should have the ISO 9001 certification, since as specified in the strategy section we want to achieve high product quality which must be developed starting from high component quality. In the following lines, we present the requirements we need for each component and possible suppliers, together with their characteristics and offered quality, price and lead time (from the beginning of procurement to the engagement on inventory/production line). Of course, these suppliers are not definitive, but they are the ones that best suits the requirements of each component. Hence, starting from the BOM we have:

- CPU: the CPU should be enough powerful to support AI operations and fast data transfer, while there is no interest on graphic issues, virtualization and so on. We decided to use a Realtek RTD1295PB-CG A53(https://www.realtek.com/), (based on ARM CORTEX A53) which has all the required features. This supplier is a powerful worldwide company, highly reliable and capable to ensure low lead times; on the other hand we have no power to ask for lower prices or to put pressure in case of delays (the power of suppliers has been better described in the strategy section). Price: 60€/unit for more than 50 units, lead time: 2 weeks.
- RAM: The RAM amount should be enough to ensure the possibility to perform every operation with our device and with low latency. That is why we decided to procure KINGSTON DDR4 2GB RAM banks, which is a famous producer leader in the market. This component is retailed by AVGN InfoTech(https://www.avgninfotech.com), which we decided to use as our partner wholesaler. This company is among price leaders in the world, anyway it is a relatively small company located far away from our headquarter (India), which means that we have to assume long lead times. Price 2.21€/unit for a slot of 100 units, lead time: 4 weeks

- PCB: The Printed Circuit Board is a key component of our product: indeed, we will need suppliers available to customize them for the architecture of our product, which means that we need reliable suppliers and also continuous provisioning since we will not have the possibility to replace our PCB supplier very easily, thus enforcing their power. We chose ItalTronic PCB products, through the MyPcbShop wholesaler (https://www.mypcbshop.com/. Price 3.86€/unit for a 100 pieces lot, lead time: 2 weeks.
- SSD BANK: The most important component to achieve fast read and write accesses to the storage. Indeed, the HDD technology is not only old-fashioned, but also practically much slower with respect to the SSD. We intend to buy 1Tb OEM ODM Solid State Storage sold by Shenzhen Flashine Science And Technology Co. (http://www.flashine168.com). This Chinese company is a new reality on the market, but in rapid expansion and very focused on reliability and quality. Again, the distance could be a problem for lead times, and the reduced dimensions and experience of the seller can be a potential threat for the regular provisioning; since the SSD storage is key component of our product, we will also consider the possibility to have alternative choices. Price 12.43€/unit, lead time: 4 weeks.
- WI-FI ANTENNA: The 802.11 antenna is a very simple and standard manufacturing piece, so it is very easy to find good quality at low prices. We selected the Wireless built-in antenna by Gaoke Ant Co. which offers very low-price products, certified with ISO 9001; once again the distance could be a problem for lead time, but the high availability at low price of the component gives us a high degree of freedom to change supplier with low costs, if needed.
  Price 0.58€/unit, lead time: 4 weeks
- BLUETOOTH ANTENNA: The same considerations stand for the Bluetooth antenna. We chose the GBT-433-2.5A (supports Bluetooth 5.0 and BLE) by Shenzhen Gerbole (https://en.szgerbole.com). Price 0.15€/unit, lead time: 4 weeks
- FAN: The cooling fan is not required to be very powerful, due to the very low power emitted by the CPU and the lack of Graphic Hardware, which is usually the biggest responsible of overheating. On the contrary it must be reliable enough to avoid that a failure of it compromises the whole product or even worse damages the surrounding environment. We selected the DC Cooling Fan IP58 by Shenzhen Topfan Technology Development Co. (https://www.topfan-china.com). Price 4.92€/unit, lead time: 4 weeks.
- LIVES: Very standard minor component, can be provisioned for 0.02€/unit by many retailers. Lead time is few days, we will consider the worst case of 1 week.
- POWER SUPPLY UNIT: CLOE will work at 3A and 15V, so we need a simple and low-power DC converter. The main requirement in this case is size: to fit our product, the power supply unit must be relatively small and thin. Once again, the quality is important to avoid premature breakdowns, but also dangerous situations for the customer. We would like to select Technoware (https://www.tecnoware.com/) as partner, which is an Italian big manufacturer, highly reliable and strongly partner-oriented.[36] Price is 13.40€/unit, lead time: 1 week.
- PLASTIC BODY: This, as well as the PCB, is a component that we need to be designed and realized uniquely for our product. Thus, the main requirements are:
  - Quality of the material, for the purposes specified in the description paragraph.
  - Reliability of the partner, that will be very difficult to change and very powerful.
  - Nice design, since it will be the only visible part of the product.

[36] https://www.tecnoware.com/ it-it/About-us/Chi-Siamo

All those requirements are met by MPT S.R.L. (https://www.mptsrl.it/), an Italian excellence characterized by high reliability, supreme quality and very low lead times, even if at higher costs. Price is estimated to be 12.30€/unit, lead time lower than 1 week.

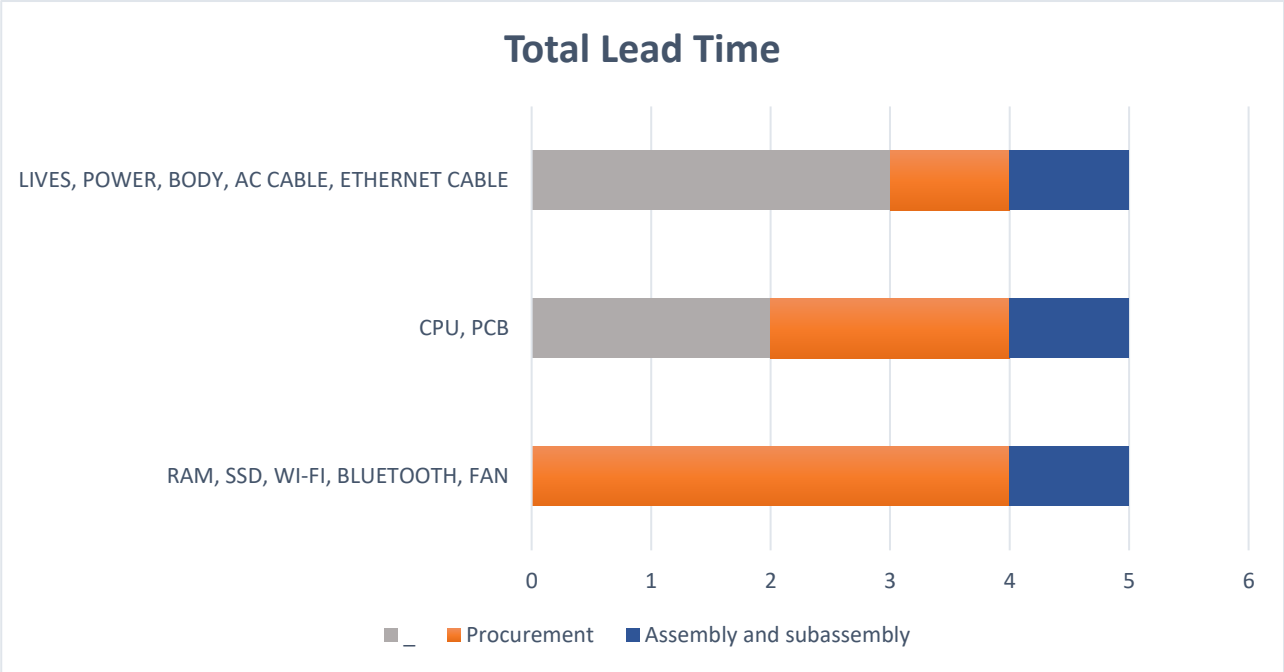
- AC INPUT CABLE: Furnished together with the Power Supply unit by Technoware, so we can consider as price: 0€, lead time: 1 week.
- CAT6 ETHERNET CABLE: Very standard component, easy to find at low price and good quality. We chose an Italian company, i.e., the Welly Enjoy (https://www.wellyenjoyit.com/). Price: 1.00€/unit, lead time:1 week.

For what concerns CLOE PRO, as we already saw, the process of production is the same. Anyway, some components will be different to meet the planned performance. In order to guarantee a solution of continuity and improve the partnership with suppliers, we decide to keep them as furnishers of CLOE PRO components (we can consider same lead times). They will be:

- CPU: Realtek RTD1395PB-CG A53 based on enhanced ARM Cortex A53, with additional Machine Learning capabilities, 4K processing and improved speed. Price: 73.42€/unit
- RAM: same model as before but this time there will be 4 slots instead of 2, so price is again 2.21€/unit
- SSD: again, we will use the same model as before but with 2 separate banks instead of 1. Price is 12.43€/unit.
- POWER SUPPLY UNIT: in order to power the additional components, we will need a more powerful input current: the AC unit must output 3.5A, thus increasing the price for this component to 15.20€/unit.
- PLASTIC BODY: the different design of CLOE PRO requires a different body, with bigger dimensions and equipped with at least 1 fall-safe stratum (e.g., thin carbon fiber). Price is estimated to be 19.20€/unit.

THE MRP

At the beginning of the production, consistently to what already explained in the previous operations chapters, the procurement policy will be the lot-for-lot ordering. Hence the orders for the first 2 months will be of 100 units/order multiplied by the number of required units per final product. On the previous paragraph we reported the lead times for the procurement of each component and the price per unit on lots of 100; we don't have pure fabrication and as shown in the process design chapter, the time for assembly is quite short (100 pieces can be assembled in 3 days) so we can consider a maximum assembly lead time of 1 week (null for subassemblies). So, the total lead time is:



Taken as input the BOM, the MPS, the total lead time and the previous considerations, and having an empty inventory at the beginning of production for any component, we can build the following MRP[37]:

LEVEL 1: CLOE

PERIOD		-5	-4	-3	-2	-1	1	2	3	4	5	6	7
CLOE LT=1	GROSS REQUIREMENTS						100		100		100		100
	SCHEDULED RECEIPTS												
	PROJECTED ON HAND												
	NET REQUIREMENTS						100		100		100		100
	PLANNED-ORDER RECEIPTS						100		100		100		100
	PLANNED-ORDER RELEASES					100		100		100		100	

[37] We refer to the weeks preceding the start of production using negative period numbers. Only some component schedules are here reported. All the components have been aggregated to the lower level in which they appear.

LEVEL 2: PLASTIC BODY

PERIOD		-5	-4	-3	-2	-1	1	2	3	4	5	6	7
PLASTIC BODY	GROSS REQUIREMENTS					100		100		100		100	
LT=1	SCHEDULED RECEIPTS												
	PROJECTED ON HAND												
	NET REQUIREMENTS					100		100		100		100	
	PLANNED-ORDER RECEIPTS					100		100		100		100	
	PLANNED-ORDER RELEASES				100		100		100		100		

LEVEL 3: POWER SUPPLY UNIT

PERIOD		-5	-4	-3	-2	-1	1	2	3	4	5	6	7
POWER SUPPLY UNIT	GROSS REQUIREMENTS					100		100		100		100	
LT=1	SCHEDULED RECEIPTS												
	PROJECTED ON HAND												
	NET REQUIREMENTS					100		100		100		100	
	PLANNED-ORDER RECEIPTS					100		100		100		100	
	PLANNED-ORDER RELEASES				100		100		100		100		

LEVEL 4: WI-FI ANTENNA

PERIOD		-5	-4	-3	-2	-1	1	2	3	4	5	6	7
WI-FI ANTENNA LT=4	GROSS REQUIREMENTS					100		100		100		100	
	SCHEDULED RECEIPTS												
	PROJECTED ON HAND												
	NET REQUIREMENTS					100		100		100		100	
	PLANNED-ORDER RECEIPTS					100		100		100		100	
	PLANNED-ORDER RELEASES	100		100		100		100					

LEVEL 5: RAM, PCB, LIVES

PERIOD		-5	-4	-3	-2	-1	1	2	3	4	5	6	7
RAM LT=4	GROSS REQUIREMENTS					200		200		200		200	
	SCHEDULED RECEIPTS												
2PIECES per CLOE	PROJECTED ON HAND												
	NET REQUIREMENTS					200		200		200		200	
	PLANNED-ORDER RECEIPTS					200		200		200		200	
	PLANNED-ORDER RELEASES	200		200		200		200					
PERIOD		-5	-4	-3	-2	-1	1	2	3	4	5	6	7
PCB LT=2	GROSS REQUIREMENTS					100		100		100		100	
	SCHEDULED RECEIPTS												
	PROJECTED ON HAND												
	NET REQUIREMENTS					100		100		100		100	

	PLANNED-ORDER RECEIPTS					100		100		100		100	
	PLANNED-ORDER RELEASES			100		100		100		100			

Once restructured the BOM (after Low Level Coding), we find lives all placed at the level 5. The total number of lives per unit of CLOE is 36. Lead time is 1 week, and we assume that order must be multiple of 1000 units.

PERIOD		-5	-4	-3	-2	-1	1	2	3	4	5	6	7
LIVES LT=1	GROSS REQUIREMENTS					3600		3600		3600		3600	
	SCHEDULED RECEIPTS												
36Pieces per CLOE	PROJECTED ON HAND						400	400	800	800	600	600	0
	NET REQUIREMENTS					3600		3200		2400		3000	
	PLANNED-ORDER RECEIPTS					4000		4000		3000		3000	
	PLANNED-ORDER RELEASES				4000		4000		3000		3000		

SAFETY STOCK

In the Suppliers Management paragraph we discussed the possibility to have unexpected differences between the expected furnishing and the actual one, especially for components that come from small and distant companies. We already proposed the idea to have "backup" suppliers in case of disruptions, but even for the basic components this change could be rather expensive and slow. In order to try to avoid such situations, we intend to keep a safety stock for the various components so that to face off possible shortages.

- For RAM, SSD, WI-FI and BLUETOOTH antennas, FANS it is reasonable to keep a 20% more in the safety stock.
- CPU safety stock is 15%. The supplier is reliable but very loaded and could be damaged by the Silicon crisis.
- For PCB, BODY and POWER UNIT we chose very professional suppliers, thus we do not need a safety stock higher than 10%
- We do not need safety stock for lives and ethernet cables. The difference between the received units and the net requirements can sufficiently cover small delays, enough to procure in other ways them.

INDUSTRIAL COSTS

In this chapter we discuss about the costs that are required to sustain to actuate the operations plan here reported. For every expense, we report the nature of it (variable vs fixed) and the estimated (or computed) amount for the first 3 years of the HNS life.

VARIABLE COSTS

INPUT MATERIALS AND LABOR COSTS

1. As discussed in the Project Management section, the first year is the pure set-up phase of the company, so no production performed which means no materials/labor costs -> **0€**
2. The second year is the first year of production. As already computed in the aggregate planning, the total expense for the work will be 191.425€. For which concerns the materials, we need 120,26€/unit (can be computed summing up the price per unit of the components illustrated on the Supplier Management Chapter, of course taking every component the number of times specified in the BOM). According to the sales forecasts, we expect to sell 12k units in the first year, which means a total expense in materials equal to 1.443.160€ -> **1.634.585€.** All the overhead factors and expenses are discussed in the cost classification chapter.
3. The third year is the second year of production. In this case, the prematurity of aggregate planning and master scheduling it makes it difficult to determine a total cost value. Indeed, we know that the increase in demand (3x second year sales) will require almost 3 times the material costs, while the increased capacity due to the progressive automation investment and the increased required output will leverage the number of needed workers (estimated to be from 15 to 22 during the year) making the labor cost be around 300k€. On the other hand, the increase in lot sizes can cause lower provisioning costs. To conclude we can estimate a total expense of **(4.700 ± 700) k€**

FIXED COSTS

INITIAL PLANT AND MACHINERY

The initial factory plant and the machinery costs have been estimated starting from currently on-sales plants and machines available in Tuscany, the total cost for the first year will be **600k€.** In the following years, anyway, we will start the investment for the final plant, that should be ready for the 3rd year of production.

ENERGY COSTS

Comparing several Italian energy provider (both for electricity and natural gas provisioning), we asked for price quotations customized on the bases of our needs. The one that best trade-offs our requirements and the price in our case was Eni Business, which can meet our energy demand with the following costs:

1. Year 1 (production not started, R&D activities): **3000€**
2. Year 2 (first of production, mainly manual work): **6000€**
3. Year 3 (second of production, progressive automation): **8000€**

MACHINERY MAINTAINANCE

To address the maintenance problem, we decided to use a preventive approach exploiting IoT devices in order to minimize disruptions and decrease costs. More details can be found on the quality chapter.

The maintenance budget has been determined by the Finance Manager based on the needs here reported. An important point is the fact that we estimate our machinery to last at least 10 years, so the maintenance expenses will be quite low for the first years. The instantiated budgets are:

1. Year 1 (no production): **0€**
2. Year 2 (first year of production): procurement of the IoT network for the little machinery present, minor repairs -> **3900€**
3. Year 3(second year of production): procurement of further IoT nodes for the new machines, other repairs, possible component substitutions -> **11700€**

SAFETY DEVICES AND KITS

That equipment is necessary to guarantee our personnel to work safely and in the best way, avoiding injuries, avoiding morale and legal problems, decreasing absenteeism. Examples of that are first aid kits, fire hydrants, safety shoes, gloves; but also periodic safety checks about the plant and the machinery/tools. The needed budget will be discussed in the financial section , anyway the main expenses are the following:

- Provisioning of the plant with security equipment and execution of safety checks when the plant will be bought
- Provisioning of each worker with his/her personal safety equipment and update of spoiled or out-of-date security stuff
- Periodic checks of machinery and plant
- When the final layout will be achieved, machineries will be equipped with safety sensors (halting the line in case of high danger)

SURVEILLANCE SERVICE

Necessary to avoid robberings of valuable goods or documents about intellectual properties. The factory plant that is intended to be bought is already equipped with an alarm system, but it could not be enough to ensure security from thefts. This service will be delivered by “La Lince SRL”, which has the following costs (based on the value of the protected plant):

1. Year 1 (no production): we have no plant and we still cannot afford it -> **0€**
2. Year 2 (initial plant) -> **470€**
3. Year 3 (initial plant with ongoing investment for the final plant) -> **720€**

BUSINESS INSURANCE

Requested by law to be signed by every business company. We selected “Sara Assicurazioni S.P.A.”, which offers the following prices for an IT startup:

1. Year 1 -> **583€**
2. Year 2 -> **625€**
3. Year 3 -> **650€**

PATENT EXPENSES

A patent will be signed to protect and have the copyrights on every CLOE proprietary technology. As better discussed in the finance section, the total amount to gain the patent + trademark + CE mark is **563€**

WEBSITE HOSTING

In order to deploy CLOE.COM, we need an external host provider which must respect all the requirements specified in the description chapter and the quality chapter. We selected the business packet of "GoDaddy", which is an international web provider characterized by the ability to accommodate the requirements of any customer. The expenses will be:

1. Year 1 (no production): development packet + first year discount -> **52.45€**
2. Year 2 (first of production, finished website): business hosting -> **103€**
3. Year 3: business hosting -> **103€**

WEBSITE DEVELOPMENT COLLABORATORS

As already cited in the introductive chapter about the products and processes, we will need the collaboration of external graphic designers and social media experts to realize a fashionable and attractive website, focused on the gains offered by CLOE. To do that, we contacted expert people in our network who asked for:

1. Year 1 (website development): full collaboration for the front-end development phase -> **500€**
2. Year 2 (consultancy): short-term collaboration just for consultancy purposes, based mainly on collected data and community feedbacks -> **50€**
3. Year 3 (restyling): restyling operations on the website -> **200€**

APPLICATION DEVELOPMENT OUTSOURCING

For the development of the application, we established a collaboration with the "Elleti Digital" (see WBS), which will take care also of the annual maintenance. The full costs are the following:

1. Year 1 (development) -> **14k€**
2. Year 2 (maintenance) -> **2k€**
3. Year 3 (maintenance) -> **2k€**

LEAN MANAGEMENT, QUALITY MANAGEMENT AND CONTINUOUS IMPROVEMENT POLICIES

LEAN MANAGEMENT

In order to achieve high flexibility together with resource savings and good quality, the company will be built from the beginning exploiting the lean management approach, so that to achieve fewer wastes and higher productivities, together with flexibility and responsiveness to changes, overcoming one of the main challenges of lean management i.e., the transition from the legacy approach to a lean system.

During the first phase of production our overall production structure will be flexible by nature, but lean principles will be exploited in order to maximize the utilization of the scarce resources at our disposal, together with the set-up of mechanisms to reduce defects and establish bases for the quality continuous improvement.

When the plant will be finalized and the production will be efficiency-centered, a lean management is still needed to avoid wastes, to increase the flexibility of a system which is not-so-flexible by nature, and to minimize inefficiencies and WiPs. The lessons learnt during the first phase will be exploited to create standard processes and methods for problem-solving and faults recovery, without stopping however the continuous improvement effort.

LEAN PRODUCTS

A good lean strategy starts from the product design. In order to have it, we need basically two properties already cited:

- Standard components: almost every single part of CLOE is highly standard, the whole product itself is the assembly of those components. This property allows us to change suppliers without the need for redesign, saving time and money. We only need customized (so non-standard) plastic bodies and PCBs.
- Modularity: as already explained previously and as reported in the BOM, CLOE is divided into modules (Central Unit, Power Pack, Wires Kit…). Every module is made of components or other submodules and so on, and the overall process is a bottom-up assembly of modules. This allows for easier defect-recovery and more standardized production processes.

LEAN PROCESSES

- Standardization: the overall process is basically a bottom-up assembly of components, so it is very highly standardized. Machinery will be standardized as well to minimize the set-up time needed when we want to switch from the production of a lot of CLOE to one of CLOE PRO and vice versa
- Manufacturing cells: during the first year of production, the plant will be organized according to the cell layout, so that to have a very large degree of flexibility, together with small lot sizes and low inventory levels. When the investment will be finalized, this organization is not suitable anymore (the product line will be adopted)
- Set-up time reduction strategies: as already studied, most of the components of the two products are the same and where they are not, the assembly process is still the same. Hence, during the first period the switching time is just the time needed by workers to take one lot of input components of CLOE PRO instead of the ones of CLOE and vice versa. On the contrary, when the plant will be

automatized, switching from one to the other means changing the selected input configuration of a subset of the machines, which will be easily capable to produce both the products.

- Pull system: to minimize the WiP, the system will be a pull one (semi-finished products are moved along the line only when needed). On the visual control part, we explain how we decided to use the c-kanban technique to achieve such purpose.
- Reduced valueless transports: as shown in the plant layout picture, adjacent workstations in the process workflow are also physically adjacent, in this way a moving piece along the line crosses no empty portions; this aspect will be further enforced on the product line of the final layout

LEAN INVENTORY MANAGEMENT

During the first year of production, as shown in the aggregate planning and in the master scheduling, the focus will be on the flexibility: the inventory level will be kept low for the entire period in order to adopt a chase strategy and minimize wastes and overproduction risks.

On the contrary when the final plant will be developed, it will be hard to maintain low levels of inventory since it will be hard to modify the capacity once levelled. Anyway, some strategies will be applied to increase flexibility and keep the inventory under an acceptable level. Such strategies, already discussed, are the frequent switching of products in the line thanks to the almost-zero setup time of the machines together with the use of lot sizes that trade-off best flexibility and low costs.

DEFECT PREVENTING STRATEGIES

- If we consider the process phases reported in the relative chapter, we immediately realize that: i) the time allocated to the first stages of the process is more than the one actually needed to perform that task, ii) considering the table 3, after the first stages there will be a certain amount of idle time. These choices allow for the allocation of that time to perform intermediate quality and defect checks, so that to discover possible problems as soon as possible in the production line. In the next paragraphs we will discuss this point more in details
- Visual controls: in order to ensure fail-safe processes and to help workers avoiding errors and incorrect scheduling of the phases, a set of visual control technologies will be implemented. They are:
    1. *Andon*: by definition, they are the set of light signals used to monitor the state of tools/machines. We decided to adopt such a strategy for two different purposes: the first one is the monitoring of the state of the machines, which will be performed through a set of IoT devices connected to form an IoT network for the preventive maintenance of the machines. The detailed status and operational data will be provided only to the management, but a set of LEDs (green, yellow and red) will be employed in order to notify to the worker the overall condition of it (respectively working, suspended, broken). The second use case of *andons* is in the test stations (phase 8 and 10, see process phases), in which the same set of LEDs will be used to notify the outcome of the test phase (all the lights=processing, green=positive outcome, yellow=recoverable defect, red=unrecoverable defect)
    2. *Conveyance-kanban*: it is a strategy used to implement a pull system minimizing disruptions and Work in Progress. In the process phases chapter, we divided the production line into different workstations that form a pipeline. The idea is to introduce a set of *Kanban* lights, i.e., visual LEDs, in every workstation to signal when the following one is free to accept new

inputs (to make an example, the workstations of the phase 9 will be provided with lights that will turn on as soon as a test workstation of the phase 10 is freed up). In this way, instead of creating buffers of WiP, the workers will have time to perform additional quality checks on the semi-finished products until the light will be turned on.

3. Mistake-proof visual controls: as cited before, in order to switch the current production from CLOE to CLOE PRO and vice versa, we need to change the current configuration of some machines. In order to simplify such a job, the worker will just have to select the correct configuration which will be shown through an icon, which icon represents the design of the product to which the machine configuration is relative (e.g. to indicate a CLOE and for a CLOE PRO). The same icons will be shown to the operators through a screen to make them understand which product to make as well as in the boxes containing the input components and materials.
4. Mistake-proof assembly: to avoid erroneous assembly operations, each module of CLOE should be compatible exclusively the space allocated to it in the plastic body, so that to fit it but without the possibility to wobble inside it.

SUPPLIER MANAGEMENT

A very important point in the lean management is the relationship with suppliers. Recalling the supplier management chapter, we can identify basically two kinds of suppliers:

- Sellers of highly standardized components, chosen for the lowest price guaranteed that they have all the needed quality requirements.
- Providers of ad-hoc or (partially) customized materials, we chose them based on the offered quality and on their professionality with the buyers, together with reduced lead times.

While the first category could be easier to replace in case of disruptions or non-compliances, with the second ones we will need a real partnership, establishing a collaborative environment and mutual help for quality improvements.

PREVENTING MAINTEINANCE AND HOUSEKEEPING

- In the previous chapter we introduced the intention of building an IoT network of sensors to monitor the status of the machinery. More in details, every machine will be supported with 1 or more nodes provided with a set of sensors (vibrations, temperature, generated noise…), and all the data will be centrally collected and shown to the top management. This data will be processed by Machine Learning algorithm to determine the health status of the machinery and also their productivity, average usage, peaks of stress and so on. Such a mechanism is of course expensive, but it prevents higher costs generated by capacity disruptions, set up times and even dangerous situations. The application will notice to the management the repairs to be done and their urgency and could also help technician to find possible problems quickly and reduce downtimes.
- A clean plant is an organized plant, that's why every single material/finished good that is stored in the inventory will be identified using a RFID, i.e., a magnetic passive id useful to keep under control the inventory levels at any time, but also to track the origin of each material in order to determine if some lot is under the desired quality threshold. The RFID can also be exploited by workers in case they cannot remember if they are handling a CLOE or a CLOE PRO component, the code returned by the RFID will answer; finally it can help CLOE CARE technicians to retrieve substitute components.

CONTROL TOOLS

The correct exploiting of the Lean Management approach must be supervised by the Operations Manager. This means that he/she oversees checking that at any time the aforementioned strategies are correctly applied by workers and managers, and they actually help increasing the level of productivity. Furthermore, periodically the Operations Manager must conduct a Value Stream Mapping, analyzing from scratch the productive process in order to apply the needed modifications to minimize valueless operations.

QUALITY MANAGEMENT AND CONTINOUS IMPROVEMENT

QUALITY OBJECTIVES ON PRODUCTS

- Performance: the upload/download speed must be higher than the 30% of the available throughput in the Local Area Network (e.g., for a 100Mbps Ethernet Lan, the average upload/download speed must be >30Mbps).
  When media files are casted to an external device (e.g., Smart TV), the throughput must be comparable with the one of the most famous content providers (e.g., for a 100Mbps Lan, >10Mbps).
  Power-on time < 15s.
  The contract stipulated with the host provider of the website ensures that the number of accesses is not a malus factor on the bandwidth (due to scalability techniques). In any case, we will not accept latency times higher than 15s.
- Conformance: a product will be considered conformant if all the requirements in the tech specs in the manual provided to the users are fulfilled and no visible damage is present on it when delivered
- Reliability: the product should be resilient to little mechanical and temperature stresses in the bounds specified by the manual. In normal conditions, it should work at least 3 years respecting the quality requirements on performance and conformance. The overall service life should be at least 6 years. The CPU must never reach or overcome 70°C and the plastic body should never be subjected to temperatures higher than 45°C. Eventually, no data leak is tolerated at all.
- Serviceability: the community on the website and CLOE CARE are the 2 biggest services we offer; through them the user can receive support for any doubt/complaint/help request. If a user needs the premium service of CLOE CARE, we ensure to deliver back the product within 20 days, and to continuously update the user on the current status of the fixing using the provided e-mail.
- Consistency: every stock CLOE unit is equivalent and ready to communicate potentially with any other CLOE unit
- Ease of use: in the introductive chapter of this Operations Section we described all the requirements in term of ease of use for any component of the final product. Those choices will be considered actually effective if and only if the number of help requests in the community is no more than the 20% of the overall posts

QUALITY OBJECTIVES ON PROCESSES

- On the chapter about Lean Management, we discussed some strategies we will apply to manage the quality during the process. Other policies and techniques will be discussed later. Through those strategies, we have the objective to achieve the ratio of 1/500 defective products within the end of first year of production, and to continuously make efforts to reduce it as soon as the previous objective will be achieved.

QUALITY OBJECTIVES ON SUPPLIERS

A high-quality product can be generated only from high-quality processes and high-quality input materials. As already mentioned in the suppliers management chapter, every single supplier we decide to collaborate with must own the ISO 9001 quality certification and their products should always fulfill the requirements we specified. Moreover, as discussed in the lean management chapter, we want to create a stable and collaborative relationship with our suppliers, but only if at any time these policies are satisfied:

- No single component should be responsible for at least the 30% of the fails of the product (e.g., we cannot tolerate to have 100 defective units in which at least in 30 of them there are disk failures: in this case we will start looking for new suppliers for the SSD storage)
- Defective input materials mean necessarily a defective end product: no supplier should deliver materials in which the defective rate is higher than our current objective (e.g., if we strive to achieve a 1/8000 defective ratio, we cannot tolerate input lots of RAM banks in which 3 pieces every 8000 are defective)

QUALITY STRATEGIES AND CONTINUOUS IMPROVEMENT

In the previous paragraph we listed the objectives and the policies we established in order to achieve sufficient quality standards and to try to improve them. In this paragraph and in the lean management chapter we discuss some practical strategies to implement quality processes and continuous improvement efforts. The general approach is not exactly a TQM one, since especially at the beginning it could be too expensive: our aim is to maximize the profitability at the beginning, making customers be aware about us, and only when the backbone of our company will be solid enough, move through a more radical quality-seeking approach. These strategies are:

- Continuous intermediate checks of the products on the line, according to the times and strategies discussed in the lean management chapter, to detect as soon as possible eventual defective or sub-standard products. If a single unit is defective, it will be removed by the line **without stopping the production** and processed to understand if it must be thrown away or there are possibilities to avoid such a waste. If a series of consecutive units are defective, the only possible approach is to suspend production and solve the problem. Since the system is a pull one, this will not generate additional WiP, but of course will generate setup costs. In order to deal with problems effectively and rapidly, workers will be trained to recognize and solve the most frequent and less difficult issues, implementing a distributed problem-solving strategy, in which everyone is completely capable of administrating his/her workstation. Furthermore, workers should also be trained and involved in the importance of the quality checks, which are not lost time or rest periods; to help achieving such an aim, a mechanism of bonuses will be created for operators that distinguish themselves for the premature individuation of machine problems/failures or defective products components or for very high-quality tasks, and on the contrary negative measures could be adopted for the ones that repeatedly miss very evident problems that could be found with a minimal quality control or in case of very poor-quality tasks.
- Task rotation whenever possible, enforced by a cross-training effort of the workers, so to teach them how to replace absent colleagues and to allow for a periodic swapping of tasks to break the routine. The worker must not feel him/herself as a machine, but the policy of the company should avoid alienation highlighting the virtuosity of them to make them feel proud creators of a high-quality product.

- Continuous improvement policy on the product: the quality level is not a standalone concept, but it always starts from what are the customers' expectations. That is why the most important suggestions to improve quality are not the ones of the managers, but of the customers. Posts on the community, help requests, comments on social media and interviews will be the starting point to compare the achieved level of quality with the one expected by customers, and they will be the primary input to the management, which has the responsibility to translate them into practical solutions.
- Continuous improvement policy on the process: suggestions on the product should also change the way processes are organized, in this optic another very important opinion is the one of the workers: through periodic meetings within the work time, workers will have the possibility to discuss among them about how to improve the process and what are the main problems/bottlenecks/instabilities. Representatives of the management will participate to those meetings, reporting any suggestion that will be input for possible process re-designs. Proactiveness of workers is never punished, even if it does not suggest good changes, and bonuses could be allocated to all the workmen if their points allow for a practical improvement of the process.
- Continuous improvement policy on the management: as far as our company will grow up, we will need a larger and larger "white collar" staff. Independently from the policies of selection, what we would like to achieve is the maturation of junior and minor managers, but also of other employees, so that to make them ready to be top managers one day. To do that, office workers will be periodically asked to perform responsible jobs to improve their skills, if needed supported by a tutor.
- Continuous improvement through data collection: to have all those suggestions as input could be very useful, but also confusing and generic. As discussed in the lean management chapter we intend to create an IoT network across the factory to collect and analyze data about machinery and inventory. This generated data is useful not only to implement a proactive maintenance approach for machinery, but also as input to Machine Learning algorithms that could help us to identify bottlenecks and inefficiencies. All those issues, together with the valuable ones collected by workers and customers, will be input for a periodic PDSA aimed at improving the productivity, the quality or the working environment.
- Software quality: in the introductive chapter we anticipated several times that we intend to develop software anticipating as much as possible the test phases. Indeed, we know how much is important in software development to test continuously and not to proceed until we are sure that we are making things well. An error in a phase will be propagated in the successive ones and even if corrected, it usually needs patches that deteriorate software quality. This cannot be accepted. In addition to this, the whole software will be test-driven, highly modular and loosely coupled, in order to simplify maintenance operations and the updates with new features. In particular, the website code should be highly SOA oriented, with very loosely coupled tiers, and it should exploit the scalability provided by the web host infrastructure (which is Cloud Based) and allow for easy maintenance and restyling.
- Quality in the supply chain: to establish partnership with the most important suppliers and to benchmark the quality of their processes with the one of our own process, periodically we will perform visits to their plants to exchange suggestions and mutually benefit from helping one another to achieve better levels of quality.
- Quality certifications: as soon as possible, we will submit our company as a candidate for the ISO 9001 certification. We know that it will take till 15 months and it will stress improvements and processes/services quality, but it will be very helpful to achieve bigger market shares, trust of our

retailers, attractiveness. The judgement parameters of the ISO certification could also be helpful to understand where to improve quality.

FINANCE PLAN

This chapter analyzes the company's financial plan for the first three years. First, what will be done will be to classify the costs expressed in the previous chapters and in the Project Plan, in order to understand whether they are manufacturing cost or not, together with the distinction between fixed and variable costs. Once this is finished, the "process costing" strategy will be used to estimate the unit product cost and the CVP analysis will be considered for understanding the relationships among cost, volume, and profit.

Afterwards, the financial statement consisting of balance sheet, the profit and loss and the explanatory notes will be presented. Thanks to the data calculated for each year, it will be possible to decide on a budgeting strategy for following year.

Since it is all a conjecture given by the data presented by forecasting, deviations will also be considered, presenting how these could impact our profits and costs.

Finally, attention will also be paid to the possible economic/financial changes presented in the risk assessment and risk management documents.

COST CLASSIFICATION

Costs have been classified into two main categories: manufacturing, divided into direct material, direct labor and manufacturing overhead, and non-manufacturing, which includes selling and administrative costs. Furthermore, since we are also interested in the configuration of the various costs, when these are presented it will also be said whether they are fixed costs (specifying whether committed or discretionary[38]), variable costs (specifying whether true variable or step variable[39]) or mixed costs.

MANUFACTURING COSTS

The manufacturing costs, as the name suggests, are all those costs that are needed to create our device. These costs have been introduced in a scattered manner in the Operation Plan and are listed and divided here into three categories: direct materials, direct labor, and manufacturing overhead.

DIRECT MATERIALS

Direct materials are all those materials that can be traced back to the construction of a single product. Here we have to distinguish between CLOE and CLOE pro:

- CPU:
  - 60€ for lots of 50 or more units. (CLOE)
  - €74,42 (CLOE Pro)
- RAM:

[38] Investments in facilities, equipment, and the basic organization often can't be significantly reduced even for short periods of time without making fundamental changes. Such costs are referred to as committed fixed costs. Discretionary fixed costs (a.k.a. managed fixed costs) usually arise from annual decision by management to spend on certain fixed costs items.

[39] Direct materials are a true or proportionately variable cost because the amount used during a period will vary in direct proportion to the level of production activity. The cost of a resource that is obtained in large chunks and that increases or decreases only in response to fairly wide changes in activity is known as a step-variable costs.

    - €3,94 for lots of 100 or more units (2 slots) (CLOE)
    - Same but with 4 slots (CLOE Pro)
- PCB: €3,86 for lots of 100 or more units
- SSD: €12,43
- WI-FI: €0,58
- BLUETOOTH ANTENNA: 0.15€
- FAN: €0,58
- LIVES: €0,02 (needed 36 for a single CLOE)
- POWER SUPPLY UNIT:
    - €13,4 (CLOE)
    - €15,2 (CLOE Pro)
- PLASTIC BODY:
    - €12,3 (CLOE)
    - €19,2 (CLOE Pro)
- CAT6 ETHERNET CABLE: €1

All these costs are variable costs and more specifically they are true variable, as they increase their cost linearly to the number of CLOEs produced. Although the CPU, RAM and PCB may be step-variable depending on the size of the chunks purchased, in the MRP they have always been considered lots greater than or equal to 50/100 allowing them to be considered as fixed costs for the single unit.

DIRECT LABOR

Direct labor consists of labor costs that can be easily (i.e., physically and conveniently) traced to individual units of product. It has been estimated in the aggregated planning as 15€ per unit. This cost is a true variable cost. (There is no difference here between CLOE and CLOE pro)

MANUFACTURING OVERHEAD

Manufacturing overhead includes all manufacturing costs excepts the costs already described. Manufacturing overhead costs includes:

- Indirect materials. The only one indirect material that we have is the sticky paste for mounting CLOE (the price of it is less of one thousand per year)
- Indirect labor, basically R&D and the social media manager. A R&D worker is paid €2.300 and the social media manages is paid €1.700.
- Maintenance of repairs: we consider €0 first year, €3.9k for second year, €11.7k for third year[40]
- Heat/Light. We estimated in the industrial costs paragraph 3k for the first year, 6k and 8k euros for the second and the third years.
- Depreciation: the premise will be acquired for €340k during the third year of activity. When determining the technical economic depreciation plan, a useful life of 50 years was estimated with consequent annual depreciation amounts equal to 2% of the depreciable value (for assumption equivalent to the entire amount paid). The depreciation rates are therefore €6,8k per year. Machineries will be acquired for €52k during the first year of activity: a useful life of 10 years was estimated with consequent annual depreciation amounts equal to 10% of the depreciable value (for

[40] As written in the Operation Plan

assumption equivalent to the entire amount paid). The depreciation rates are therefore €5,2k per year. Intangible assets are depreciated considering their value of validity (e.g., patent during 5 years)

- Vigilance security service: the price quotation that we found online is €470 for the first year, from the second year onwards, due to greeter needs, we must pay €720.
- Insurance of manufacturing facilities: estimated in Industrial Costs as €583, €625 and 650€ for the first, second and third years respectively
- TFR: since we have two types of works, we must compute two types of TFR:
    - Regular workers (and social media manager): each worker is paid €20.4k annually (considering that he/she also works overtime[41]). The severance pays (i.e., TFR in Italian) for each worker is therefore[42]:
        - Annual fee: 20.4/13.5 = €1.51k
        - Revaluation: 1.51k x 2.25%[1.5% + 0.75%(1.1% x 0.75%)] = €31.4
    - R&D: each worker is paid €27.6k annually. The severance pays for each worker is therefore:
        - Annual fee: 27.6/13.5 = €2.05k
        - Revaluation: 2.05k x 2.25%[1.5% + 0.75%(1.1% x 0.75%)] = €42.63
- CE mark: it is free, but to obtain it a technical file is required (€120)
- Trademark: €373, with a duration of 10 years and with class 9[43]
- Patent: €50 with 5 years of validity[44]
- Webpage: since we founders are all engineers, to lower costs what we thought to do is to create these services by us with the use of a design consultant, the estimated cost is around €500/600.
- Application: €14k

NON-MANUFACTURING COSTS

SELLING COSTS

The selling costs that we take into consideration are:

- Distribution cost: presented in the Physical Distribution chapter of the Marketing Plan, and for the first three years of production are:
    - First year: €65.280
    - Second year: €60.484,32
    - Third year: €82.466
- Advertising cost: as explained in the Communication chapter in the Marketing Plan, different strategies were used. The total annual costs were (considering years of production):
    - First year: €41,2k
    - Second year: €49,8k

[41] This value was calculated considering the total overtime costs presented in the Aggregate Plan and divided by 10 (i.e., the number of employees). In the aggregate plan

[42] The TFR is calculated by adding for each year of work a share equal to the amount of salary, due for the same year, divided by the coefficient 13.5. The progressively accumulated amount, except the one for the year, is revaluated on December 31st of each year with a fixed rate of 1.5% plus 75% of the ISTAT consumer price index (inflation) recorded for the previous year. The consumer price (i.e., in Italian "prezzi al consumo") is 1.1% (https://www.istat.it/it/archivio/prezzi+al+consumo).

[43]Costs taken from https://uibm.mise.gov.it/index.php/it/tasse-e-tariffe/costi-marchi, https://www.uibm.gov.it/attachments/2%20ok.pdf

[44] https://uibm.mise.gov.it/index.php/it/tasse-e-tariffe/costi-brevetti-per-invenzione-industriali

- Third year: €46,4k

Selling costs are all discretionary fixed costs based on annual decision as described in the Marketing Plan and in the budgeting chapter.

ADMINISTRATIVE COSTS

As a small startup we do not have a complex organization (as presented in the PM document), for this reason, the only administration costs are those to pay the marketing manager, the strategy and project manager (position hold by the same person), the financial manager, and the operation manager. These salaries[45] and related severance pay are:

STRATEGY AND PROJECT MANAGER: The salary as a project manager for an entry level position is € 9.6k, while the salary for the strategy manager is € 42k, thus obtaining a total salary of 51.6k per year. The related severance pay is:

- Annual fee: 51.6/13.5 = €3.82k
- Revaluation: 3.82k x 2.25%[1.5% + 0.75%(1.1% x 0.75%)] = €79,4

MARKETING MANAGER: The salary as a marketing manager for an entry level position is € 35.8k. The related severance pay is:

- Annual fee: 35.8/13.5 = €2.65k
- Revaluation: 2.65k x 2.25%[1.5% + 0.75%(1.1% x 0.75%)] = €55,1

OPERATION MANAGER: The salary as an operation manager for an entry level position is € 40k. The related severance pay is:

- Annual fee: 40/13.5 = €2.96k
- Revaluation: 2.96k x 2.25%[1.5% + 0.75%(1.1% x 0.75%)] = €61,5

FINANCE MANAGER: The salary as a finance manager for an entry level position is € 50k. The related severance pay is:

- Annual fee: 50/13.5 = €3.7k
- Revaluation: 3.7k x 2.25%[1.5% + 0.75%(1.1% x 0.75%)] = €77

For summarizing: the total administrative costs is equal to €177.4k; the total service indemnity (for administrative costs) for the first year is €13.13k and the one for the following years is €13.4k.

COST ACCOUNTING SYSTEM

Hungry Nerds Solutions offers two products, CLOE and CLOE pro. These two devices as described above are homogeneous, i.e., they need the same processing time and share the same type of components, although a higher material cost has been estimated for CLOE pro.

The presence of this homogeneous product makes up opt for process costing as cost accounting system. Process costing systems accumulate costs for an entire period (we consider a year) and then divide the

[45] All set to the minimum

accumulated total manufacturing cost by the total number of units produced during the period. The formula is:

$$\text{Unit product cost} = \frac{\text{Total manufacturing cost}}{\text{Total units produced}}$$

Since we have two different total material costs, it seemed appropriate to have to modify the formula in such a way as to consider not the total manufacturing cost but only the manufacturing overhead, which it will divided equally for each unit. Therefore,

Cost ↓	Year →	1	2	3
Indirect materials		0	1.000	1.000
Indirect labor		110.400	130.800	130.800
Repairs		0	3.900	11.700
Depreciation		5.200	5.200	12.100
Vigilance		470	720	720
Insurance		583	625	650
Heat/Light		3.000	6.000	8.000
TFR[46]		8200	24.980,52	25.325,92
CE mark		150	0	0
Trademark		373	0	0
Patent		50	0	0
Web Page and hosting		602,45	103	303[47]
Application[48]		14.000	2000	2000
TOTAL		128.376	213.604,52	220.154,92
Total units produced		0	12.000	36.000
Unit product overhead cost		Total loss	17,8	6,12

COST-VOLUME-PROFIT ANALYSIS

Cost-volume-profit (CVP) analysis is a powerful tool that helps managers understand the relationships among cost, volume, and profit. CVP analysis focuses on how profits are affected by the following five factors:

1. Selling prices
2. Sales volume

[46] In the first year only the R&D workers are present, instead for the following years both the R&D and normal workers and the social media manager are present. The TFR related to the administrative costs is not consider here as related to non-manufacturing costs.
[47] Redesign of the web page
[48] We ask a price quotation to an application consultant company (Elleti Digital).

3. Unit variable costs
4. Total fixed costs
5. Mix of products sold

Many of these factors have been presented on the previous pages. Here, we need to gather them into three categories: sales, variable expenses, and fixed expenses.

Since the different profits and costs vary over the three years considered in the Finance Plan, there is a need to produce the CVP chart and repeat the analysis for each year. This allows us to understand how much we need to price out product as a minimum to reach break-even safely every year. I will then be up to the Marketing Manager to price it considering the different levels of the products (i.e., core, actual and augmented product).

FIXED EXPENSES: Non-manufacturing costs and overhead costs are to be considered as fixed costs as they will be paid in any case whether we produce something or not. The total amount of fixed costs is:

$$\text{non-manufacturing} + \text{overhead}_{YEAR\ 1} = 318.906$$

$$\text{non-manufacturing} + \text{overhead}_{YEAR\ 2} = 404.404{,}52$$

$$\text{non-manufacturing} + \text{overhead}_{YEAR\ 3} = 410.954{,}84$$

VARIABLE EXPENSES: The variable costs are the materials to produce a single device (this may be CLOE or CLOE pro) and the cost of labor per single unit.

To consider the variable cost linked to the two devices, it was decided to use the information of the percentage division of sales (based on forecasts) of the two versions: 80% regarding CLOE and 20% regarding CLOE PRO. To simplify, it was decided to use the function:

$$\begin{aligned}\text{cost}(x) &= \text{x} * 0{,}8 * \text{price material CLOE} + \text{x} * 0{,}2 * \text{price material CLOE pro} + \text{direct labor*x} \\ &= 112{,}9 * 0{,}8 * \text{x} + 149{,}3 * 0{,}2 * \text{x} + 15 * \text{x} = 90{,}32 * \text{x} + 29.86 * \text{x} + 15 * \text{x} \\ &= 135{,}18 * \text{x}\end{aligned}$$

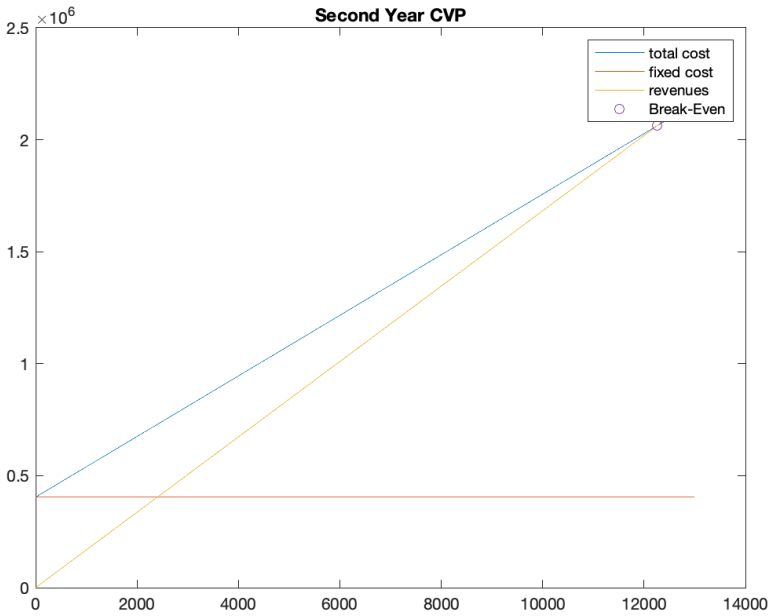
TOTAL REVENUES: Total revenues are those due from the sales of our product. At this step the Marketing Manager has yet to find a value for CLOE and CLOE pro taking into consideration the different levels of the product, but before doing so it was decided to help her through the break-even analysis to recommend a minimum sales value in order to be sure to be profitable. The initial sales price for this phase was calculated as the cost of production plus the 25% of it to allow for a certain profit margin. Considering the approximate function of variable expenses, we obtain:

$$revenues(x) = 168{,}24 * x$$

YEAR 1 CVP

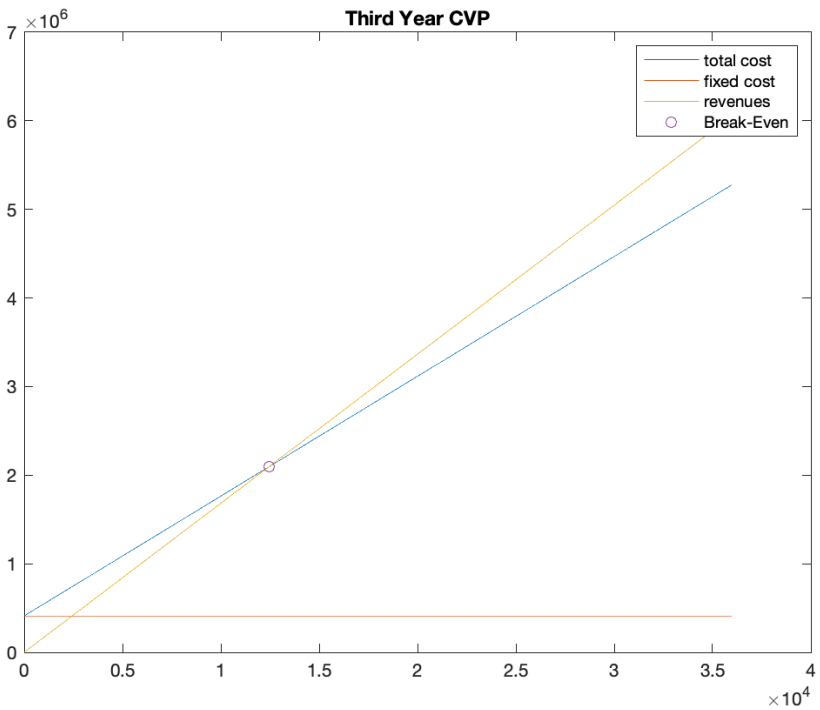
Not useful since we do not produce anything.

YEAR 2 CVP



The break-even value is reached with the 12.453rd sale. The volume to reach break-even is higher than the value set by the forecasting for the year, this means that using the sale price now indicated the second year will certainly produce a negative net profit. The marketing manager is advised to keep notice of this aspect and to offer a higher price, but to stay also in line with the marketing analysis and considerations.

YEAR 3 CVP



The break-even is reached with the 12.453rd sale. Since for the third year we prospect many sales, this value to reach the break-even is very confident.

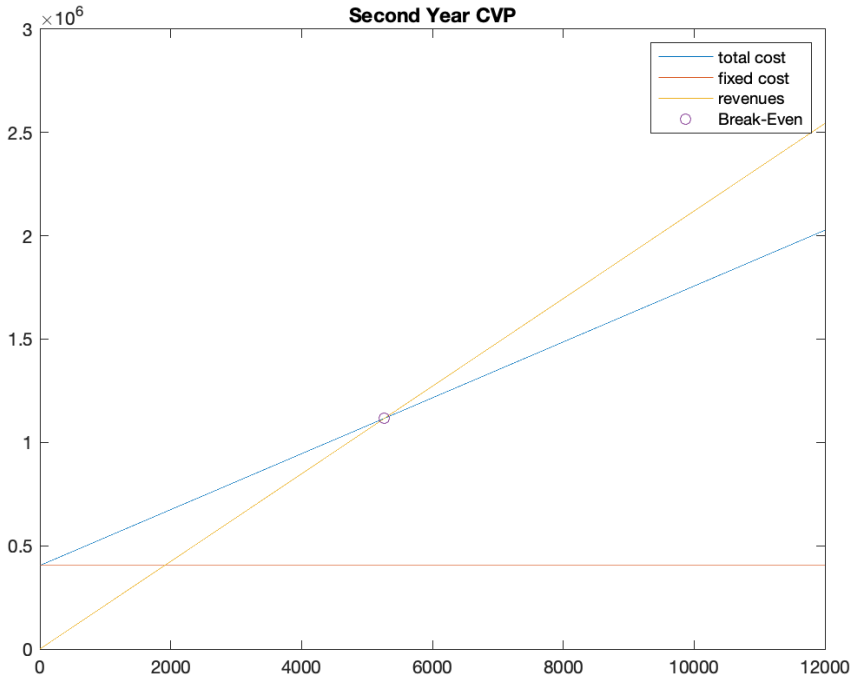
FINAL CVP FOR THE SECOND AND THIRD YEARS

After having examined the previous break-even analysis, the marketing manager estimated, using an integrated approach as described in the Pricing chapter of the Marketing Plan, the following sales costs with the related forecasts:

SECOND YEAR: During the second year, sales are made only through our website, which is why the sales costs considered are solely those online. Furthermore, it was considered that the number of CLOEs sold is equal to 9600 (80%) and the number of CLOE pro sold is equal to 2400 (20%). Therefore, the linear function to approximate the revenues considered is:

$$\begin{aligned}\text{profit}(x) &= \text{x} * 0{,}8 * \text{CLOE online price} + \text{x} * 0{,}2 * \text{CLOE pro online price} \\ &= 199{,}99 * 0{,}8 * \text{x} + 259{,}99 * 0{,}2 * \text{x} = 211{,}99 * \text{x}\end{aligned}$$

The CVP is:



Through the new sales prices offered by marketing manager it was possible to reduce the reaching of the break-even (the break-even is reached with the 5269th sale) by proposing a reasonable price to our customers. This reduction of break-even point of almost 50% of the one computed in the previous phase means that the achievement of a positive earning is lower, guaranteeing greater safety regarding sales volume. This sales volume is 43.9% of the total volume calculated through the forecasting which increases the robustness of our company.

An important thing to emphasize is that this analysis was made without considering the cost of buying the premise. If we were to buy the premise, estimated to cost € 340k, the break-even point for the second year will move at 6012 sales, always a reasonable value since it is 50% of the sales forecasted. But how we experience in the Financial Statements, purchasing the premise now can be risky even if it is feasible. For the subsequent analysis presented in the Financial Statements ("Profit and Loss", "Balance Sheet" and "Explanatory Notes") and the analysis made in the "Risk Management" chapter will always be considered the purchase of the premise in the third year.

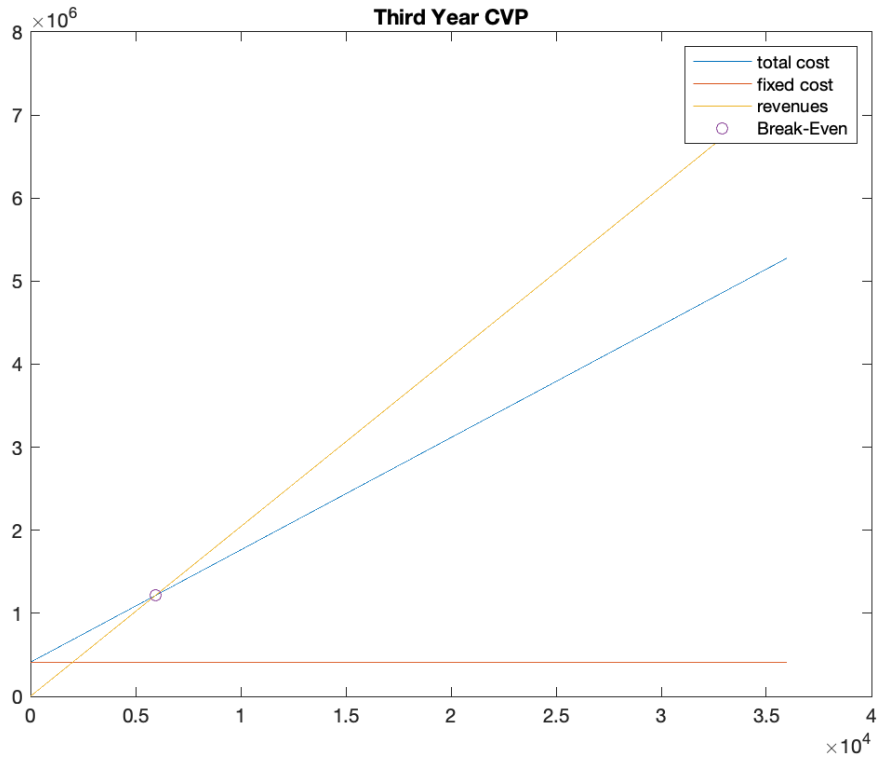
THIRD YEAR: During the third year, sales are made through our website and through retailers. The marketing manager estimated a total of online sales of 10,080 units (30% of total sales) and a total of retailer sales of 25,920 (70%). Sales, both online and to retailers, were divided between CLOE and CLOE pro always using the percentages 80% and 20%. Another important element to consider during this year is that online sales will have a different cost than to retailers as discussed in the Pricing chapter of the Marketing Plan, we would have that:

- ONLINE (directly to consumers):
  - CLOE: €199,99
  - CLOE pro: €259,99
- TO RETAILER:
  - CLOE: €187
  - CLOE: €243

Therefore, the linear function to approximate the revenues considered is:

$$profit(x) = 0{,}3 * x * (0.8 * \text{CLOE online price} + 0.2 * \text{CLOE pro online price}) + 0{,}7 * x * (0.8 * \text{CLOE retailer price} + 0.2 * \text{CLOE pro retailer price}) = 63{,}597 * x + 138{,}74 * x = 204{,}337 * x$$

The CVP is:



For the third year the costs do not soar, but they increase very slowly, thus we have a break-even point that is not very high, and which is reached with just the 5.947th sale. This means that for the third year, in which the volume is 36 thousand, the profit is very high. Furthermore, since the break-even point is reached with a number of sales that is equal to the 16.5% of the estimation done in the forecasting, it is possible to assess that, for the third year, the risk of losses is very low.

PROFIT AND LOSS

		NOTE	Year 1	Year 2	Year 3
REVENUES					
	Sales of products and services	1	0	2.543,9	7.356,2
	Financial revenues	2	0	0	0
	Extraordinary revenues	3	0	0	0
	TOTAL REVENUES		0	2.543,9	7.356,2
COSTS					
	R&D expenses	4	(1,3)	(20)	(20)
	Industrial costs	5	(70,7)	(1.745,1)	(3.824,6)
	Personnel costs	6	(287,8)	(512,2)	(695,8)
	Other operating expenses	7	(36,33)	(184,7)	(191,9)
	TOTAL COSTS		(396,13)	(2462)	(4732,3)
EBITDA			(396,13)	81,9	2.623,9
	Interest	8	0	0	0
	Depreciation	9	0	(5,2)	(12,1)
EBT			(396,13)	76,7	2.611,8
	Taxes	10	(11,2)	(23,8)	(157,7)
EAT			(407,33)	52,9	2.454,1
	Dividends	11	0	5,3	147,2
RE			(407,33)	47,6	2.306,9

ASSETS AND LIABILITITES

ASSETS

		NOTE	Year 1	Year 2	Year 3
ASSETS					
Fixed Assets					
	Intangibles	12	0,6	0,6	0,5

	Net Fixed Accounts	13	52	46,8	374,8
	Long Term Investments	2	0	0	0
	Total Fixed Assets		52,6	47,4	375,3
Current Assets					
	Inventories	14	0	288,6	865,3
	Account Receivable	15	0	0	1.284,3
	Cash	16	30,67	136	990,5
	Total Current Assets		30,67	424,6	3140,1
Total Assets			83,27	472	3.515,4

EQUITY AND LIABILITIES

		NOTE	Year 1	Year 2	Year 3
EQUITY					
	Shared Capital	17	290	290	290
	Legal Reserve	18	0	2,4	117,7
	Retained Earning		(407,33)	45,2	2.191,6
	Total Equity		-117,33	337,6	2.599,3
LIABILITIES					
Current Liabilities					
	Account payable	19	0	0	811,1
	Short Term Loans	20	177,4	0	0
Long Term Loans		21	0	96	42
Service Indemnity		22	23,2	38,4	63
	Total Liabilities		200,6	134,4	916,1
Total equity liabilities			83,27	472	3.515,4

EXPLANATORY NOTES

SCHEME

The scheme used for the Profit and Loss is scaled down with the individual items analyzed by nature.[49] It is believed that this exposure, also followed by the main competitors and in line with international practice, is the one that best represents the company's results. Furthermore, to better specify the various items, what has been done is to highlight some items explicitly such as EBITDA and EBIT.

The financial statements and the data included in the "notes to the financial statements" are all expressed in thousands of euros with a 1 decimal digit precision unless otherwise indicated.

DEPRECIATION: Depreciation of tangible fixed assets is calculated on the basis of the useful life of the asset. The useful life is determined by the company management at the time of recording the asset in the Balance Sheet, the assessments about the useful life duration are based on historical experience, market conditions and expectations of future events that could affect the useful life itself, including technological changes. Consequently, it is possible that the actual useful life may differ from the estimated useful life.

INTANGIBLE ASSETS: Identifiable and controllable intangible assets are recognized in the accounts and the cost of them can be reliably determined on the assumption that such assets generate future economic benefits. These assets are recognized at cost determined according to the criteria indicated for tangible fixed assets and, if with a definite useful life, they are systematically depreciated over the period of the estimated useful life itself. Amortization starts from the moment the fixed asset is ready for use, or in any case begins to produce economic benefits for the startup. Industrial patent rights and intellectual property rights are representative of identifiable, and capable of generating future economic benefits under the control of the startup; these rights are therefore amortized over the relative useful lives.

Research costs are charged to the income statement. Any development costs of new products and / or processes are charged to the income statement in the year in which they are incurred, if they do not have the multi-year utility requirements

ACCOUNT RECEIVABLES: They refer to financial assets deriving from commercial relationships for the supply of goods and services and are valued at amortized cost adjusted for expected losses in value. These assets are eliminated from the Balance Sheet in the event of a sale that transfers all the risks and benefits associated with their management to third parties.

INVENTORIES: Inventories are stated at the lower of cost, including any directly attributable and net estimated realizable value related charges. Inventories of materials in progress are valued at the weighted average manufacturing cost of the year, which includes raw materials, consumables and direct and indirect production costs excluding overheads.

ACCOUNTS PAYABLE: They refer to financial liabilities deriving from commercial supply relationships and are recognized at amortized cost.

RECOGNITION OF REVENUES AND COSTS: Revenues and income are recognized net of returns, discounts, and allowances, as well as taxes directly associated with the sale of products and the provision of services.

- Revenues from the sale of CLOE (or CLOE pro) online are recognized and accounted for at the time of sale for simplicity.

[49] The specific structure used is called "at cost of sales" (in Italian "a costo del venduto")

- Revenues from the sale of CLOE (or CLOE pro) to retailers are recognized and accounted for two months later, in order to have commercial credit.
- Costs are accounted for according to the accrual principle

REVENUE EXPENDITURES AND PROCEEDS: Revenue expenditures and proceeds are recognized on an accruals basis.

TAXES: Taxes are calculated using rates in force at the current date, this is because we do not know what the future ones will be.

SERVICE INDEMNITY (TFR): Liabilities relating to defined benefit programs are determined net of any assets serving the plan on the basis of actuarial assumptions, consistent with the work performance necessary to obtain the benefits[50]. The assessment of the liability has already been carried out in the paragraph "Manufacturing Overhead".

CRITERIA FOR CONVERTING ITEMS IN FOREIGN CURRENCIES: The functional currency adopted by the startup is the euro. Transactions in foreign currencies are initially recognized at the exchange rate in effect on the date of the transaction, but, since we cannot know the future exchange rate, what has been decided to do is consider the current value[51].

PRELIMINARY CONSIDERATIONS

SHARE CAPITAL

The estimated share capital for the first year and subsequent years is € 290. This share capital was raised mainly using the FFF (fool, family and friends) strategy implemented through word of mouth and the use of the start engine platform (https://www.startengine.com).

FAMILY AND FRIENDS The share capital raised thanks to our family and friends is € 50. This sum was achieved by presenting the business plan to our family and friends to convince them to become shareholders of Hungry Nerds Solutions. What was supposed, and why it was possible to reach that sum, is that each of us will bring within the company about 10 friends and between 5/10 family members depending on the size of the family, with a total of people considered equal to 70. With this number of people it is therefore possible to estimate a participation of € 0.72 per person.

This assumption may seem to include too many people, which is why it is important to emphasize that even if there will be fewer people, the participation of some people will be greater than estimated. In fact, speaking with friends of ours who are used to investing in risk capitals, it was found that some of them are willing to give a sum greater than the calculated one and around a few thousand euros (but always below or equal to € 5).

[50] Law: 12/27/2006, n.296 (https://www.parlamento.it/parlam/leggi/06296l.htm)
[51] 05/22/2021: 1 euro=7,84 CNY (Chinese yuan). The materials bought in foreign country are already priced in euro using this currency conversion.

FOOLS Among the fools there are us founders and all the people who do not know us and invest in us through the StartEngine portal. We founders have decided to put a sum equal to €10 each and get €200 from the aforementioned online platform.

On StartEngine, people craft their investment pitch into a web page, raise capital from hundreds or even thousands of investors online, and fund the next phase of their growth with a big and strong community. StartEngine offers two paths to get funds:

- **Regulation Crowdfunding**: with the possibility to raise up to $5M each year, but with some limitations: launch at potentially no or minimal upfront cost and a launch period of 4-6 weeks. The duration of the campaign must be alive for at least 21 days. The website suggests that generally companies raise for anywhere between 60-90 days, but they sometimes continue raising for up to one year or beyond. After the raise is over, businesses are required to maintain their public disclosures and file an annual financial report.
- **Regulation A+:** with the possibility to raise up to $75M each year, but with some limitations: launch at potentially no or minimal upfront cost and a launch period of 6 month. Under Regulation A, companies generally arise for anywhere between 6 months to a year, but they can continue raising for up to three years. After the raise is over, businesses are required to maintain their public disclosures and file two semiannual financial report.

Our choice was Regulation A+, this due to the limitations on launching that do not agree with the start of production and sale of our products. In fact, what we need is to have some money long before starting production, this is not possible in a month and a half as indicated by Regulation Crowdfunding, but we need to obtain liquidity at least a few months before as the second option allows us.

Although this choice, the plan will not be fully exploited as we consider receiving only € 200 in equity (possible through the platform), we are still obliged to submit a semiannual financial report before the annual financial statement. This is not a concern as a startup it is also convenient for us to have an additional half-yearly report to the regular financial statements to understand the situation of the company and to intervene quickly if something goes wrong.

With this said it does not mean that once the estimated sum has been reached the fundraising campaign is closed, this could continue in such a way as to grow more and exploit the money obtained to improve aspects such as the quality of the product and the automation of some production steps to improve lean management aspects and production speed. Although this could be tempting, it should be emphasized, however, that a very high equity leads our participation (i.e., of us founders) to be too low and this could be a problem[52]. Precisely for this reason, what has been thought is to limit funding and subsequently move on to obtaining money through bank debts and similar.

PURCHASING OF NET FIXED ACCOUNTS

Purchasing of net fixed accounts is one of our biggest problem. This is a problem linked to the fact that we do not produce the first year, and for starting the production we need two things mainly: the machinery and

[52] The problem of dilution is present anyway, but it is important to notice that we have a lot of money that comes from family and friends, and we can take advantage of the future value estimated for our company in order to maintain the majority.

the premise. As explained above, these two are the most expensive items we need and getting them both in the first year is impossible without asking investors for more money, and banks in a situation like ours will hardly give us loans. Precisely for this reason our solution was to try to minimize expenses as much as possible in the first year using a solution that involves buying the machinery at the price mentioned above and renting the premise, which we will then bought in the third year, only when we really can purchase it without incurring in possible financial problems.

NOTES TO THE FINANCIAL STATEMENTS

FIRST YEAR

1 SALES OF PRODUCTS AND SERVICES: The first yeas is just a developing year, so we have no earning by sales

2 FINANCIAL REVENUES: The value is set to zero since we do not invest in any bonds and/or other financial assets

3 EXTRAORDINARY REVENUES: It's zero since we do not have sold any fixed assets.

4 R&D EXPENSES: These are the expenses made by R&D for their activity. It has been estimated that for the first year these costs are to the purchase of materials to produce the first prototypes. Assuming that at least 10 prototypes (such a low number is due to the fact that everything will be simulated with specific programs on PCs, in order to avoid useless prototypes) will be built, and among these 6 will be for CLOE and 4 will be for CLOE pro. The data entered is based on the cost analyzes made in the Operation Plan and in the Direct Material paragraph. Since the number of resources is less than the number of lots considered, it seemed reasonable to add a percentage of 4%.

5 INDUSTRIAL COSTS: The industrial costs considered are (expressed in euro, not thousands of euros):

Vigilance	470
Insurance	583
Heat/Light	3.000
Web Page	550
Hosting	52,45
Application	14.000
Machines	52.000
TOTAL	70.655,45 (~18,7k)

6 PERSONNEL COSTS: The only workers that we have in the first year are the ones in the R&D team. We have also the salaries of the managers (i.e., us) but since we don't have enough money to pay us back, the total salaries due to the administrative costs is balance with a short-term debt.

7 OTHER OPERATING EXPENSES: We have the TFR expenses:

R&D Total TFR	8,2

Administrative Total TFR	13,13

And the cost for renting the premise: 15.

8 INTERESTS: No interest for this year

9 DEPRECIATION: During this first year, as discussed above, we will buy the machinery needed to produce our products. Since these machines will be bought when we rent the premise, what happens is that their use will not be as great as the actual production has not yet started. Precisely for this reason it was decided not to consider the amortization for these months and to start considering the useful life from the beginning of the second year.

10 TAXES: Since we are at a loss, we do not have to pay the tax rate on the EBT, but we must still pay the IRAP which is 3.9% of the salaries given.

11 DIVIDENDS: Since we are at a loss, we do not have any.

12 INTANGIBLES: The intangibles considered are:

CE mark	150
Trademark	373
Patent	50

13 NET FIXED ACCOUNTS: The net fixed accounts are the machineries (€52).

14 INVENTORIES: We do not have inventories for the first year.

15 ACCOUNT RECEIVABLE: We have no creditors for the first year, however we decided to pay 10 each for the share capital by first paying 75% of the sum into a credit institution and the remaining 25% (2,5 each) by the end of the year (in order to cancel the credit against us)

16 CASH: In addition to the money that we founders initially put in, it was counted: 200 from https://www.startengine.com/ and 50 using a FFF (fool, friends, family).

17 SHARE CAPITAL: Discussed in the "Preliminary Considerations" of this chapter.

18 LEGAL RESERVE: Since we have a share capital of more than 10 thousand euros, we must have a legal reserve by law. This must reach 20% of the share capital through the allocation of at least 5% of the net profit, but since we have no positive profit, no money will be placed in the reserve for the year.

19 ACCOUNT PAYABLE: It's zero since we don't have commercial transaction for the first year.

20 SHORT TERM LOANS: The only short-term loans that we have is the one towards the administrative managers.

21 LONG TERM LOANS: We don't have long term loans for now.

22 SERVICE INDEMNITY (TFR): Already computed in the "Manufacturing Overhead" and "Non-Manufacturing Overhead" paragraphs.

SECOND YEAR

1 SALES OF PRODUCTS AND SERVICES: during the second year we have forecasted 12k sales. To calculate the value of sales revenues we used the formula proposed in the chapter on CPV analysis for the second year.

2 FINANCIAL REVENUES/LONG TERM INVESTMENT: The value is set to zero since we do not invest in any bonds and/or other financial assets

3 EXTRAORDINARY REVENUES: It's zero since we do not have sold any fixed assets.

4 R&D EXPENSES: We use the budget proposed as the value.

5 INDUSTRIAL COSTS: The industrial costs considered are (expressed in euro, not thousands of euros):

Vigilance	720
Insurance	625
Heat/Light	6.000
Web Page	50
Hosting	52,45
Application	2.000
Maintenance of repairs	3.900
Materials needed	1.443.160
Additional materials	288.600
TOTAL	1.745.107,45 (~1.745,1k)

6 PERSONNEL COSTS: During the second year we have different employees as it is addressed in the Project Plan. Thus, the total personnel cost is:

R&D	110,4
Workers	204
Social media manager	20,4
Administrative	177,4
TOTAL	512,2

7 OTHER OPERATING EXPENSES: We have the TFR expenses and cost for renting the premise:

R&D Total TFR	8,4
Administrative Total TFR	13,4
Workers + social media manager TFR	16,61
Renting	36

Marketing costs	110,3
TOTAL	74,41

8 INTERESTS: No interest for this year

9 DEPRECIATION: During the second year, the depreciation is set to the value of the amortizations of the machineries, we do not consider the premise because it will be bought next year as note 21 underlines. The depreciation of the intangibles is minimum (€50 circa, not in thousands), thus it will be considered properly only next year.

10 TAXES: Since this year we are not being at a loss, we have to pay IRPEF as well as IRAP. IRPEF is 5% for a startup.

IRPEF	3,8
IRAP	20

11 DIVIDENDS: We decided to convert 10% of the EAT into dividends to cheer our shareholders.

12 INTANGIBLES: The intangibles considered are the same of the first year.

13 NET FIXED ACCOUNTS: The net fixed accounts are the machineries (€46,8, considering the amortization).

14 INVENTORIES: As explain before we consider €288,6 (20% of the total material cost).

15 ACCOUNT RECEIVABLE: No creditors, since we use our webpage/app as selling platform, therefore people who buy the devices pay at the time of the purchase using one of the payment methods offered (e.g., PayPal, credit cards, etc.).

16 CASH: In the cash item we have money coming from the long-term loan and the RE.

17 SHARE CAPITAL: Same of the last year

18 LEGAL RESERVE: 5% of the RE is here inserted. The value is not 20% of Shared Capital yet, thus next year we will add other money.

19 ACCOUNT PAYABLE: During the second year we have our first commercial transactions as we need to buy the different materials for the production of the CLOE devices. But since we are a startup and we are in our first year of production, we decided to pay our retailers immediately in order to create a certain trust between us and them. This is possible as note 21 explains.

20 SHORT TERM LOANS: See long term loans.

21 LONG TERM LOANS: The second year is full of expenses, but also of earnings as the balance sheet shows us. Since these gains do not all come together, we need to understand how we need to ask for loans from the bank in order to achieve our goals. To do this we have done the following analysis (the values in the tables are in euros, not in thousands of euros):

MONTH	FORECAST	REVENUES	MATERIALS	LABOR	MARKETING	RENT	OTHER WORKERS	VARIES
January	200	42.398	27.036	3.000	1.838,06666666667	3.000	23.983	10.000
February	200	42.398	27.036	3.000	1.838,06666666667	3.000	23.983	10.000
March	300	63.597	40.554	4.500	2.757,1	3.000	23.983	10.000
April	550	116.594,5	74.349	8.250	5..054,68333333333	3.000	23.983	10.000
May	850	180.191,5	114.903	12.750	7.811,78333333333	3.000	23.983	10.000
June	1000	211.990	135.180	15.000	9.190,33333333333	3.000	23.983	10.000
July	1200	254.388	162.216	18.000	11.028,4	3.000	23.983	10.000
August	1250	264.987,5	168.975	18.750	11.487,9166666667	3.000	23.983	10.000
September	1300	275.587	175.734	19.500	11.947,4333333333	3.000	23.983	10.000
October	1550	328.584,5	209.529	23.250	14.245,0166666667	3.000	23.983	10.000
November	1600	339.184	216.288	24.000	14.704,5333333333	3.000	23.983	10.000
December	2000	423.980	270.360	30.000	18.380,6666666667	3.000	23.983	10.000

The debt-profit simulation is:

MONTH	REVENUES – ALL THE OTHER ITEMS	DEBT REQUESTED	DEBT PAID
January	-26459,0666666667	150.000	
February	-26459,0666666667		
March	-21197,1		
April	-8042,18333333333		
May	7743,71666666667		
June	15636,6666666667		27.000
July	26160,6		
August	28791,5833333333		
September	31422,5666666667		
October	44577,4833333333		
November	47208,4666666667		
December	68256,3333333333		27.000

Some notes regarding the tables:

- The marketing expenditure is made to be proportional to the units sold.
- Other workers refer to different managers and R&D.
- Varies stand for all not contemplated costs, it is just a delta. The choice of setting it so high is due to consider risk and inconvenient expenses.

Keep in mind that the only money we have left after the first year is €30.67 and we cannot risk running out of cash. As you can see from the table, the first 4 months we most likely need to ask for money from a bank, certainly the money requested must be equal to or better than the sum of the 4 revenues, therefore greater than or equal to € 82.2. It should be borne in mind that the revenues of the fifth month will be valid only at

the end of the month, however we need money to cover the expenses for that month as well. In the same way, we can do the same thing for the following months, so what we can do is request a debt of 150k with an 8%[53] six-month interest rate and a length of 3 years.

By doing this, by the end of the year, we would have more or less the money to buy the premise, but since we still have the short-term loan towards us (to pay the unpaid salary of last year) the premise will be bought next year, and we will continue to pay the rent as indicated in the note above.

22 SERVICE INDEMNITY (TFR): Already computed in the "Manufacturing Overhead" and "Non-Manufacturing Overhead" paragraphs.

THIRD YEAR

1 SALES OF PRODUCTS AND SERVICES: During the third year (a.k.a. second year of production) we have forecasted 36k sales. To calculate the value of sales revenues we used the formula proposed in the chapter on CPV analysis for the third year.

2 FINANCIAL REVENUES/LONG TERM INVESTMENT: The value is set to zero since we do not invest in any bonds and/or other financial assets

3 EXTRAORDINARY REVENUES: It's zero since we do not have sold any fixed assets.

4 R&D EXPENSES: We use the budget proposed as the value.

5 INDUSTRIAL COSTS: The industrial costs considered are (expressed in euro, not thousands of euros):

Vigilance	720
Insurance	650
Heat/Light	8.000
Web Page	250
Hosting	52,45
Application	2.000
Maintenance of repairs	11.700
Materials needed	3.461.180
Premise	340.000
TOTAL	3.824.552,45 (~3.824,6k)

The premise will be bought in January, but the payment will be spread during the other months of the year.

The materials needed are paid in a deferred manner as note 19 explains, hence the materials cost here indicated refers to those pertaining to the financial year.

[53] This high interest rate is because we are high risky.

6 PERSONNEL COSTS: During the third year we have the same types of employees that we have the last year, but since the number of devices produced increased three times, we need to recruit more workers needed in the operational part (we considered 19 workers as said in the Operation Plan)

R&D	110,4
Workers	387,6
Social media manager	20,4
Administrative	177,4
TOTAL	695,8

7 OTHER OPERATING EXPENSES: We have the TFR expenses, bearing in mind the increase in personnel (+9 workers, for a total of 19 workers) and the revaluation for the previous year workers and social media manager:

R&D Total TFR	8,4
Administrative Total TFR	13,4
Workers + social media manager TFR	30,5
Marketing expenses	128,9
TOTAL	181,2

8 INTERESTS: No interest for this year

9 DEPRECIATION: The depreciation value is equal to that of the machinery (already considered for the past year), that linked to the premise (the considerations made at the beginning of the finance plan are used) and that relating to intangible assets

Machineries	5,2
Premise	6,8
Intangible assets	0,1
TOTAL	12,1

10 TAXES: Since this year we are not being at a loss, we must pay IRPEF as well as IRAP. IRPEF is 5% for a startup.

IRPEF	130,6
IRAP	27,1

11 DIVIDENDS: We decided to convert 6% of the EAT into dividends to cheer our shareholders. This value is also more than half of the shared capital (which is 145), making shareholders regain a little more than half of their equity investment.

12 INTANGIBLES: The intangibles are the same of the previous years, but now we consider their values minus the value depreciated.

13 NET FIXED ACCOUNTS: The net fixed accounts are the machineries and the premise (less the depreciated value)

14 INVENTORIES: As explain some chapters before we consider €865,3 (20% of the total material cost).

15 ACCOUNT RECEIVABLE: For simulation purposes we have kept true the option used in the second year in which the sales made through our site and our applications occur immediately, but this is not possible to keep credible in the case of retailers. Precisely for this reason we have considered that retailers pay us for the goods only 3 months later, therefore becoming creditors towards us. Since there are no monthly forecasts for the third year, we assumed a homogeneous sale to retailers of the products during the year. Therefore, if sales to retailers are equal to 25.920, sold in lots of 240 devices with a total of 108 orders (as shown in the "Distribution" chapter of the Marketing Plan), we can estimate that there are 9 orders per month, thus obtaining a total of 27 orders not yet paid[54]. Twenty-seven orders are equivalent to 6.480 devices for which we expect payment, and using the distribution formula between CLOE and CLOE Pro we can estimate that:

$$(0{,}8 \times \text{CLOE retailer price} + 0{,}2 \times \text{CLOE pro retailer price}) * 6.480 = 198{,}2 \times 6.480 = 1.284.336$$

16 CASH: The cash item is really promising this year, and this is due to the high retained earnings.

17 SHARE CAPITAL: Same of the last year.

18 LEGAL CAPITAL: 5% of the RE is here inserted plus the one allocated in the previous year. The value now greater of the 20% of Shared Capital, which is €58.

19 ACCOUNT PAYABLE: During the third year we do not pay our suppliers immediately for the purchase of goods, but we postpone the cash outflow to two months later. We do this to better manage the tradeoff between the money received immediately and those received deferred (i.e., those on credit) with the different expenses made.

The choice of two months is linked to the fact that the first year of production (i.e., second year) we pay the suppliers immediately and therefore we cannot extend the payment time too much. Since there are no monthly forecasts for the third year, we use the same assumption of note 15 (homogeneous selling of devices), thus we consider 3 thousand selling per month[55]. Because the materials not paid during the considered year refer to November and December, we have to consider 6 thousand devices, therefore using the cost function computed in the CVP analysis we have:

$$\text{estimated material cost per device} \times \text{number of devices} = 135{,}18 \times 6.000 = 811.080$$

See the indexes of the third year if this solution is effective or leads to some problem. Since it is a solution that is conceived and made at the beginning of the year, only at the end, at the time of the balance sheet formulation, we can actually understand its effectiveness.

20 SHORT TERM LOANS: No short-term loans this year.

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[54] 9 * 3 = 27, three is the number of months in which payment is not paid in the year in question: October, November, December

[55] 36k devices/12 months

21 LONG TERM LOANS: The one done the previous year less the two payments as described in the second-year explanatory notes.

22 SERVICE INDEMNITY (TFR): Already computed in the "Manufacturing Overhead" and "Non-Manufacturing Overhead" paragraphs and adapted to the case.

ECONOMIC AND FINANTIAL RATIOS

Economic and financial ratios are quantitative measures that are used to assess businesses. These ratios are used by financial analysts, equity research analysts, investors, and asset managers to evaluate the overall financial health of businesses, with the end goal of making better investment decisions.

In the evaluation we used different types of financial metrics to evaluate our startup as accurately as possible, in fact, finance ratios can be broken down into four categories: profitability ratios, liquidity ratios, solvency ratios, cash flow ratios and operating performance ratios. In the following analysis, what we will do is to consider these categories and the related ratios for the three years considered in the financial statements.

FIRST YEAR RATIOS

Although the first year of operating results are not positive it is important to calculate the main indexes related to profitability to inform our shareholders of the situation[56]. This should not, however, worry our investors, who, thanks to the analysis made in the CVP and the one in the financial statements' chapters, will be rewarded hopefully in the second year and surely in third year by the positive net profit.

The return on equity, return on assets, and the return on investment are:

$$ROE = \frac{EAT}{Equity} = \frac{-396{,}13}{-117{,}33} = 3{,}37$$

$$ROA = \frac{EBIT}{Total\ Assets} = \frac{-396{,}13}{83{,}27} = -4{,}76$$

$$ROI = \frac{EBIT}{Capital\ Employed} = \frac{-396{,}13}{-117{,}33\ +\ 177{,}4} = -5659$$

The values of the ROI and ROA are negative since the EBIT has a negative value, this to indicate the very bad situation in which our company finds itself. The ROE becomes misleading in this case, since both the denominator and the nominator are negative, thus producing a positive value that could make the situation seem better than it is.

SECOND YEAR RATIOS

Focusing on the second year we can present a more detailed analysis of the classes of ratios considered, this is due to the fact that from this year we start the production and sale of our devices.

PROFITABILITY RATIOS

[56] Also important for all those who have given us equity through the StartEngine platform

The **return on equity** is a measure of a company's annual return (net income) divided by the value of its total shareholders' equity. ROE provides a simple metric for evaluating returns.

$$ROE = \frac{EAT}{Shared\ capital} = \frac{52{,}9}{337{,}6} = 0{,}16$$

By comparing our company's ROE to the industry's average, it is possible to pinpoint a company's competitive advantage (or lack of competitive advantage). The average ROE for computer services for the year 2021 is 18,62%[57], hence our ROE is not sufficiently high. This is not a problem since we are in the first year of activity.

The **return on assets** is a type of ratio that measures the profitability of a business in relation to its total assets. This ratio indicates how well a company is performing by comparing the EBIT it has being generating with the total capital it has invested in assets. The value for this year is:

$$ROA = \frac{EBIT}{Total\ Assets} = \frac{76{,}7}{472} = 0{,}17$$

The ROA value is greater than the one for technology industry, which is about 11%[58].

The **return on investment** is a performance measure used to evaluate the profitability. It tries to directly measure the amount of return on the investment. The ROI value for the second year is:

$$ROI = \frac{EBIT}{Capital\ Employed} = \frac{76{,}7}{337{,}6} = 0{,}24$$

Also, the value of ROI is greater than the average in the IT industry, which is about 9,4%[59].

LIQUIDITY RATIOS

The **current ratio** (a.k.a. working capital ratio) measures the ability of a business to meet its short-term obligations that are due within a year. The ratio compares total current assets to total current liabilities. The current ratio looks at how a company can maximize the liquidity of its current assets to settle its debt obligations, this is why we consider it here in this analysis.

Since the current liabilities are 0, the formula will tend to plus infinity. This can be seen as a bad thing, since a very high current ratio suggests that the company is leaving too much excess cash unused, rather than investing the cash into projects for company growth. This is true, but here what we do during the second year is to save money as much as possible for the next year expenses (e.g., purchasing the premise) and be less risky as possible.

[57] https://www.statista.com/statistics/1044049/return-on-equity-in-the-technology-and-telecommunications-in-europe/
[58] https://csimarket.com/screening/index.php?s=roa
[59] https://www.statista.com/statistics/1009444/roi-of-it-industry-italy/

The **quick ratio** (a.k.a. the acid-test ratio) measures the ability of a business to pay its short-term liabilities by having assets that are readily convertible into cash. These assets are cash and accounts receivable. These assets are considered "quick" assets because they can be quickly and easily converted into cash.

Since the current liabilities are 0, the formula will tend to plus infinity. Hence, the same analysis on liquidity ratios applies here.

SOLVENCY RATIOS

The **equity ratio** (a.k.a. proprietary ratio) is a financial metric that measures the amount of leverage used by a company. It uses investments in assets and the amount of equity to determine how well a company manages its debts and funds its asset requirements.

$$ER = \frac{\text{Shared capital}}{\text{Total liabilities}} = \frac{290}{134{,}4} = 2{,}16$$

This value indicates that the company uses more money funded by shareholders than debts, this is consistent with the initial assumptions made related to the fact that being a startup means that it is difficult to obtain heavy debts from banks. In fact, the only debt required was 150k at the beginning of the second year, a smaller amount than the share capital. In fact, it has always been an attempt to exploit the money earned through sales instead using debts.

The value can be considered quite high and therefore the company can be considered strong financially.

The **debt-to-equity** ratio (a.k.a. financial leverage) is a leverage ratio that calculates the weight of long-term loan against total shareholders' equity. This ratio highlights how a company's capital structure is tilted either toward debt or equity financing. For the second year we have:

$$DER = \frac{\text{Long term loan}}{\text{Owners' fund}} = \frac{96}{337{,}6} = 0{,}28$$

This low ratio indicates that the firm is less levered and closer to being fully equity financed. This can be a pro, since if things don't go as expected the leverage effect will strongly affect our finances.

CASH FLOW RATIO

First, we must compute the Free Cash Flow, which is equal to the EBT, therefore €76,7k.

The **free cash flow** ratios indicate how much cash it is generating after paying the cost of remaining in business, hence high values are hoped. The FCF ratios for this here are:

$$FCF = \frac{\text{Free cash flow}}{\text{Revenues}} = \frac{76{,}7}{2543{,}9} = 0{,}03$$

$$FCF = \frac{\text{Free cash flow}}{\text{Total assets}} = \frac{76{,}7}{472} = 0{,}16$$

The **free cash flow to equity** ratio is:

$$FCF\text{E} = \frac{\text{Free cash flow - Interest expenses}}{\text{Owners' Funds}} = \frac{76{,}7}{337{,}6} = 0{,}23$$

Since all these values are very low, we must try during the third year to generate more money. We believe it is normal not to be excellent during this first year of production and we look forward to improve in generating more cash for the following years.

OPERATING PERFORMANCE RATIOS

For measuring the performance, we use three turnover ratios.

The **asset turnover ratio** measures how efficient a company uses its assets to generate sales. This ratio looks at how many euros in sales is generated per dollar of total assets that the company owns.

$$\text{Asset Turnover Ratio} = \frac{Sales}{Average\ Total\ Assets} = \frac{2.543{,}9}{472 - 83{,}27} = 6{,}54$$

This means that for every euro of total assets, the company generates about €6,54 in sales. This value is really high respect to the average in IT industry, which is 0.6[60]; this indicates an efficient use of assets.

Another turnover ratio is the **inventory turnover ratio**. The inventory turnover ratio measures how many times a business sells and replaces its stock good in a given period of time (usually, as in this case, the fiscal year). This ratio indicates how efficient a business is at clearing its inventories. The value for the second year is:

$$\text{Inventory Turnover Ratio} = \frac{Sales}{Average\ Inventory} = \frac{2.543{,}9}{288{,}6 - 0} = 8{,}81$$

This means that on average the inventories are transformed into sales 8.81 times in a year. And computing the **inventory turnover days** we have that they are sold once each:

$$\text{Inventory Turnover Days} = \frac{Number\ of\ Days\ in\ Period}{Inventory\ Turnover\ Ratio} = \frac{365}{8{,}81} = 41{,}4\ days$$

The value obtain is lesser than the average for the tech industry[61] (which is 9.93), however it is very good.

Last turnover that we consider is the **account receivable turnover ratio**. The account receivable turnover ratio measures the number of times over a specific period (again, the fiscal year) that a company collects its average accounts receivable.

Since, as explain in the explanatory notes, we are paid as soon as the online purchase is made, we don't have account receivable, hence making the account receivable turnover ratio to be equal to infinity. This is also confirmed by the formula of the **accounts receivable days**, which is the number of days on average that it takes a company to collect on credit sales from its customers.

$$\text{Account Receivable Days} = \frac{Number\ of\ Days\ in\ Period}{Accounts\ Receivable\ Turnover\ Ratio} = \frac{365}{inf} = 0$$

[60] https://csimarket.com/Industry/industry_Efficiency.php?s=1000
[61] https://csimarket.com/screening/index.php?s=it

This means that the money is collected immediately.

THIRD YEAR RATIOS

In this paragraph the ratios seen in the previous paragraph will be recomputed using the data of the third year. Precisely because of the repetitiveness of this analysis, the description of each index is shunned, but only the result and a brief comment on it are presented.

Furthermore, the same reference values used in the previous paragraph will be used here as benchmarks.

PROFITABILITY RATIOS

The **return on equity** for the third year is:

$$ROE = \frac{EAT}{Equity} = \frac{2.611{,}8}{2599{,}3} = 1{,}05$$

The value is very high, much more than that of the technology industry, this indicates the very great position of our business, and the shareholders should be very happy with this.

The **return on assets** is:

$$ROA = \frac{EBIT}{Total\ Assets} = \frac{2.611{,}8}{3.515{,}4} = 0.74$$

The ROA value is higher compared to that of the technology industry. This indicates how more productively and efficiently we are utilizing economic resources with respect to last year.

The **return on investment** for the third year is:

$$ROI = \frac{EBIT}{Capital\ Employed} = \frac{2611{,}8}{2599{,}3\ +\ 811{,}1} = 0{,}77$$

Also, the value of ROI is greater than the IT industry's average indicating that we outperform the competitors.

LIQUIDITY RATIOS

The **current ratio** for the third year is:

$$\text{Current Ratio} = \frac{Current\ assets}{Current\ liabilities} = \frac{3.140}{811{,}2} = 3{,}87$$

The value obtained is really promising since it is greater than one and reasonable (not infinity as last year). This suggests a financial well-being for our company.

The **quick ratio** is:

$$\text{Quick Ratio} = \frac{Cash\ +\ Account\ Receivable}{Current\ liabilities} = \frac{2.274{,}8}{811{,}2} = 2{,}8$$

Since the quick ratios is greater than 1, it implies that the company can repay its short-term debt obligations with only its liquid assets. Hence, this is a good result for us.

SOLVENCY RATIOS

The **equity ratio** for the third year is:

$$\text{ER} = \frac{\text{Shared capital}}{\text{Total liabilities}} = \frac{290}{916{,}1} = 0{,}32$$

The current value is much lower than the one of last year, in fact it is now below 0.5. This causes the company to be considered as a leverage company. However, this is not entirely true, as the only debts we have are the account payable (i.e., the money we have not yet paid to our suppliers). This means that we have to change the gap between the purchase of the materials and the payment of them, in order to have the amount of account payable reduced.

The **debt-to-equity ratio** is:

$$\text{DER} = \frac{\text{Long term loan}}{\text{Owners' fund}} = \frac{42}{2.599{,}3} = 0{,}016$$

This low ratio indicates that the firm does not make use of the leverage effect that the equity ratio may suggest. Given our liquidity situation, we could try to increase the value of long-term loans and exploit the leverage for having a greater ROE.

FREE CASH FLOW RATIOS

First, we must compute again the Free Cash Flow, which is equal to the EBT, therefore €2.611,8k.

The **free cash flow** ratios are:

$$FCF = \frac{\text{Free cash flow}}{\text{Revenues}} = \frac{2.611{,}8}{7.356{,}2} = 0{,}35$$

$$FCF = \frac{\text{Free cash flow}}{\text{Total assets}} = \frac{2.611{,}8}{3.515{,}4} = 0{,}74$$

The **free cash flow to equity** ratio is:

$$FCFE = \frac{\text{Free cash flow - Interest expenses}}{\text{Owners' Funds}} = \frac{2.611{,}8}{2.599{,}3} = 1{,}005$$

The values are still low but have greatly improved compared to the second year, given that more sales and less expenses are expected for next year (there will be no need to buy a premise like this year) these values will most likely rise even more.

OPERATING PERFORMANCE RATIOS

For measuring the performance, we use three turnover ratios as previously presented.

The **asset turnover ratio** for the third year is:

$$\text{Asset Turnover Ratio} = \frac{Sales}{Average\ Total\ Assets} = \frac{7.256{,}2}{3.515{,}2 - 472} = 2{,}41$$

This means that for every euro of total assets, the company generates about €2,41 in sales. This value is still higher than the IT industry's average; this still indicating an efficient use of assets. However, the value is about three times lower than the one had the last year.

The **inventory turnover ratio** is:

$$\text{Inventory Turnover Ratio} = \frac{Sales}{Average\ Inventory} = \frac{7.256{,}2}{865{,}3 - 288{,}6} = 12{,}76$$

This means that on average the inventories are transformed into sales 12.76 times in a year, 4 points more the last year. And computing the **inventory turnover days** we have that they are sold once each:

$$\text{Inventory Turnover Days} = \frac{Number\ of\ Days\ in\ Period}{Inventory\ Turnover\ Ratio} = \frac{365}{12{,}74} = 28{,}65\ days$$

The value obtain is greater than the average of the tech industry, indicating that we are using our inventory better than the other firms in the IT industry.

Lastly, the **account receivable turnover ratio** is equal to:

$$\text{Account Receivable Turnover Ratio} = \frac{Sales}{Average\ Account\ Receivable} = \frac{7.256{,}2}{1.284{,}3 - 0} = 5{,}73$$

And the **accounts receivable days** are:

$$\text{Account Receivable Days} = \frac{Number\ of\ Days\ in\ Period}{Accounts\ Receivable\ Turnover\ Ratio} = \frac{365}{5{,}73} = 63{,}7$$

Comparing the number of days obtained to the one related to computer and technology industries[62], we can consider us in a very good position. Thus, our approach towards our retailers' payments is very good.

BUDGETING

A budget is a quantitative plan for acquiring and using resources over a specified time period. Budgets are used in our company for two distinct purposes—*planning* and *control.* Planning involves developing goals and preparing various budgets to achieve those goals. Control involves the steps taken by management to

[62] https://www.readyratios.com/sec/ratio/receivables-turnover/

increase the likelihood that all parts of the organization are working together to achieve the goals set down at the planning stage[63].

The budgets that we explore here is a *planning budget.*[64]

CHOOSING A BUDGET PERIOD

We choose to cover a one-year period operating budget corresponding to the company's fiscal year.

This was done because in the previous chapters our objectives were set as annuals, but above all because this option is also the one most used by companies[65]. It is important to underline that in case the real situation is not as promising as the one proposed here, our company will use a reduced period using a rolling mechanism considering only three/four months.

BUDGETING SYSTEM

The budgeting strategy we decide to implement is the *self-imposed budget* (also called *participative budget*). In self-imposed budget a budget is prepared with the full cooperation and participation of managers at all levels, but it is proposed just by the manager who takes care of the topic (e.g., marketing, operations). This is done because budget estimated by front-line managers are often more accurately and reliable than estimates prepared by top managers who have less intimate knowledge of markets and day-to-day operations. This, also, reduced the risks that a manager can complain about the project as unrealistic and impossible to meet. With a self-imposed budget, this excuse is not available.

One important limitation of self-imposed budgeting is that lower-level managers may allow too much *budgetary slack.* Because the manager who creates the budget will be held accountable for actual results that deviate from the budget, the manager will have a natural tendency to submit a budget that is easy to attain (i.e., the manager will build slack into the budget). For this reason, budgets prepared by lower-level managers should be scrutinized by higher levels of management. Questionable items should be discussed and modified as appropriate[66].

The manager, who has a certain budget, is the only responsible for how it is used, even if the final approval is settled with the presence of all managers. Thus, it important to underline the concept of *responsibility accounting* that our company uses. The basic idea underlying responsibility accounting is that a manager should be held responsible for those items—and only those items—that the manager can actually control to a significant extent. Each line item (i.e., revenue or cost) in the budget is the responsibility of a manager who is held responsible for subsequent deviations between budgeted goals and actual results. In the case of the results not measuring up the budget goal (positively or negatively) the manager has to understand the source of significant favorable or unfavorable discrepancies, and should be prepared to explain the reason for discrepancies to higher management (precisely to the project and strategy manager and the finance manager, the latter will have to adjust them in the financial plans).

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[63] Planning and control are already mostly described in the marketing and operation plan, here we will focus only on the budgets and the budgeting system.
[64] A planning budget is prepared before the period begins and is valid for only the planned level of activity.
[65] As Noreen, Brewer, and Garrison said in their book about managerial accounting.
[66] This will be done every year before submitting the new budgeting planning, since here is a simulation, we will not discuss this part that will be simply a meeting between managers.

MASTER BUDGET

The muster budget consists of a number of separate but independent budgets that formally lay out the company's sales, production, and financial goals.

SECOND YEAR MASTER BUDGET

The independent budgets that we considered are:

SALES BUDGET: The sales budget is constructed by multiplying budgeted unit sales by the selling price, thus: $211{,}99 \times 12.000 = 2.543.880$[67]

PRODUCTION BUDGET: The production budget is composed of the direct materials budgets, direct labor budget, manufacturing overhead budget. In view of the fact that we use a self-imposed budget system and the values corresponding to such topics were already discussed in the previous chapters we present just a table with the values already computed:

Direct materials budget	1.443.160
Direct labor budget	180.000
Manufacturing overhead budget	213.604,52

ENDING INVENTORY BUDGET: The ending inventory budget is considered as 20% of the direct materials budget as written in the operation plan, for a total of €288,632. This value also appears in the balance sheet for the second year. The explanatory notes for the homonymous item apply here.

SELLING AND ADMINISTRATIVE EXPENSE BUDGET: For the reason that we use a self-imposed budget system and the values corresponding to such topics we already discussed in the "Non-Manufacturing cost" paragraph, we just insert here a table for summarizing:

Selling budget	110.284,32
Administrative expense budget	177.400

R&D BUDGET: Since the R&D department need money for designing, developing, and testing, we decide to attribute €20k in order to cover those expenses. Also, we have to increase this latter value by the salary for the R&D team: €110,4k. Obtaining a total budget of €130,4

THIRD YEAR MASTER BUDGET

The independent budgets that we considered are:

SALES BUDGET: The sales budget is constructed by multiplying budgeted unit sales by the selling price, thus: $204{,}337 \times 36.000 = 7.356.132$ (using the formulas explained in the CVP analysis chapter)

PRODUCTION BUDGET: The production budget is composed of the direct materials budgets, direct labor budget, manufacturing overhead budget. In view of the fact that we use a self-imposed budget system and the values corresponding to such topics were already discussed in the previous chapters we present just a table with the values already computed:

[67] Using the formula computed in the CVP analysis chapter

Direct materials budget	4.326.480
Direct labor budget	540.000
Manufacturing overhead budget	220.154,52

ENDING INVENTORY BUDGET: The ending inventory budget is considered as 20% of the direct materials budget as written in the operation plan, for a total of €865.296. This value also appears in the balance sheet for the second year. The explanatory notes for the homonymous item apply here.

SELLING AND ADMINISTRATIVE EXPENSE BUDGET: For the reason that we use a self-imposed budget system and the values corresponding to such topics we already discussed in the "Non-Manufacturing cost" paragraph, we just insert here a table for summarizing:

Selling budget	128.866
Administrative expense budget	177.400

R&D BUDGET: Since the R&D department need money for designing, developing, and testing, we decide to attribute €20k in order to cover those expenses. Also, we have to increase this latter value by the salary for the R&D team: €110,4k. Obtaining a total budget of €130,4.

RISK ASSESMENT AND RISK MANAGEMENT DOCUMENTS

In this chapter, a financial analysis will be made regarding the seven points considered in the "Risk Management" chapter of the Project Plan, in which they are described with the explanation of how they are solved. After that, a briefly examination of credit and liquidity risk managements will be presented.

PROJECT PLAN RISK IDENTIFIED

FAILURE OF SOME SUPPLIERS The failure of some suppliers should not cause too much concern, this for the simple fact that the electronic components we need are very standard and are produced by many companies (we assemble them in a certain way to make them become something innovative, but nothing more); in addition, the Chinese market, which is the one in which we take almost all of the materials, offers many suppliers who produce components of excellent quality and at a very low price, thus making the substitution of a supplier not a difficult task.

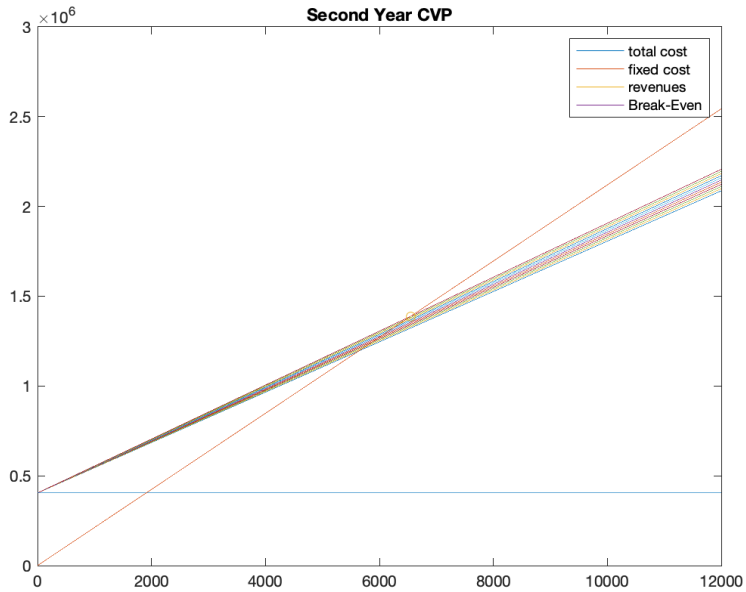
In the considerations made previously, what we have done is to choose the suppliers that offer the materials with the best quality/price ratio, therefore in the event of failure of these we should move on to the second best that we have already identified as the business plan shows. The prices of the new supplier will most likely be higher than the previous one (otherwise we would have already chosen it immediately), but this should not cause too much concern as there will be very few euros more (as mentioned above, the Chinese suppliers offer more or less all the same price).

Called δ the new price variation of the components, it will affect the production cost of the CLOE devices (the standard edition and the PRO) in three different ways (it is assumed that the selling price always remains the same, this for marketing reasons):

- Change a component associated only with CLOE: since a component price is changed the CLOE's price of production will increase of δ (δ>0), modifying the CVP presented in the "Cost-Volume-Profit Analysis" chapter in the following way:

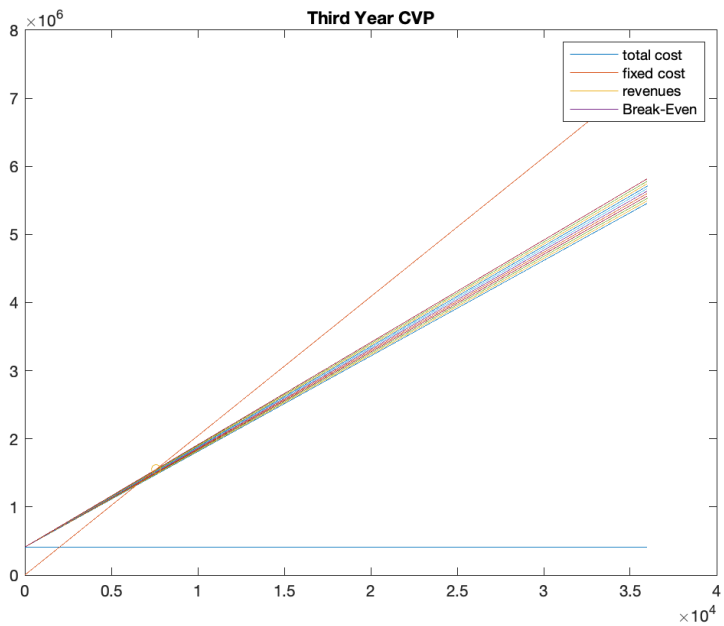
$$\text{cost(x)} = \text{x} * 0{,}8 * \ (old\ price\ material\ CLOE + \delta) + \text{x} * 0{,}2 * (\text{price material CLOE Pro}) + \text{direct labor } * \text{x} = (90{,}32 + \delta) * \text{x} + 29.86 * \text{x} + 15 * \text{x} = (135{,}18 + \delta) * x$$

And if we consider δ a value between 5 and 15, we have that the new CVP is:



Where the lines that starts at the same value of the fixes cost's line are total costs' lines with a different value of δ. The new value of the break-even will be higher than the previous computed, but as the plot shows the revenues are still greater than the total costs meaning that we are still profitable. Anyway, the new value of the break-even point for the second year, assuming that the value of δ is equal to 15 (the worst case imagined), is 6650.

For the third year we can do the same computations:



The break-even point, with delta equals to 15, is reached at the 7596th sale. Since we forecast 36k of sales this is not a big problem.

- Change a component associated only with CLOE pro: same as the previous case.
- Change a component associated with both the devices: we need to compute a new function for the costs considering two different δs that we will call δ_1 and δ_2. We do this because for CLOE and CLOE pro we have some materials that are different between each other, or the quantity required is different. Hence, the new cost function will be:

$$\begin{aligned}\text{cost(x)} = \text{x} * 0{,}8 * \ (\text{old price material CLOE} + \delta_1) + \text{x} * 0{,}2 * (\text{price material CLOE Pro} \ + \ \delta_2) \\ + \text{direct labor} \ * \text{x} = (90{,}32 \ + \ \delta_1) * \text{x} + (29.86 + \delta_2) * \text{x} \ + \ 15 * \text{x} \\ = \ (135{,}18 + \delta_1 + \delta_2) * \text{x} \ = (135{,}18 + \delta_{tot}) * x\end{aligned}$$

The formula obtained is the same of the one obtained before so the same plots apply here (considering δ_{tot} a value between 5 and 15). It is quite intuitive that even if the value of δ_{tot} would be a value between 10 and 30, thus increasing the total cost, the break-even point will be reached before the number of products forecasted, hence in both graphs we will have profits.

POOR QUALITY IN THIRD PARTY APPLICATIONS The solution presented in the Project Plan is to contact a company led by people we know personally and whom we trust. This solution usually has higher costs because we require a higher quality service, but we hope that the personal knowledge with the third party may help to have discounts. This strategy was used to create and maintain the application as shown in the previous chapters, so the cost related to this was already counted in the analysis made and we don't have to add anything here.

INABILITY TO FIND A PREMISE IN THE CITY CHOSEN DURING THE PLANNING PHASE As reported in the Risk Management chapter in the Project Plan this is not a big issue, since all transport companies arrive everywhere in Italy and the retailers we have chosen are located throughout the country, so everything is still accessible. The only problem can be in the price of the premise, but since the one considered was an indicate price it will be easy to find a new building with the same price or even lower: lots of premises are sold by the courts at auction at a very low price, so we can take advantage of that.

UNDERESTIMATE THE DIFFICULTY OF IMPLEMENTING CLOE OS The solution proposed was already taken into account as demonstrated by the salary of the R&D employees, which is higher than the one of the other workers. In the unfortunate scenario in which we need more R&D employees for the first year, the losses for the first year will be greater than the one computed in the profit and loss. This can be a serious problem and can be solve asking more money:

- We founders have decided that we can add €10k each to the sum already deposit, therefore investing €20k each. This is a solution that we will surely do if problems of this type appear, this is because it would allow us to have more control over our company. We didn't do that at the beginning of the plan since it's a lot of our money put at risks and we are only students, but if it is required, we trust our analysis and we are confident of our team.
- Ask money online using StartEngine (prolonging the campaign) or making use of other crowdfunding sites (Indiegogo and/or Kickstarter). This is better explained in the next point.

We underly the fact that we cannot ask money to banks as a company, since we do not have any results and they will not trust us.

UNSATISFACTORY RESULTS WITH STARTENGINE StartEngine is not the only platform that can allow us to obtain the money required, we can use other platforms such as Indiegogo and/or Kickstarter; also, the possibility of adding €10k each is still present. Assuming that we put 40k additional euros, the rest of the money we need must be collected through the other two websites, which work in the same way. However, these crowdfunding website works differently from StartEngine since here we don't ask for equity, but simply we ask for money in exchange for something. A possible solution can be the:

Type of support	Minimum Pledge (€)
Contribution without reward	5
CLOE	189,99 (save €10)
CLOE pro	249,99 (save €10)
2 CLOE	384,98 (save €15)
CLOE + CLOE pro	444,98 (save €15)
2 CLOE pro	484,98 (save €15)

This helps to do two things: get the first initial money and to know how many devices to produce (developing a sort of back ordering strategy). Although it may seem that the sale of CLOEs, which will then be shipped only in the following year, appears to be a loss to us as CLOE and CLOE pro are sold for less than the listed price, but it is important to keep in mind that these prices are always higher than those we offer to retailers, in which we earn a few euros less (few, but still less), so we are still making profits. Since this hypothesis was made only here, the effects and action strategies for the Marketing and Operations part have not been considered, however they will have to be slightly changed to manage this first back ordering period, which will be closed at the beginning of the second year.

A very positive thing about this approach is in the changes we would have in the Financial Statements and the indices associated with the Shared Capital. Since the money is not taken here as equity, but it is money that will go directly to the Cash, this will contribute to make the shared capital lower than that the one considered in the previous analyzes; and therefore, if the economic results are the same, the ROE index will be definitely much higher, with the possibility in the third year of reaching and exceeding the share of the industry average[68].

Although this strategy may seem very profitable and a good alternative, it is also very difficult to implement as there is a need to set a closing date for the fund campaign and a minimum amount to collect, which must allow us to start with the different business activities. If the minimum threshold is not reached at the end of the campaign, the campaign is bankrupt and the money earned will not be delivered to us, but will be returned to the owners. Furthermore, if the campaign were a success, the money will be delivered to us only at the end of the campaign, making it possible to have problems with some payments (e.g., salaries, machinery, materials, etc.), which must be in some way deferred.

[68] Supposing that the only money in the Shared Capital is the one obtained by us the funders (fools) and the family and friends, we will have a total Shared Capital equal to $80k + 50k = 130k$. Considering this value and the value of the EAT for the third year, the ROE obtained is equal to 107,1%, greater than the industry's average which is 18,62% as already said.

Another possible solution is to rely on a Venture Capital, in order to obtain the required money. Since it is possible to ask for more money than what will then go into the Shared Capital, what we will try to get is about € 150k for 20% of the equity by exploiting our business valuation[69]. If we do not succeed and everything will end up in equity, what will be obtained will be the previous description, which is still excellent. Precisely for this reason in the general analysis we evaluated the worst possible case: if in the worst case we are profitable, then we are always profitable.

WRONG BUSINESS IDEA AND MARKETING STRATEGY To reduce this risk we used the pretotyping strategy invented by A. Savoia as mentioned in the Marketing Plan and the Project Plan. The cost of pretotyping were already considered in the computation since we have decided to use it from the very beginning.

FAILURE OF RETAILER The possibility of a retailer going bankrupt is very difficult as all of our retailers have been on the market for many years and are the main electronics stores in Italy. However, if any of them fail this shouldn't be a problem from a marketing point of view, because the rest will still have many stores and we could reach customers through retailers without too much difficulty anyway (no effects on the revenues).

The bankruptcy of a retailer from a financial point of view could be a problem if it fails to pay debts, for this reason what is better to do, from a financial point of view, is to make use of a provision (the *provision for doubtful debts*[70]) if we realize that a retailer's situation is not excellent.

CREDITS AND LIQUIDITY RISK MANAGEMENT

For what concerns the **credit** risk, we do not have to worry because for the second year we have no credits, as the payments are made immediately after the purchase, and in the third year the credits are quite withheld, they have a not too long life cycle which allows to have a good liquidity, and are towards financially stable and well-known retailers. If one of these is more at risk of failure, we can use the option proposed in the paragraph above and make use of a provision for doubtful debts, together with a limitation of the delivery of our products to them (in order to limit the risk of lost).

Considering the **liquidity risk**, also that it is very low: for the second year we don't have current liabilities and for the third year they are well contained as the liquidity ratios shows. Hence, we remark again how strong financially our company is.

[69] Valuation is the process of determining the current worth of a business, using objective measures, and evaluating all aspects of the business.

[70] It is called in this way, but it refers to the credits that we have (in Italian it is called "fondo svalutazione crediti")

PROJECT PLAN

In this section the roles of the entire staff will be defined in detail, also going to define the company structure and the tasks of the company areas.

TEAM CULTURE

A good culture is one in which team members collaborate, share knowledge, communicate, and most importantly support one another. Not only does this benefit the company, but it benefits the personal growth. When a culture is strong, trust exists, and people will do the better thing. Therefore, we want to achieve a **Cooperative Culture**.

We are a group of students with a background in the field of computer engineering, and this allows us to have that wealth of knowledge necessary to be able to carry out this project idea. A very important aspect is that we have already worked together in other situations, and therefore we are used to dividing the work and cooperating with each other, with all the necessary tools.

The team is composed by four students, each one is one of the four main managers. The Strategy Manager will take care also of the Project Management.

Federica Baldi

- Marketing Manager

Daniele Cioffo

- Strategy and Project Manager

Edoardo Fazzari

- Financial Manager

Mirco Ramo

- Operations Manager

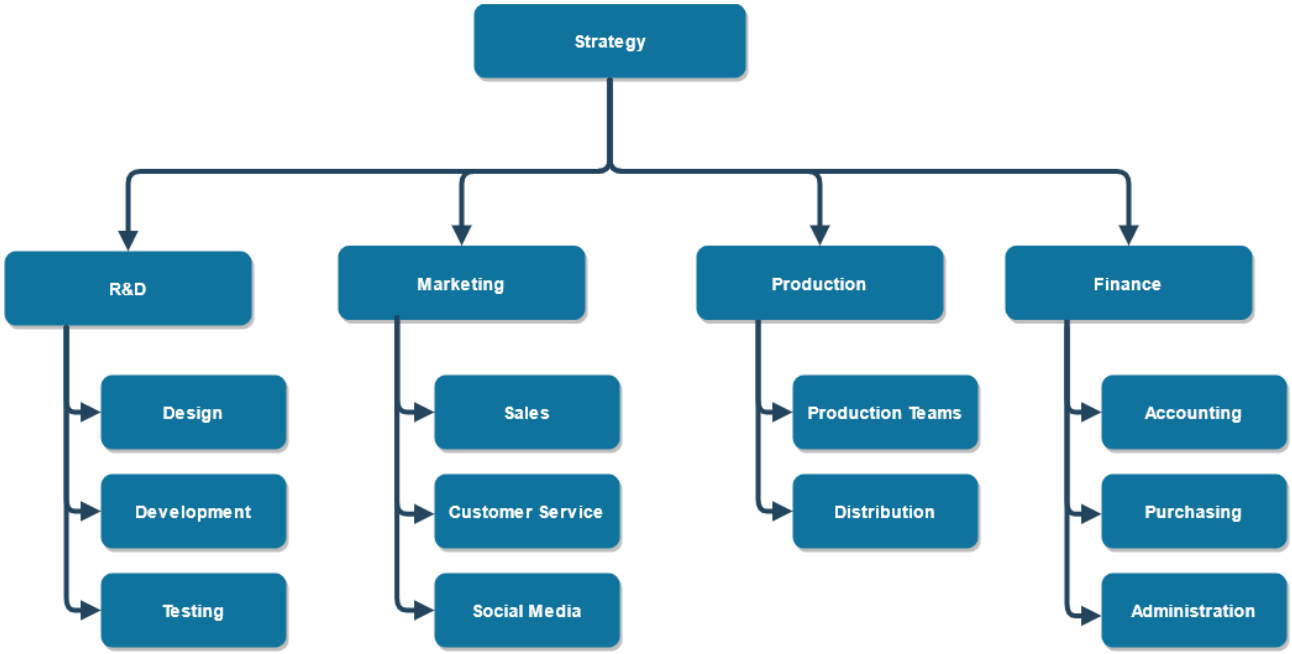
ORGANIZATIONAL STRUCTURE

First, it is necessary to say that the organizational structure we are talking about is not that of the first year of the company's life, but the definitive one. We have decided to use a **functional structure**, this is because our company is not geared to the development of projects, but to production. Our company is not divided into multiple geographical areas, so the functional structure manages to work well.

This structure provides good control over personnel and provides continuity in the functional disciplines. But we must consider that the coordination becomes complex, and additional lead time is required for approval of decisions.

A commission was created for the development of the CLOE project to avoid the slowdowns due to this hierarchical structure, which slows down times. The commission is made up of the Strategy Manager, the Financial Manager, the Operations Manager, and the Marketing Manager. The Project Manager will report directly to this commission, and will primarily oversee R&D.

At the top of the hierarchy will be the Strategy Manager, who will indicate the company's long-term strategies. Below him will be the division in functionality, with a manager at the head of each of them. We have decided that the Project Manager will oversee the R&D, remaining in the company even after the launch of the first version of the product, as R&D manager.



The organizational structure shows the functions to be performed within the company but does not indicate the number of employees. In fact, the Finance Manager will take care of all financial activities, without the need for employees. A similar thing happens for the Marketing Manager, who will only have a Social Media Manager under him. Finally, some functions are done by the same people, for example in R&D we have the same employees take care of the design, implementation, and testing.

STAFF TO BE HIRED

As analyzed in the Operations Plan, the size of the staff changes over time, this is mainly due to the change in the production plant. For clarity, we will analyze the final version, during the transitional phase the number of workers is variable.

Specifically, we need **4 IT Engineers** for R&D, with many years of experience in *Assembly* and *C*, the main languages we will use for the implementation of the operating system, and experience in web programming languages, such as *HTML*, *CSS*, *Javascript*, *PHP*, *AJAX*, *Java* (backend).

We also need a **Social Media Manager**, who will take care of our media channels. As already mentioned in the Marketing Plan, it is essential to reach the young age groups, and therefore we preferred to rely on an expert. In fact, this figure will have to have many years of experience in social media management, preferably with experiences related to the technology field.

Finally, we need the actual *production workers*. According to an estimate by the Operations Manager, we will need **26 workers** in the final plant; in this case we do not need specialized workers, the tasks to be performed are relatively simple and standard. Having 6 machines in the first workstation, we will need 6 workers to manage them and move the pieces. Hardware Testing will be automated, but at least 3 people are needed to put CLOE devices in and out of the test stations. At least one person per workstation will be needed to install the OS, so 8 in total. The final test will be parallelized and automated, but for 22 worstations it takes at least 9 people, also to bring the finished products to the warehouse or to load them on the trucks.

TOP RESPONSIBILITIES AND KPIS

Finally, let us define the responsibilities of managers, also defining KPIs to be able to evaluate their work.

MARKETING MANAGER

The marketing manager will take care of sales, customer service, and the management of communication channels. As already mentioned, he will be helped by a Social Media Manager for the management of social media channels. As measures of performance, we will consider the *customer number*, the *CSAT* and *NPS*.

The CSAT (Customer Satisfaction Score) allows to compute the level of customer satisfaction. The idea is to ask customers to express their own evaluation on the purchase made. The Customer Satisfaction formula requires dividing the number of positive responses by the total number of responses collected, and then multiplying the value obtained by 100.

$$CSAT = \frac{Positive\ responses}{Total\ number\ of\ responses\ collected} * 100$$

In our case, the experience gained over time counts a lot, so we do not ask for this evaluation immediately after the purchase, but we use the Community on the site to ask for this information to customers who have gained this experience.

The NPS (Net Promoter Score) is a management tool that can be used to assess loyalty in a business-customer relationship. The NPS is based on a single question to be asked to those who have used the service: "How likely is it that you would recommend this product to a friend or colleague?".

The responses provided by customers are classified as follows:

- 0-6 = Detractors: dissatisfied customers who could damage the brand through negative word of mouth.
- 7-8 = Passive: satisfied but indifferent customers, who do not generate word of mouth of any kind and do not advise or advise against the company and for this reason considered "neutral" in the calculation of the NPS.
- 9-10 = Promoters: Happy customers who will buy back the product and recommend it to other people.

It is easy to notice that more weight is given to negative evaluations, this tool is mainly used to understand if we need to improve something. The NPS can assume values between -100 and +100; at -100 indicates that they are all detractors while at +100 they are all promoters of the company.

OPERATIONS MANAGER

The operations manager mainly deals with production, he manages the production team, machinery, and takes care of distribution. It will be his task to organize the production process, from raw materials to sending the products to customers. As KPIs, we will consider the *absenteeism rate*, the *percentage of products defects*, and the *employee satisfaction*.

The *absenteeism rate* helps identify employees that are disengaged at work so that you can bring them back to being an engaged employee. Engaged employees tend to work harder, have a higher retention rate, and help workplace culture flourish.

The *percentage of products defects* indicates the number of defective units in the time frame examined. It is computed dividing the number of defective units by the total number of units produced. Clearly, the lower the better.

The *employees' satisfaction* is a vital information. Happy employees work harder. Obviously, it is impossible for every employee to be happy all the time, but it is important to have employees fill out surveys and express what they enjoy at work and what they are dissatisfied about.

FINANCE MANAGER

The Finance Manager will take care of the financial management of the company, and the quality of his work will be measured through the *Current Ratio*, the *Return On Equity*, and the *Quick Ratio*.

The *Current Ratio* divides total assets by liabilities to gives an understanding of the solvency of the business—i.e., how well the company is positioned to meet its financial obligations consistently on time and to maintain a level of credit rating that is required to order to grow and expand the business.

The *Return on Equity* (ROE) measures the company's net income in contrast to each unit of shareholder equity. ROE indicates whether your net income is appropriate for your company's size.

The *Quick Ratio* measures an organization's ability to utilize its highly liquid assets to immediately meet the business's short-term financial responsibilities. This is the measurement of a company's wealth and financial flexibility.

PROJECT MANAGER

The Project Manager will have to deal with the design of the startup until the start of production, so as long as the company is not able to walk on its own. To measure the performance of the Project Manager we will use the following KPIs: *On-Time Completion Percentage*, *Number Of Errors*, *Planned Hours Vs. Time Spent*.

The first indicates whether or not an assignment or task is completed by the given deadline.

The second is the number of times to redo and rework something, which affects budget revisions and calendar revisions as well.

The third indicates how much is the difference between the time estimated versus the actual hours.

ANNEX - PROJECT MANAGEMENT

In this section we will show how Project Management techniques have been used to manage the activities to be performed until the production phase is reached. The main activities to be carried out will be specified, with the related responsibilities and division of the work among the members of the management team.

Each manager has drawn up their own document in which the implementation details have been specified. In this section we will give a global view of all the work to be done and the deadlines to be respected.

The main task of the Project Manager is to guide the development of the company until its maturity. It is the one who focuses on the startup phase.

CREATION OF THE BUSINESS PLAN

First, we used Project Management techniques to divide the work to be done for the creation of the Business Plan. This phase is fundamental, because it is in the Business Plan that we decide the strategies that will be applied in the following years. Thanks to these techniques the work was done more efficiently.

This part was performed during the lecture periods. At the beginning, the Project Manager carried out a planning and the corresponding scheduling to decide the sequence of the activities to be carried out, and their timing.

PLANNING

During the first month of lessons we only analyzed possible ideas, documenting ourselves in the field of cloud devices. To start the project, we waited to do the chapter on planning. We can consider **01/04/2021** as the project start date. From that day on, the Project Manager started planning the activities that would have to be carried out in the following months.

THE MILESTONE SCHEDULE

These are the major milestone for the creation of the Business Plan. We have several documents to generate, written by the managers of the team. The start date is the 01/04/2021, and the end date is 14/06/2021. So, we will have **75 days** to complete our job.

Project start date	01/04/2021
Project end date	14/06/2021
Other major milestones	Strategy Plan Project Plan Marketing Plan Operations Plan Finance Plan Annex – Project Management Presentation at the end of May
Data items	Strategy Plan document Project Plan document Marketing Plan document

	Operations Plan document Finance Plan document Annex – Project Management document First version of the Business Plan (for the presentation at the end of May)

Initially, the presentation at the end of May was also considered in the planning, even if it was not done later.

WORK BREAKDOWN STRUCTURE

A very powerful project management tool for planning is the Work Breakdown Structure. With this tool it is possible to split the project into more easily manageable elements and make the understanding of the project less complex.

This WBS was done up to level 3, dividing the total document into sections, and dividing each section into the main chapters. The Business Plan followed this same division, as can be seen from the initial summary.

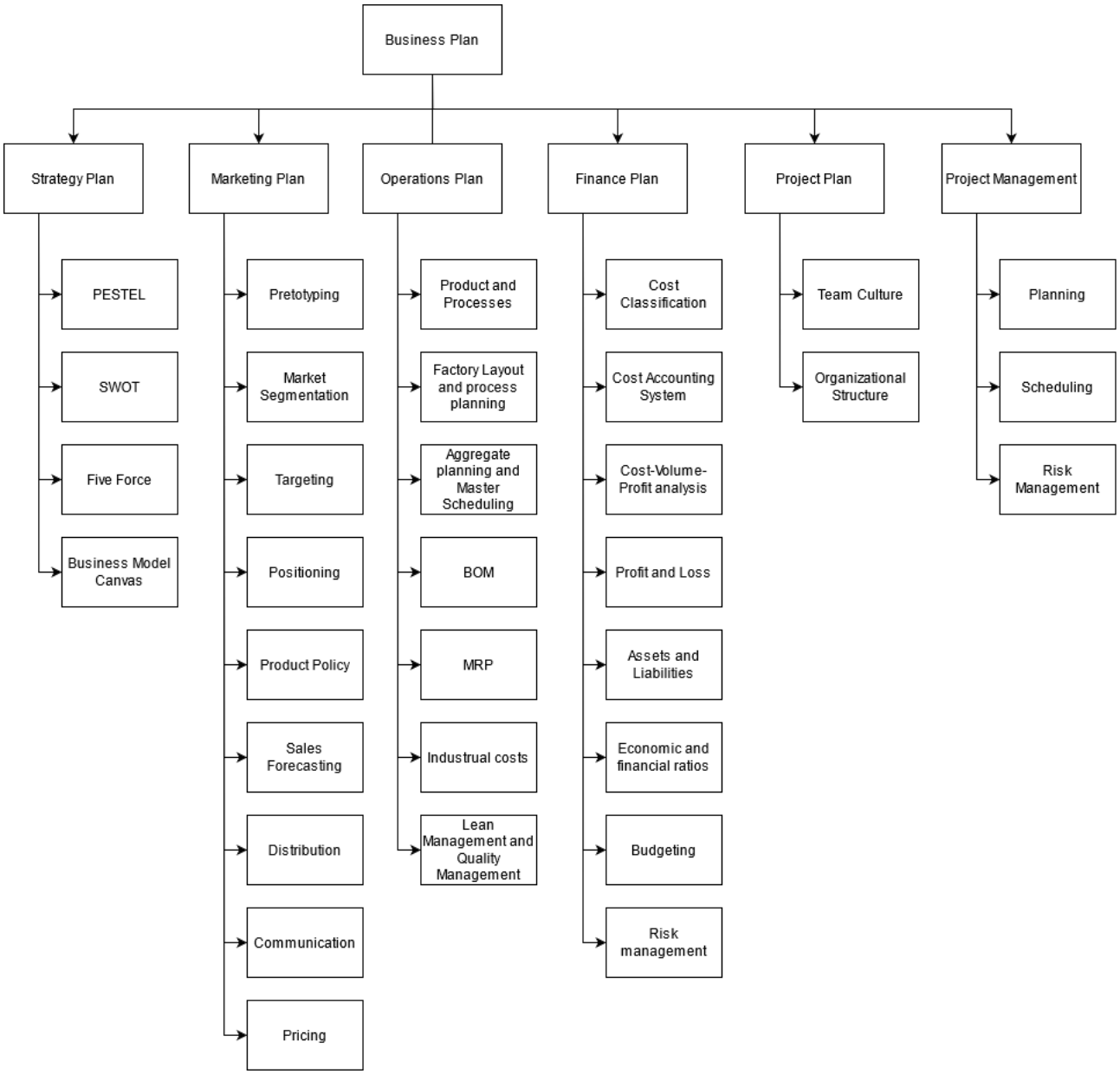


Figure 19 - WBS of the Business Plan

RACI

The RACI matrix allows to assign the responsibilities of the various activities. The roles are Responsible (R), Accountable (A), Consulted (C), Informed (I). The Responsible is the one who actually carries out the activity. The Accountable is the one who has responsibility for the result of the activity (there must be only one Accountable for each activity). The Consulted is the person who helps and collaborates with the Responsible for the execution of the activity. The Informed is the one who must be informed at the time of the execution of the activity.

Task Description	Strategy Manager	Marketing Manager	Operations Manager	Finance Manager	Project Manager
Strategy Plan	R, A	C	C	C	C
Marketing Plan	C, I	R, A	C	C, I	I
Operations Plan	I	C	R, A	C, I	C
Finance Plan	I	C	C	R, A	C, I

Project Plan			C		R, A
PM Document	C, I	C, I	C, I	C, I	R, A

For the Project Plan it is necessary to consult the Operations Manager to understand how many production workers will be needed in the final plant.

SCHEDULING

After having done the planning, it is important to put on the time scale the various activities to be performed, and to do this, scheduling techniques were used.

GANTT AND CRITICAL PATH ANALYSIS

A GANTT chart allows the graphical representation of a calendar of activities, useful to plan, coordinate and track the activities of the project, giving a clear illustration of their progress.

Some days are special, for example the 22/04/2021 is the date of the first presentation with Prof. Bonaccorsi. In this occasion we have presented the strategy section and the first part of the marketing plan. On 14/05/2021 we made the second presentation, in which we showed the first part of the operations plan. The 31/05/2021 is when the presentation at the end of May should have been held, and therefore a good part of the work had to be finished by that date.

Some activities could not start before the end of others, such as the pricing chapter of the marketing section, which could not be done completely without the break-even analysis done by the financial manager. All dependencies have been reported in the chart, and *the red path is the critical path*.

Since the Project Manager and the Strategy Manager are the same person, the Team Culture chapter was scheduled after the end of the Strategy Plan. For the structural organization we must wait for the end of the Operations Plan.

As you can see from the chart, there are four burst points (more than one activity depends on them), one is the Product Policy, which is necessary to continue with the Pretotyping and to start the Operations Plan. The second is the Sales Forecasting, that it is needed for cointinuing the Marketing Plan, but also to do the Aggregate Planning and Master Scheduling. The third is the Cost-volume-profit-analysis, which is used both to continue the Financial Plan and to do the Pricing in marketing. Finally, the last is the Assets and Liabilities chapter, which allows the Project Manager to start planning for the first year, while the Financial Manager continues the Finance Plan.

Note that some activities may be performed in parallel.

	Name	Duration	Start	Finish	Predecessors
1	**Project Plan**	44 days	**4/13/21 8:00 AM**	**5/26/21 5:00 PM**	
2	Team Culture	2 days	4/13/21 8:00 AM	4/14/21 5:00 PM	10
3	Organizational Structure	3 days	5/24/21 8:00 AM	5/26/21 5:00 PM	25
4	**Project Management**	73 days?	**4/1/21 8:00 AM**	**6/12/21 5:00 PM**	
5	Planning Business Plan	2 days	4/1/21 8:00 AM	4/2/21 5:00 PM	
6	Scheduling Business Plan	2 days	4/3/21 8:00 AM	4/4/21 5:00 PM	5
7	Planning of the Project	5 days?	6/2/21 8:00 AM	6/6/21 5:00 PM	38
8	Scheduling of the Project	4 days	6/7/21 8:00 AM	6/10/21 5:00 PM	7
9	Risk Analysis and Risk Management	2 days	6/11/21 8:00 AM	6/12/21 5:00 PM	8
10	**Strategy Plan**	8 days	**4/5/21 8:00 AM**	**4/12/21 5:00 PM**	
11	PESTEL Analysis	2 days	4/5/21 8:00 AM	4/6/21 5:00 PM	6
12	SWOT Analysis	1 day	4/7/21 8:00 AM	4/7/21 5:00 PM	11
13	Five Force Model	2 days	4/8/21 8:00 AM	4/9/21 5:00 PM	12
14	Business Model Canvas	3 days	4/10/21 8:00 AM	4/12/21 5:00 PM	13
15	**Marketing Plan**	48 days	**4/13/21 8:00 AM**	**5/30/21 5:00 PM**	
16	Pretotyping (+ Survey)	7 days	4/24/21 8:00 AM	4/30/21 5:00 PM	20
17	Market Segmentation	3 days	4/13/21 8:00 AM	4/15/21 5:00 PM	14
18	Targeting	3 days	4/16/21 8:00 AM	4/18/21 5:00 PM	17
19	Positioning	3 days	4/19/21 8:00 AM	4/21/21 5:00 PM	18
20	Product policy	2 days	4/22/21 8:00 AM	4/23/21 5:00 PM	19
21	Sales Forecasting	3 days	5/1/21 8:00 AM	5/3/21 5:00 PM	16
22	Distribution	3 days	5/4/21 8:00 AM	5/6/21 5:00 PM	21
23	Communication	5 days	5/7/21 8:00 AM	5/11/21 5:00 PM	22
24	Pricing	4 days	5/27/21 8:00 AM	5/30/21 5:00 PM	36
25	**Operations Plan**	30 days	**4/24/21 8:00 AM**	**5/23/21 5:00 PM**	
26	Product and Processes	5 days	4/24/21 8:00 AM	4/28/21 5:00 PM	20
27	Factory Layut and Process Planning	3 days	4/29/21 8:00 AM	5/1/21 5:00 PM	26
28	Aggregate Planning and Master Scheduling	5 days	5/4/21 8:00 AM	5/8/21 5:00 PM	21
29	BOM	4 days	5/9/21 8:00 AM	5/12/21 5:00 PM	28
30	MRP	2 days	5/13/21 8:00 AM	5/14/21 5:00 PM	29
31	Industrial costs	4 days	5/15/21 8:00 AM	5/18/21 5:00 PM	30
32	Lean and Quality Management	5 days	5/19/21 8:00 AM	5/23/21 5:00 PM	31
33	**Financial Plan**	23 days	**5/19/21 8:00 AM**	**6/10/21 5:00 PM**	
34	Cost Classification	3 days	5/19/21 8:00 AM	5/21/21 5:00 PM	31
35	Cost Accounting System	3 days	5/22/21 8:00 AM	5/24/21 5:00 PM	34
36	Cost-Volume-Profit Analysis	2 days	5/25/21 8:00 AM	5/26/21 5:00 PM	35
37	Profit and Loss	3 days	5/27/21 8:00 AM	5/29/21 5:00 PM	36
38	Assets and Liabilities	3 days	5/30/21 8:00 AM	6/1/21 5:00 PM	37
39	Ecnomic and Financial Ratios	3 days	6/2/21 8:00 AM	6/4/21 5:00 PM	38
40	Budgeting	4 days	6/5/21 8:00 AM	6/8/21 5:00 PM	39
41	Risk Management	2 days	6/9/21 8:00 AM	6/10/21 5:00 PM	40

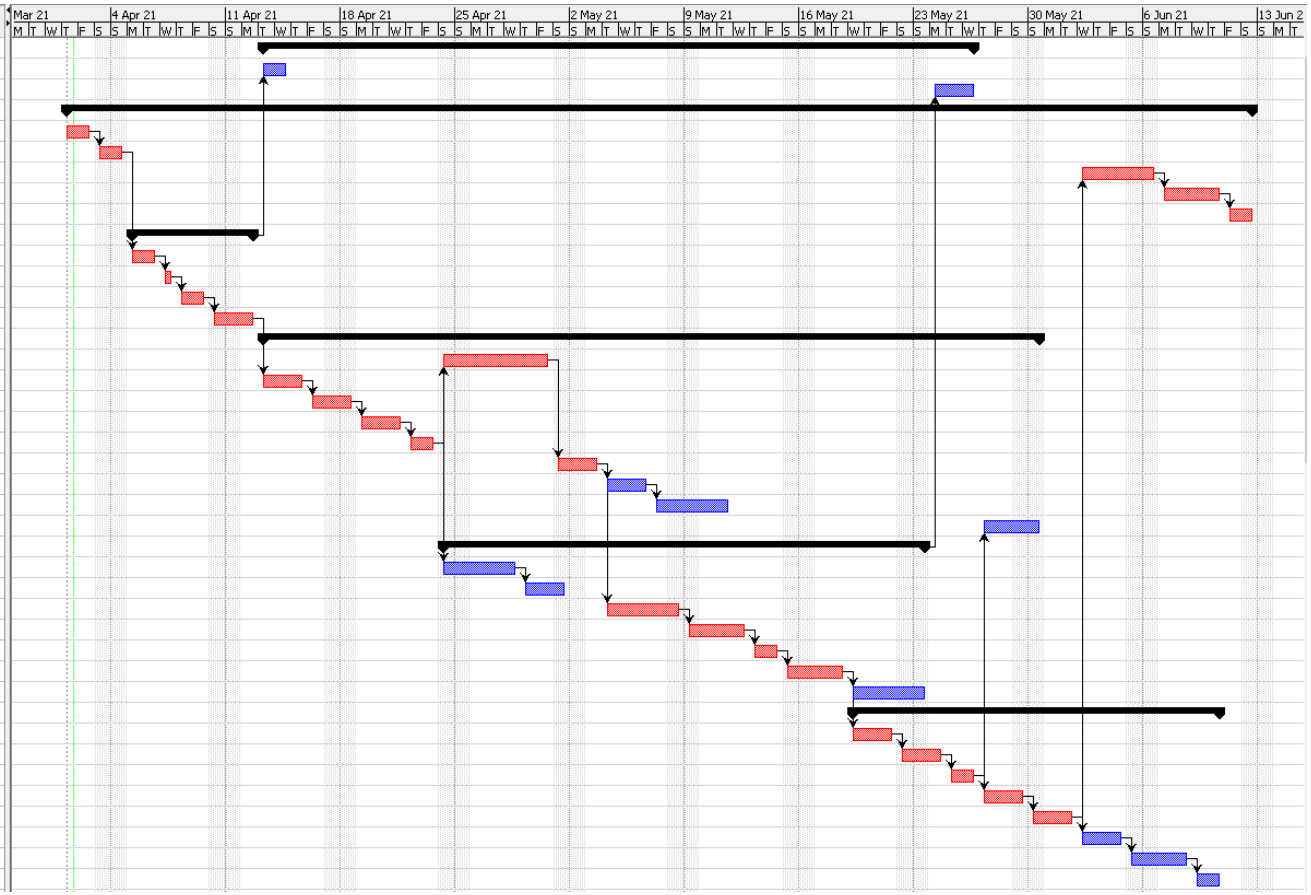


Figure 20 - GANTT and Critical Path for Business Plan

FIRST YEAR – CLOE DEVELOPMENT

The first year starts on **2022-01-01**.

During the first year it is necessary to **develop the first version of the product**, implementing everything that is necessary, such as the operating system. It will be the heart of our product and will require the maximum attention to obtain the best possible performance. But there are also other things to implement, such as the website on which we will do direct sales.

CLOE PRO is a special version of CLOE, but the differences are mainly in the production. In fact, CLOE PRO has more performing hardware, and at the software level the limitations imposed on CLOE are removed.

In this chapter we will not go into too much technical detail, all this information has already been well defined in the Operations Plan. Indeed, all the activities to be performed to obtain the first version of CLOE have been detailed in that document, now we are going to see how to perform their planning with the Project Management tools.

But we must not only consider the activities related to the development of CLOE, but also all those activities necessary to **start our startup**, which will be carried out during this first year.

PLANNING

The first year requires very careful planning, the activities are many and fundamental to start our company.

THE MILESTONES SCHEDULE

These are the major milestone for the first year:

- Furniture of the premise
- Staff recruitement
- Contracts with supplier
- CLOE Applications
- CLOE.com
- CLOE OS

WORK BREAKDOWN STRUCTURE

This WBS was done up to level 4. We must not only implement the product, but also prepare the infrastructure, manage internal and external relations, and finally the financial procurement.

As for the infrastructure, we must look for possible premises and choose the best one, considering its geographical location and the cost of rent. Once the premises have been rented, we must furnish it, preparing the sections with all the necessary material. In fact, there is not only the assembly line, but also several offices and warehouses.

As regards internal and external relations, it is necessary to consider the creation of the staff, the relations with our suppliers and the obtaining of all the necessary certifications. During the first year we need the R&D team, this will be one of the first activities to be carried out. The production workers and the Social Media Manager will be needed for the second year, but to have them ready to work we must start the interviews in the last months of the first year. There is also a need to enter contracts with suppliers, such as the Elleti

company for application development. We must also prepare the contracts with the suppliers that we will need in the production phase, to be able to start in the second year. To reduce the risks associated with suppliers, we have decided that we will also perform a search for backup suppliers. Finally, it is important to consider the need to obtain all the certifications we will need, including ISO 9001 for the quality of processes.

For what concern the software development, as previously mentioned we must develop the CLOE Operating System, the website for direct sales and the applications to interact with CLOE remotely. Not all these operations will be performed by us, some of them will be outsourced (the applications).

Finally, during the first year it is necessary to obtain equity, and as already mentioned in the financial section we use different strategies to obtain it (FFF + StartEngine).

This table summarizes the descriptions of the various activities, which have already been mentioned in the specific sections of the Business Plan.

Task name	Description
Search for potential premises	Search for potential locations in Pisa on which to start the business
Analysis of the premises	Analyze the premises found in terms of position, mainly for what concern the reachability (we have to easily send the products), and obviously in terms of costs
Rent premise	Proceed with all the necessary paperwork to rent the building (i.e., stipulation of the contract, registration with the tax office, and so on)
Set up of the inventory for raw components	We need to purchase and assemble all the necessary furniture and prepare the warehouse to be ready for use in the second year.
Set up of the offices	These offices will be used by the R&D team to develop CLOE software components and for testing. So, they will have to be prepared in the beginning, by purchasing and preparing the necessary computers.
Set up of the assembly line	As previously mentioned in the Operations Plan, we have an assembly line to have ready for the start of the second year, in which production will begin.
Set up of the inventory of final products	We also have a warehouse for finished products, which will also need to be ready by the start of the second year. We need to buy similar furniture to the other inventory, such as shelves.
Set up of the general furniture	All remaining necessary furniture will be purchased and assembled during this activity
R&D employees recruitment	As already defined in the Project Plan, we need an R&D team, in order to create it we need to find valid employees.
Production Workers interviews	These workers will be needed from the beginning of the second year, in order to get ready we absolutely

	must start the interviews before the end of the first year.
Social Media Manager interview	This manager will have to start working from the second year, also in this case we have to anticipate his research to be ready to go.
Contracts with suppliers	In the previous sections (mainly in the Operations section) we have defined the suppliers that we need, with an analysis of which ones to choose. However, we have to contact these suppliers and make the contracts.
Look for backup suppliers	Since we want to minimize the risks due to supplier failure, we must also look for backup suppliers, in order to be ready to change if necessary.
CE mark request	As we are going to market our product within the European Union, we need the CE mark. A license is not required to place the CE mark on the product, but before doing so it is necessary to ensure compliance with all relevant requirements at EU level, and to draw up a technical dossier proving compliance.
Trademark application	As already mentioned in the Finance section, we need the trademark. The trademark guarantees consumers to be able to trace the source of origin of the products or services marked by it and to us manufacturers to be able to prevent third parties from using confusing trademarks for identical or similar products or services. In the absence of opposition from third parties, an Italian trademark normally comes to registration after about 6-8 months from the filing of the application.
Patent application for CLOE OS	Thanks to the patent we have the exclusive right to exploit the invention, to prevent others from producing, selling, or using the invention without authorization. Patent granting times are very long in Italy, it can take up to two years. In this activity we have to prepare the patent application, which will be delivered for approval.
ISO 9001[71] request	To obtain it, it is necessary to pass two main phases: The design and implementation of a Quality Management System (QMS) and the audit of a certification body. In this activity we have to carry out the design and implementation of the QMS.
CLOE OS: Pre-Procurement	We need to provide to the development team the basic hardware and software tools that they will need in order to start the OS creation.

[71] It is a very useful certification to improve our image on the market and to improve organizational and performance efficiency.

CLOE OS: Requirement's definition	Starting from the general high level requirements, the low-level needs are analyzed and all the use-cases are listed. A Mock-up of the M2M interface that will communicate with the APPs is defined.
CLOE OS: Planning	All the requirements are translated into solutions. Then the architecture is designed with the goal to maximize the non-functional requirements.
CLOE OS: Prototyping	A massive test on the prototypes is here conducted, to detect errors and imperfections as soon as possible.
CLOE OS: Procurement	Further needed hardware and software resources are here provided. Now the team is equipped with testbeds, platforms, IDEs, etc.
CLOE OS: Development and Testing	The OS is coded as conceived during the Requirements Definition. Continuous testing is performed to immediately prevent possible problems.
CLOE OS: Final testing	Another massive test phase is performed to be sure the system meets all the requirements. Alpha and Beta testing steps will be conducted.
CLOE OS: Maintenance and Update	This step will be performed after the completion of CLOE OS and in a continuous manner. The team will continue to work to improve the first version of the Operating System, solving bugs and errors.
IOS Application	It is necessary to implement an IOS application to remotely interface with the device. The application development process can start as soon as the prototyping phase of the OS is concluded, when it is ready the skeleton of the OS (Drivers and APIs, even if the actual implementation is still not ready)
Android Application	It is necessary to implement an Android application to remotely interface with the device. The application development process can start as soon as the prototyping phase of the OS is concluded, when it is ready the skeleton of the OS (Drivers and APIs, even if the actual implementation is still not ready)
Windows Application	It is necessary to implement a Windows application to remotely interface with the device. The application development process can start as soon as the prototyping phase of the OS is concluded, when it is ready the skeleton of the OS (Drivers and APIs, even if the actual implementation is still not ready)
MAC/OS Application	It is necessary to implement a MAC/OS application to remotely interface with the device. The application development process can start as soon as the prototyping phase of the OS is concluded,

	when it is ready the skeleton of the OS (Drivers and APIs, even if the actual implementation is still not ready)
CLOE.com: Requirements Definition	During this activity, the team will identify the functional and non-functional requirements of the web site, considering the three different sections: Frontend, CLOE Community and E-commerce Platform, which have been well defined in the Operations section.
CLOE.com: Backend and Link Planning	In this phase the server-side behavior is defined, with special attention to the availability and the handling of large traffic loads. At this moment we are still in the design phase of the application, we are not implementing anything.
CLOE.com: Prototyping and Testing	A massive test on a prototype is here conducted, to detect missing requirements, errors, and imperfections as soon as possible.
CLOE.com: Frontend Design and Implementation	At this point it is possible to move on to the actual development of the graphical interface of the site, using an external designer for the design of the interface and subsequently developing it.
CLOE.com: First Publication	Since the frontend is finished, it is possible to make the first publication to start promoting the product, even if it is not yet possible to join the community and buy the product.
CLOE.com: Back-end Implementation and Testing	Effective implementation of the backend components, with continuous testing.
CLOE.com: Final Testing and Release	In this last activity of CLOE.com we will perform a final testing and, if satisfactory, we will release the first complete version of the website. Otherwise, it is necessary to continue development.
FFF	The share capital will be raised mainly using the FFF (Fool, Family and Friends), as specified in the Finance Plan. We must present the Business Plan to our families and friends, to convince them to become shareholders. Among the Fools there are us founders.
StartEngine campaign	To increase the share capital, we must convince people who do not know us to invest in us, through the StartEngine platform. This activity must be performed in the last 6 months of the first year, because after 6 months there must be the product launch.

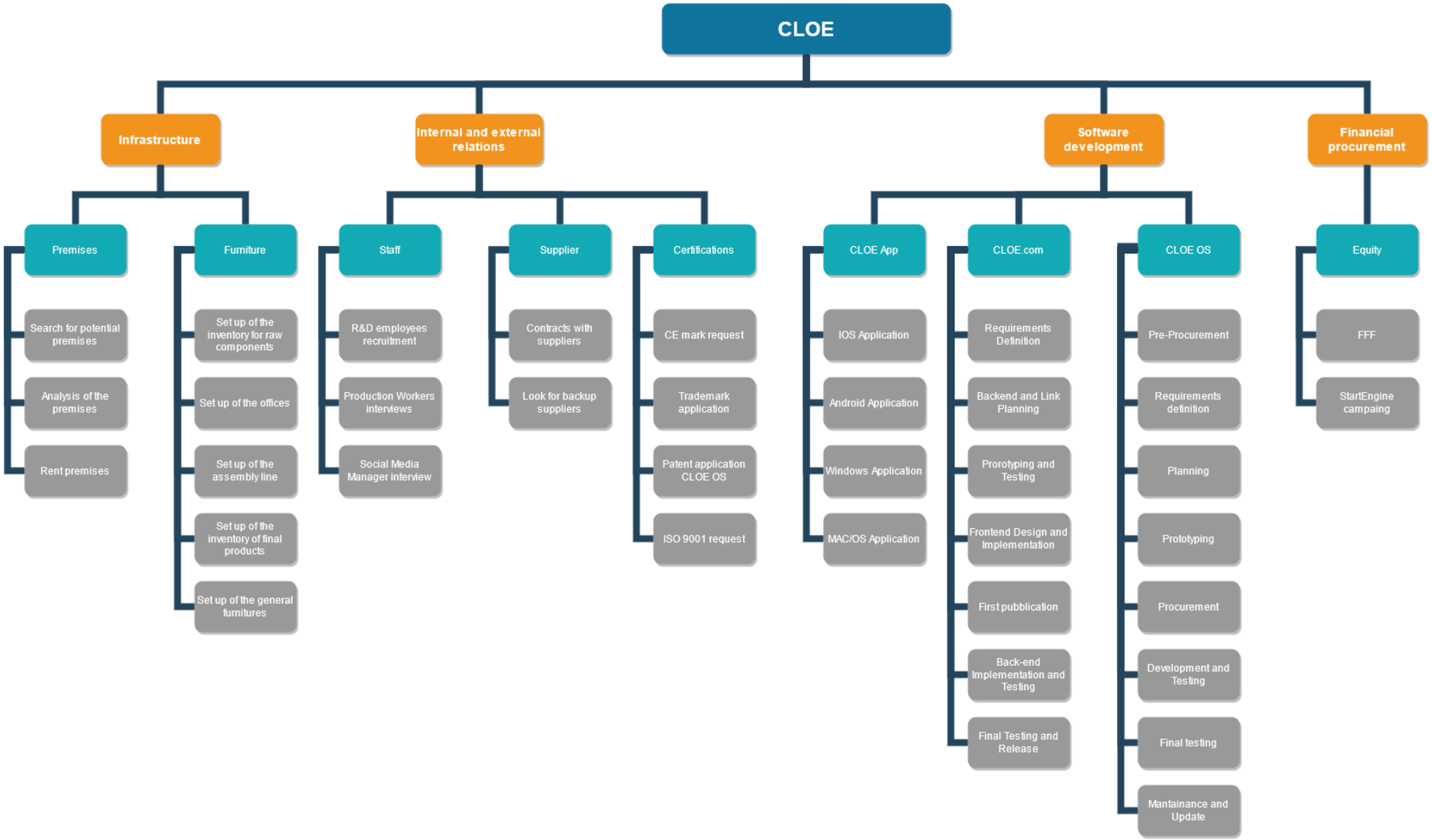


Figure 21 - WBS of the first year

RASCI

The RASCI matrix allows to assign the responsibilities of the main activities. The roles are Responsible (R), Accountable (A), Support (S), Consulted (C), Informed (I). The Responsible is the one who actually carries out the activity. The Accountable is the one who has responsibility for the result of the activity (there must be only one Accountable for each activity). Support indicates that this person provides support during the implementation of the activity. The Consulted is the person who helps and collaborates with the Responsible for the execution of the activity. The Informed is the one who must be informed at the time of the execution of the activity.

Activity		Project Manager	Marketing Manager	Operations Manager	Finance Manager
Premises		I		A/R	
Furniture		I		A/R	
Staff recruitement	R&D employees	A/R			I
	Production workers	I		A/R	I
	Social Media Manager	I	A/R		
Suppliers		A/R		S	C
Certifications	CE mark request	I		S	A/R
	Trademark application	I	A/R		C
	Patent application	I		S	A/R
	ISO 9001 request	I		A/R	S
CLOE Applications		A		I	I
CLOE.com		A/R	I		I
CLOE OS		A/R		S	I
Equity procurement		I	I	I	A/R

All managers must be updated on the trend of Equity Procurement because the activities that can be carried out, requiring cash, will depend on this.

For the implementation of the applications, we use an external company, which is the Responsible (R). Therefore, the letter R is missing.

SCHEDULING

Now we can put on the time scale the activities to be performed, and to do this, scheduling techniques were used.

GANTT AND CRITICAL PATH ANALYSIS

GANTT was used as a scheduling technique, defining the timing of each activity. But not only GANTT was done, but the precedence constraints were also defined to be able to calculate the critical path. Indeed, it is known that the main disadvantage of GANTT is the lack of information on the relationships between the activities. ProjectLibre was used as software for the development of GANTT, which takes care of calculating the critical path automatically. The working hours are from 8 to 17, which is why the start of a day is at 8 and the end at 17.

In the figure below you will see the GANTT chart. The arrows identify the dependencies that have been specified in the table, while the red tasks are the critical ones.

As was easily imagined, the critical path is the one that concerns the main activity to be carried out in the first year, the development of CLOE OS, starting from the search for the premise (in which there will be the office to work) up to the mantainance and update of that operating system.

Some relationships are trivial, for example to rent the premise I must first have chosen it. Once we have rented the premise, we will go to prepare the offices. Only these are urgent to start software development, the remaining parts of the premise will be prepared later. Obviously, to start the development of CLOE OS we also need the R&D team. So, the first step of CLOE OS development is a Sink Point, it needs input from multiple activities.

Before we can start the development of the applications, we must have completed the contract with the company *Elleti Digital* and we must have finished the prototyping phase of CLOE OS, to have the skeleton of the application (including the definition of the interface that will be used from these applications). So, also this activity is a Sink Point. From now on, application development is independent of the actual implementation of CLOE OS.

It is easy to see that CLOE OS prototyping is a burst point, that is, more than one activity depends on the success of this one.

Another burst point is the final testing of CLOE OS. Many activities can start only after the development of the first full version of CLOE OS is finished. Because only at that point will we have all the information necessary to apply for the patent, apply for the CE mark, etc. The development of the website will also start after this activity, to avoid having to hire other employees.

	Nome	Durata	Data di Avvio	Data di chiusura	Predecessori
1	**Premises**	28 giorni	**03/01/22 8.00**	**09/02/22 17.00**	
2	Search for potential premises	15 giorni	03/01/22 8.00	21/01/22 17.00	
3	Analysis of the premises	10 giorni	24/01/22 8.00	04/02/22 17.00	2
4	Rent premise	3 giorni	07/02/22 8.00	09/02/22 17.00	3
5	**Furniture**	157 giorni	**10/02/22 8.00**	**16/09/22 17.00**	
6	Set up of the inventory for raw compone	15 giorni	02/05/22 8.00	20/05/22 17.00	
7	Set up of the offices	10 giorni	10/02/22 8.00	23/02/22 17.00	4
8	Set up of the assembly line	60 giorni	21/05/22 8.00	12/08/22 17.00	
9	Set up of the inventory of final products	15 giorni	15/08/22 8.00	02/09/22 17.00	
10	Set up of the general furnitures	10 giorni	05/09/22 8.00	16/09/22 17.00	
11	**Suppliers**	60 giorni	**03/01/22 8.00**	**25/03/22 17.00**	
12	Contracts with suppliers	30 giorni	03/01/22 8.00	11/02/22 17.00	
13	Look for backup suppliers	30 giorni	14/02/22 8.00	25/03/22 17.00	12
14	**Certifications**	100 giorni	**01/06/22 8.00**	**18/10/22 17.00**	
15	CE mark request	20 giorni	07/09/22 8.00	04/10/22 17.00	30
16	Trademark application	7 giorni	01/06/22 8.00	09/06/22 17.00	
17	Patent application CLOE OS	15 giorni	07/09/22 8.00	27/09/22 17.00	30
18	ISO 9001 request	30 giorni	07/09/22 8.00	18/10/22 17.00	30
19	**Staff**	249 giorni	**03/01/22 8.00**	**15/12/22 17.00**	
20	R&D employees recruitment	20 giorni	03/01/22 8.00	28/01/22 17.00	
21	Production Workers interviews	33 giorni	01/11/22 8.00	15/12/22 17.00	
22	Social Media Manager interview	33 giorni	01/11/22 8.00	15/12/22 17.00	
23	**CLOE OS**	222 giorni	**24/02/22 8.00**	**30/12/22 17.00**	
24	CLOE OS: Pre-Procurement	15 giorni	24/02/22 8.00	16/03/22 17.00	7;20
25	CLOE OS: Requirements definition	10 giorni	17/03/22 8.00	30/03/22 17.00	24
26	CLOE OS: Planning	7 giorni	31/03/22 8.00	08/04/22 17.00	25
27	CLOE OS: Prototyping	7 giorni	11/04/22 8.00	19/04/22 17.00	26
28	CLOE OS: Procurement	15 giorni	20/04/22 8.00	10/05/22 17.00	27
29	CLOE OS: Development and Testing	75 giorni	11/05/22 8.00	23/08/22 17.00	28
30	CLOE OS: Final testing	10 giorni	24/08/22 8.00	06/09/22 17.00	29
31	CLOE OS: Mantainance and Update	83 giorni	07/09/22 8.00	30/12/22 17.00	30
32	**CLOE Applications**	120 giorni	**20/04/22 8.00**	**04/10/22 17.00**	
33	IOS Application	30 giorni	20/04/22 8.00	31/05/22 17.00	12;27
34	Android Application	30 giorni	01/06/22 8.00	12/07/22 17.00	33
35	Windows Application	30 giorni	13/07/22 8.00	23/08/22 17.00	34
36	MAC/OS Application	30 giorni	24/08/22 8.00	04/10/22 17.00	35
37	**CLOE.com**	79 giorni	**07/09/22 8.00**	**26/12/22 17.00**	
38	CLOE.com: Requirements Definition	10 giorni	07/09/22 8.00	20/09/22 17.00	30
39	CLOE.com: Backend and Link Planning	3 giorni	21/09/22 8.00	23/09/22 17.00	38
40	CLOE.com: Prototyping and Testing	10 giorni	26/09/22 8.00	07/10/22 17.00	39
41	CLOE.com: Frontend Design and Implem	15 giorni	10/10/22 8.00	28/10/22 17.00	40
42	CLOE.com: First Pubblication	1 giorno	31/10/22 8.00	31/10/22 17.00	41
43	CLOE.com: Back-end Implementation an	30 giorni	01/11/22 8.00	12/12/22 17.00	42
44	CLOE.com: Final Testing and Release	10 giorni	13/12/22 8.00	26/12/22 17.00	43
45	**Equity procurement**	260 giorni	**03/01/22 8.00**	**30/12/22 17.00**	
46	FFF	107 giorni	03/01/22 8.00	31/05/22 17.00	
47	StartEngine campaing	153 giorni	01/06/22 8.00	30/12/22 17.00	

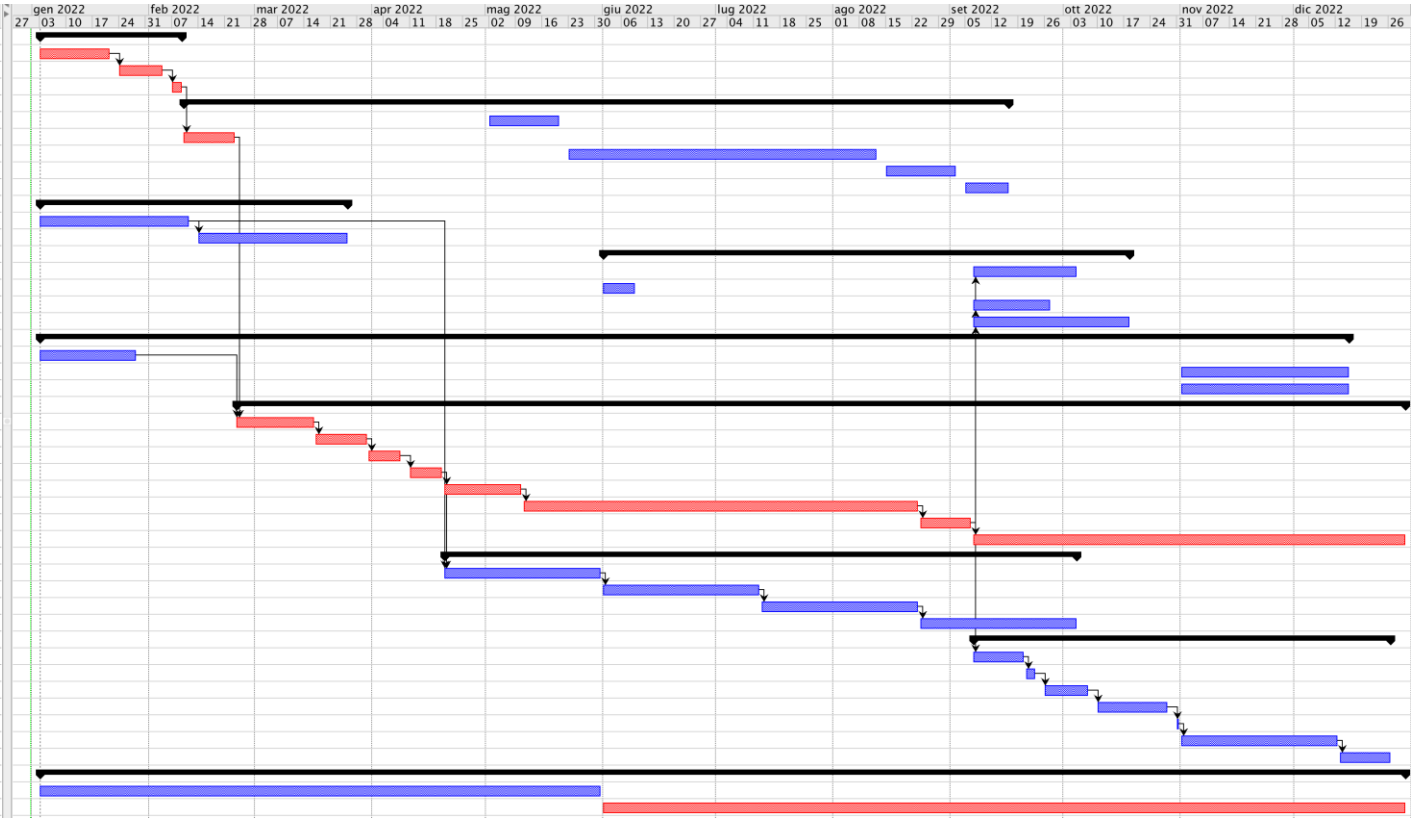


Figure 22 – GANTT and Critical Path for the first year

RISK MANAGEMENT

In this chapter we are going to think about the risks that our planning can entail, trying to anticipate these problems by finding a possible solution. For each of these risks we will try to understand if it is avoidable, or if it is necessary to make changes (or additions) to be able to manage it.

These are the main risks of our planning:

Risk	Description	What we do
Failure of some supplier	As was well explained in the Operations Plan, we need many suppliers to obtain the production materials. We do not produce hardware, we assemble it, and therefore we need all these components. The failure of one of these suppliers could result in a failure to produce our devices for a certain period. In addition to the suppliers for the materials, we must also consider the case of failure of the company to which we have outsourced the development of the applications.	As shown in the planning of the activities of the first year, to mitigate this problem we will go in search of backup suppliers, to be ready in case of problems with the suppliers chosen in the business plan.
Poor quality in third party applications	Handing the application development to an external company allows us to reduce costs (we would have needed more high-level employees), but we lose control. This loss of control can lead to unpleasant results.	To try to minimize this problem, we contacted a company led by people we know personally, and whom we trust. This allows us to reduce the risk of unpleasant surprises on the quality of the work performed.
Inability to find a premise in the city chosen during the planning phase (i.e., Pisa)	At the beginning of the first year, we will start looking for the premise, but it is not obvious that we will find what we need, both in terms of positioning and in terms of costs.	This risk does not affect us too much, transport companies now arrive everywhere in Italy and the retailers we have chosen are located throughout the country, so they are easily accessible. So, we can also look for the premise in a different city, trying to find an easily accessible place that has low costs.
Underestimate the difficulty of implementing CLOE OS	The operating system is the heart of our device. It is also the most complex component to develop, and CLOE's performance will depend on it. When developing an entire operating system, it is easy to underestimate the	To minimize this risk, we need to find highly qualified R&D personnel. This may not be easy for a startup, not having much experience in job interviews. But it must also be considered that we managers are all IT engineers,

	problems and come up with an unsafe system.	therefore with a strong background behind us.
Unsatisfactory results with StartEngine	The creation of equity largely depends on the campaign we will do on the StartEngine platform. Not being able to foresee the future, the risk of not obtaining the necessary amount is high.	StartEngine is not the only platform that can allow us to achieve this goal, in case of poor results we can also take advantage of the others, such as *Indiegogo* and *Kickstarter*.
Wrong business idea and marketing strategy	Any innovative idea can be a failure. There may be problems entering the market, or the business idea may not be attractive.	To reduce this risk, we used the pretotyping mechanism, using both a survey (with good results) and the fake door mechanism, to test our business idea and our value proposition.
Failure of retailer	As already said for suppliers, we must consider the possible failures of the companies we collaborate with, and therefore also the retailers.	We avoid this risk by using multiple retailers instead of just one, thus avoiding a *single-point-of-failure*.