



ENGINEERING CONSULTANCY

BUSINESS PLAN

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1. Introduction

A consultant is “someone who provides unique assistance or advice to someone else, usually known as the client.” An engineer fits this definition and he typically helps the client identify their problem and provides a solution to this problem. As a company is established, it would have more satisfactory outcomes if it concentrates on one special area of expertise. This is where the need for consultants appears.

As three students of master in computational mechanics and numerical methods with different engineering skills, we want to set up a small business structure in Spain in order to commercialize our knowledge and give support as consultants to another companies. Our company’s main activities revolve around Mechanical, Civil and Biomedical Engineering.

There are many benefits of being a consultant over other types of businesses. These can range from working from your home to having the freedom to choose what you want to work on. Another advantage is that since you are using your brain, there is minimal capital to set up your business. One of the benefits of owning your own business has been choosing the clients to do elicit your services. Another benefit stems from assuming all the risk in the venture by having the opportunity to unlimited profits. This means that your salary is not limited to a typical employee-employer pay scale.

Some companies do not have enough knowledge to conduct some specific parts of projects related to civil engineering, mechanical engineering, etc. for the reason that they are more focused on other responsibilities. Assume a Design Engineering Company which is completely dedicated to “designing” different structures but does not have an acceptable sector to investigate the possibility of such structures to be successful. Meanwhile, as it is more focused on design, it does not want to spend huge amounts of money on validating the structure getting help from famous related companies. This is where our company appears!

Our business structure is focused on giving engineering service. The main aim is to offer technical support related to simulations and project management to other companies. Our company gives support to small companies to compensate their lack of experience or verify results. In addition, in complex projects, investors need an external project manager in order to put different aspects of a project in accordance. Our company offers service which is economically noteworthy in terms of price and time.

Mission Statement:

“Design innovative and practical solutions to meet the needs of our clients through expert service.”

OC Engineering will be formed as a consulting firm specializing in Mechanical, Civil and Biomedical Engineering services. A small office at our residence in Barcelona will be established the first year of operation to reduce start-up costs. The founders are mechanical and civil engineers with over five years of diverse experience in aerospace engineering, building and structure and biomedical engineering.

OC Engineering is a company providing professional mechanical and civil engineering services for clients developing residential or commercial projects. The company’s focus will be to attract the private sector, architects, owners, and developers throughout Spain. An interactive web site will be developed which will serve as a marketing tool. The domain name of “ocengineeringcivil.com” will be established.

OC Engineering utilizes its diverse experience in providing civil engineering from due diligence to the preparation of site development plans for a wide range of private projects. Clients include architects, owners, and developers. A range of services provide are:

- Finite Element analysis for different structures from bridges to very delicate biomedical instruments.
- Result verification
- Providing study reports
- Project management

2. Market research and analysis

a. Customers

Unlike other businesses, consulting engineering firms have mostly other companies as clients. As our company is passing through the very first stages as other start-up companies, we cannot expect to have very top engineering companies to refer to us as consultants. However, there are still many small companies which are interested in taking advantage from consultants who offer service and support with a low price while doing the job quickly and in a perfect way. Therefore, in the very first stages, our target customers are small companies in Spain some of which are listed below.

Table 1: List of Customers.

NAME	HEADQUARTERS	AREA OF INTEREST
Konkret Estudio	Madrid	Design of ephemeral architecture
Contemporanea Eventi	Barcelona	Designing and producing custom exhibition booths
Artis	Lleida	Design and installation of office areas and trade centres
Acciona	Alcobendas	Industrial engineering and construction
Acs	Madrid	Industrial engineering and construction
Astrilleros Y Talleres Del Noroeste	Fene	Shipbuilding
Talgo	Las Rozas de Madrid	Railway engineering

After our company has built up its professional reputation, it will win social acceptance among other top companies not only in Spain but also in countries like France. Of course, this should be considered in later stages.

b. Competitors

In order to have the ability to compete, it is essential for OC Engineering to identify its potential competitors. As it is starting its activity in Spain, its most crucial competitors would be among consultant companies in Spain.

Table 2: Crucial Competitors.

NAME	HEADQUARTERS	AREA OF INTEREST
INGECIBER	Madrid	Computer Engineering
CT3 INGENIERÍA	Madrid	Energy
IGINSA	Barcelona	Hydraulic systems
ALTRAN	Madrid	Aerospace
AYESA	Sevilla	Aeronautics and transport sectors
BETWEEN	Spain	Energy

c. Size and Trends of the Market

The Spanish Association of Consultancy firms (Asociación Española de Empresas de Consultoría or AEC) has compiled data directly from the consultancy firms and official statistics from the Ministry of Employment and Social Security, the National Statistics Institute (INE) and Eurostat. The figures confirm that the industry is structurally stable and is experiencing sustained growth.

Sustained growth

Turnover in the industry rose by 4.9% in 2016, from €11,270m to €11,818m. Income was up for the third year running, following a minor fall in 2013.

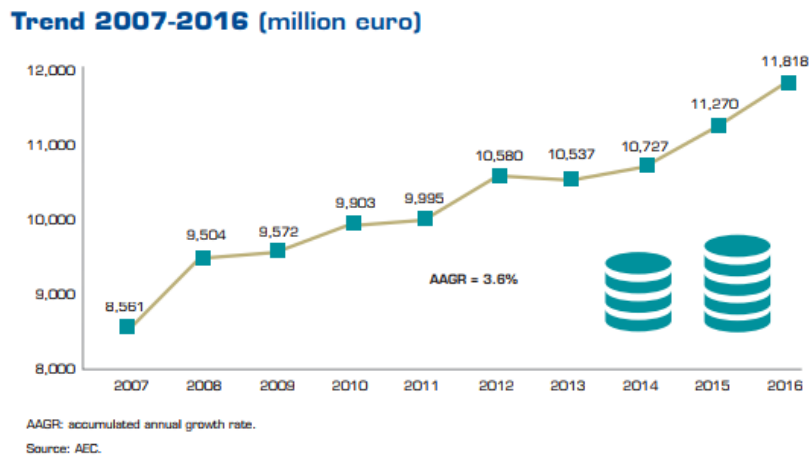


Figure 1: trend 2007 – 2016.

Consistent job creation

Net employment in the industry rose by 4.4% in the year, with over 150,000 people now employed. Spanish consultancy firms have consistently created net employment throughout the period from 2004 to 2016.

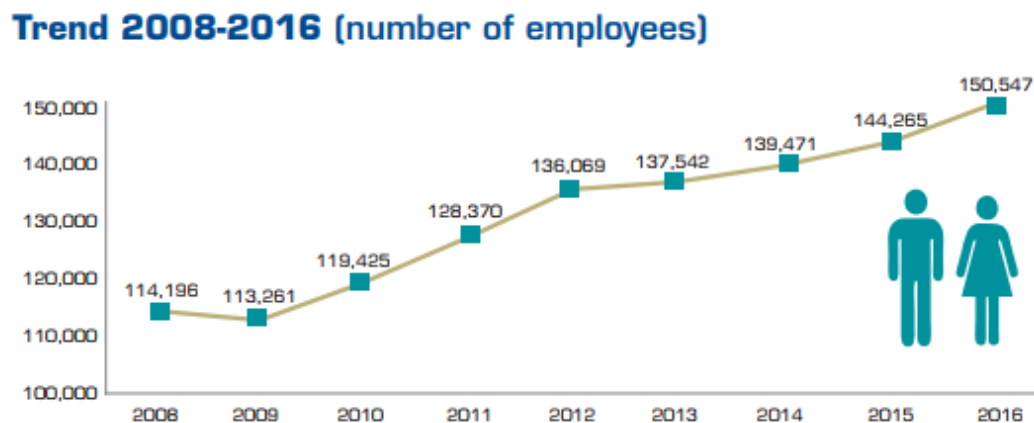


Figure 2: Trend 2008 – 2016.

Recovery of consultancy services

In 2016, the largest increase in income came from consultancy services (16.7%). Demand for this type of service has been boosted by the need for companies to undertake digital transformation of their business. Income from consultancy services accounted for 18% of total industry turnover during the year.

According to the information provided, the market in consultant companies is expected to continue growing in this 2017 and the next upcoming years, in at a significant pace that reflects the economy of a country or place.

3. Marketing Plan

Marketing is the process by which companies advertise products or services to potential customers. For a consultant, this means that you tell potential clients what you do, repeatedly. The most important part of marketing is to identify the target clients who will be purchasing the consulting services. The target groups of potential clients for our company lie in different engineering groups as: Civil, Aerospace and biomedical engineering. The clients for civil engineering services are architectural firms, developers, and property owners. For aerospace engineering department, aerospace industry is the most crucial client seeking service in researches, designs, manufactures, operates and maintains aircraft.

We try to inform potential clients that OC Engineering's complete edge is providing practical solutions, which will save them money. Getting these potential clients to hear what you have to offer and then remember you when they need your service is an enormous challenge.

Marketing a service is not the same as marketing a product. Services are intangible until the consultant performs them. There are many types of marketing strategies, which a consultant will utilize such as:

1. Direct contact and follow-up
2. Networking and referral building
3. Public speaking
4. Writing and publicity
5. Promotional events
6. Advertising

We will only focus on the two most effective strategies which are direct contact and networking.

A brochure will be developed during the first year as a mailer to the target market segment of Design and Developers. This brochure will include a list of services, contact information, a brief professional biography of OC founders and will also highlight OC Engineering complete edge.

Web page will be developed the first year of operation and include a description of services, contact information, a list of representative projects, and a brief professional biography. Brissette. The domain name as mentioned before would be "ocengineering-civil.com".

4. Design and development plan

As we said before, the main idea of our company is commercialized our knowledge concerned with finite elements analysis applied in fluid and structures. So, this section will have different aspect related with expected problems in fem analysis and new design of fem tool such as pre-and postprocessing tool.

a. Expected Problems

The main expected problem will be concerned with how much information our clients are willing to deliver us. Some companies have strict confidentiality policy. For instance, for developing a FE model we need information about geometry and material of a product or structure as well as aspect related with load and boundary condition. These aspects could be confidential or industry secret. For these reasons we are willing to make confidentiality contracts.

b. New design in software

Software develop will be needed in order to be able to pre or postprocesses results obtained by fem analysis and achieve our clients' needed.

Once problems are solved by fem, special postprocessing software will be able to manage, calculate or plot different parameters according to requirement of our clients. In Figure 3 can be seen a curve obtained by a software developed in Matlab. This software was developed for verifying the integrity of satellite's component when it is subjected to a sine frequency response.

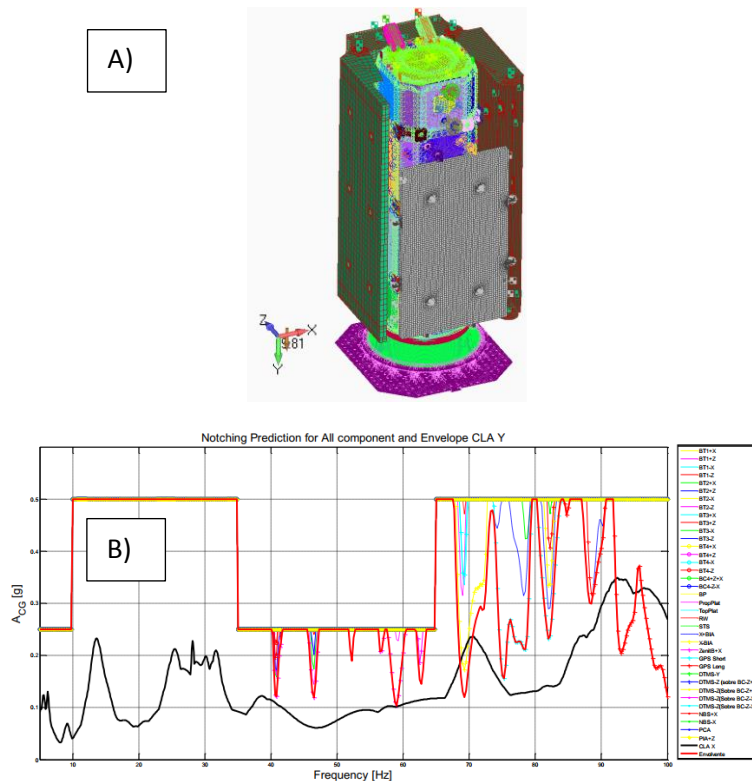


Figure 117: Sine Y Notching Prediction for all components and envelope

Figure 3: Postprocess software developed for computing sine response in a satellite. A) Satellite FEM model, b) Sine frequency response.

5. Operation Plan

a. Geographic Location

Our office is located in Sant Martin's neighbourhood or sometimes called 22@district, more precisely on 1st floor of Valencia Street 597. This location shelters the Barcelona main engineering consultants such as Tandem HSE or INYPSA among others.

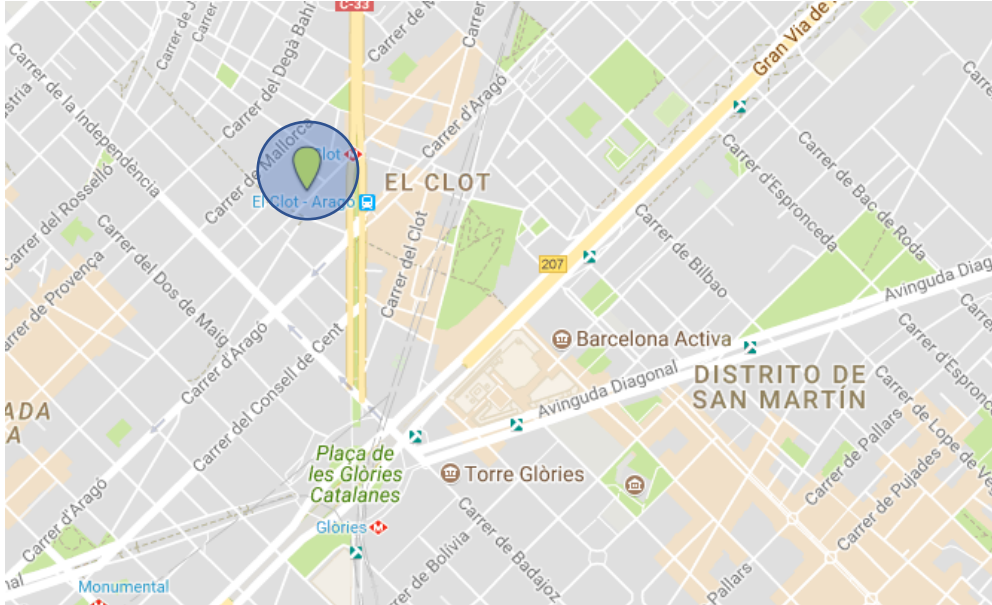


Figure 4: Our location.

We have considered this is the best place for interacting not only with our clients but also with other companies.

b. Facilities

“Time is Money”, but the idea is pretty obvious; the faster we can get things done, the better. This certainly holds for simulation as well, for this reason we have the ultimate generation of computers, fast and reliable. Being able to obtain a solution of our client problems in a shorter amount of time is always desired. The three main components of a computer that can affect how quickly an analysis can run are: processors, RAM and hard disk. Because of this, we have three computers with 8th generation Intel processors, 64 Gb of RAM memory and 1Tb SSD Hard disk.

In order to solve different FEM problems, we have bought FEM software are able to solve problems such as: linear, nonlinear, statics and dynamics problems and interaction problems between fluid and structure, such as Ansys

ANSYS offers a comprehensive software suite that spans the entire range of physics, providing access to virtually any type of engineering simulation required in the design process. Organizations around the world trust ANSYS FEA and CFD software to deliver the best value for their engineering simulation software investment. The depth and breadth of ANSYS simulation solutions is unmatched. ANSYS software features best-in-class technology in all key analysis areas including structural, fluids, and thermal. For instance, The ANSYS Mechanical software suite provides the ability to simulate every structural aspect of a product, including nonlinear static

analysis that provides stresses & deformations, modal analysis that determines vibration characteristics, through to advanced transient nonlinear phenomena involving dynamic effects & complex and also, ANSYS provides a comprehensive suite of computational fluid dynamics software for modelling fluid flow and other related physical phenomena. It offers unparalleled fluid flow analysis capabilities, providing all the tools needed to design and optimize new fluids equipment and to troubleshoot existing installations. fluid forces, thermal effects, structural integrity can all impact performance of products and industrial processes. ANSYS multiphysics solutions can help us examine these effects in combination and isolation, achieving the highest fidelity solution.

Sometimes will be needed to make special postprocesses of result obtained by FEM, for these cases we will use software able to manage a huge amount of data such as Matlab.

MATLAB is a multi-paradigm numerical computing environment. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, C#, Java, Fortran and Python.

Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing abilities. An additional package, Simulink, adds graphical multi-domain simulation and model-based design for dynamic and embedded systems.

The office has a large meeting room equipped for performing conference in real time, large place for work groups and individual box office.

c. Strategy

As pricing strategy, we have chosen "Penetration strategy". Penetration strategy is the concept of taking action to greatly expand one's share of total sales in a market. The resulting increased sales volume typically allows a business to produce goods or obtain merchandise at lower cost, thereby allowing it to generate a higher profit percentage.

We know we are a new and young company, so that we have focused in price reduction and product differentiation as pricing strategy. First of all, price reduction is simply to apply. If customers are price sensitive, they will respond by buying more of the company's products and services. However, this approach only works if the company's offerings are considered to at least have the median level of quality of competing offerings.

Product differentiation. One of the better penetration strategies is product differentiation, where a company creates new products that are notably different from and better than those of competitors. It can take time for competitors to respond, giving a business the time to garner more market share.

6. Manager team

a. Organization

Our company will be organized in a future as shown in the chart flow below.

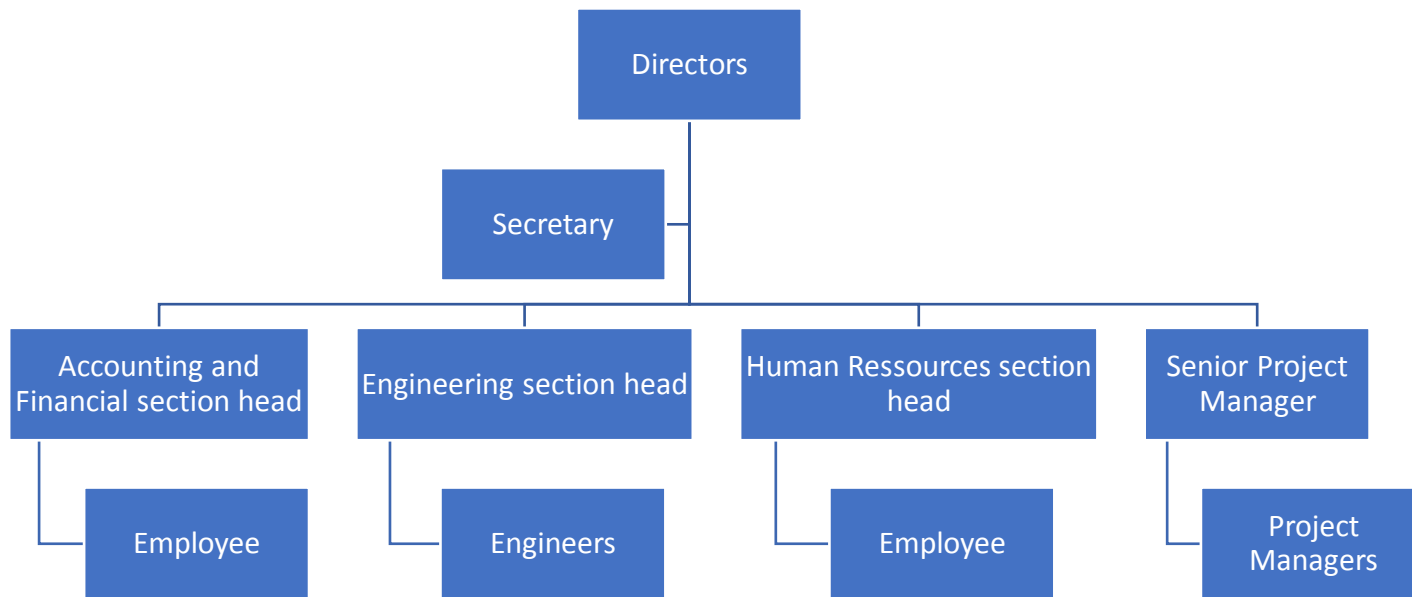


Figure 5: Chart flow organization.

b. Key manager

As it can be seen in the Figure 5 our key manager will be, Engineering section head and Accounting and Financial section head. We considered that they have the power to influence and direct company operations. It is important to say that the owner/owners of the company will be the director of the company.

c. Management salaries

In Table 3 can be show management salaries. Those amounts are per year.

Table 3: Management salaries.

Concept	Salary [€/year]
Engineering Section Head	60000
Financial and Administration Section Head	50000
Human Resource Section Head	45000
Senior Project Manager	45000
Project Manager	35000
Engineer	35000
Financial and Administration Employee	24000
Human Resource Employee	24000

We have considered to obtain a profit about of 40% of the total sales. This will be our benefit or “salary”.

d. Professional support services

Our main partner who has been motivated to participate in our company will be CIMNE with participation of UPC and BSC (Barcelona Supercomputer Centre) because as far as we are concerned they will be interested in projects the same field as us.

The International Centre for Numerical Methods in Engineering (CIMNE) is a research organization created in 1987 at the heart of the prestigious Technical University of Catalonia (UPC) as a partnership between the Government of Catalonia and UPC. The aim of CIMNE is the development of numerical methods and computational techniques for advancing knowledge and technology in engineering and applied sciences. The ultimate goal of CIMNE is to become an international reference centre and leader in computational mechanics, through achieving excellence in all the activities carried out by the centre. CIMNE employs some 250 scientists and engineers who work in the different offices of CIMNE around the world.

7. . Calendar

The company has the intention to start the business operation at the beginning of 2018, according with the new fiscal tax year. The proposed calendar has the intention to highlight the important dates according with the forecast for the three first years of life inside the engineer consultant business.

- **January 2018:** Enrol the company in the appropriate Spanish authorities.
- **January 2018:** Bank credit and money from the investors (from the founders).
- **January 2018:** Big operating expenses payment (software license).
- **February-July 2018:** Period for pay the computers (without interest).
- **July-December 2018:** Period for refund the credit to the bank. Interest of 10%.
- **December 2018:** End of the first year.
- **January 2019:** Big operating expenses payment (software license).
- **July-December 2019:** Period for refund the investment to founders.
- **December 2019:** End of the Year 2.
- **January 2020:** Big operating expenses payment (software license).

8. Risk and Critical Problems.

As any other company, there are some main risks according to each business sector and inherent for a new company. That critical points are going to be analysed depending the probability to occur and taking count that we are inside the consultancy field.

- **Technology:** According to the business description the company offer engineer service developing projects: the way how the problem are solved to achieve a correct solutions and results are using a new finite element method. Keep that method as main advantage against our competitors is the key tool for the success of the company and the differentiation point inside the engineering market.

The correct development of new technology and efforts to improve the method is the key tool in order to keep the advantage but at the same time a *critical point* where lose clients with other consultancy companies.

In order to follow the new trends of the market and keep in contact with the research team, the company have permanent contact with CIMNE (International Center of Numerical Method) and BSC (Barcelona Supercomputing Center).

- **Workforce:** considering the specialized marked where the company is focus, we can know that the adequate workforce is a *critical point* for any company inside the engineer business. Moreover, when we talk about numerical method, a new branch of the engineer fields, this take more relevance.

For this reason, as a key point, the three founders of the company are engineers specialized in solve problems using numerical methods, and more important with a wide and necessary background.

Taking care about the growing market where the company will be established, the need to incorporate workforce for the future will be a *critical point*, in order to keep the level and maintain the methodology used.

- **Software:** The need to work with different projects and the amount of data to process makes necessary to use different and updated specialized programs (software). That

represent an important risk to manage the amount of data. For this is important invest in adequate equipment (hardware) and technical support (IT).

- **Brand:** as a new company is normal a certain level of lack of confidence by part of customers. But the main risk is not get the totally confident from our clients. For this reason, is important focus and work in relevant projects with the maximum accuracy to gain a certain level of recognition. This aspect makes the difference of being a big company or normal one, representing a risk to be stagnant inside the engineering market.

9. Financial Plan

Through this point it will be carried a financial analysis and forecast for the next three years of life of the company. This chapter is divided in five points, where the income, cash management and break-even analysis it will show.

a. Estimated Income Statement

Taking account, the forecast for the next three years, and following growing market trend since 2007. As key points we can add the growth for 2016 with 4.9% and 5.5% in 2017 according to AEC (Spanish Association of Consultancy) with an important total benefits growth in Spain.

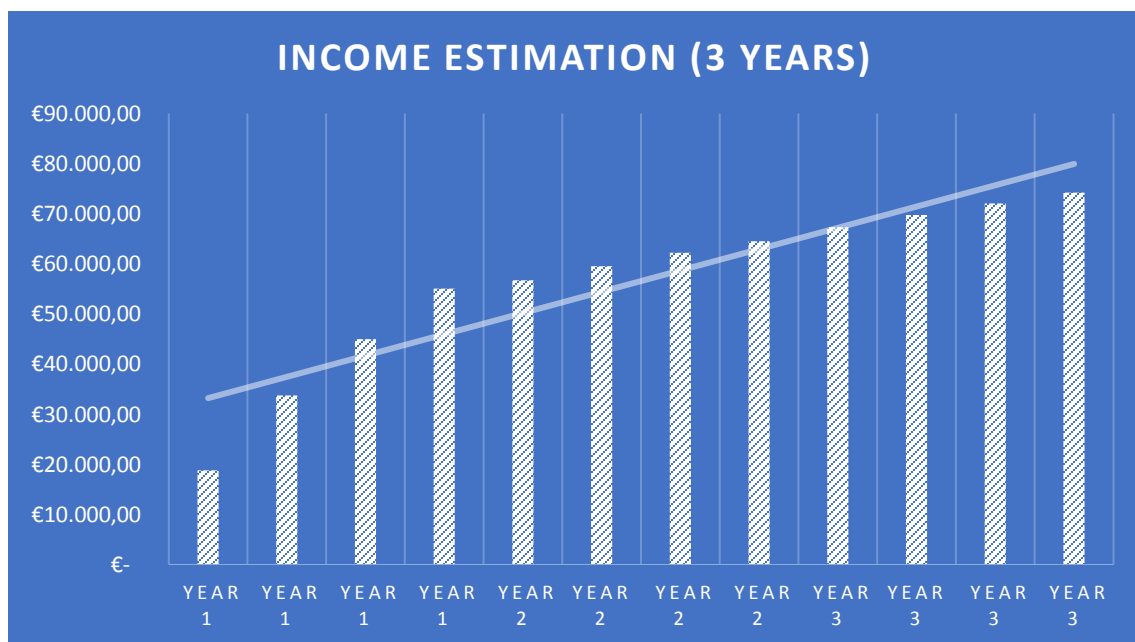


Figure 6: Incoming estimation for 3 years.

We based our predictions of revenues for three people working (for the founders), although the income statement is based on that number of workers, we don't discard to contract more workforce in the close future and depending about the forecast and initial predictions. The price of sales is per hour of engineer working in a project, assuming a price of 62.5 €/h.

As we can appreciate in the next page, we have the profit per year. That margin of benefit is variant along the three first years of the company. The first year we obtain a total of 26.538,70€ profit. That quantity is after taxes, assuming a 15% for the Year 1 and 2, according to Spanish laws for new companies.

In the other hand, we find a profit of 21.736.20€ for the second year. Although, a priori it seems a less benefit compared with the previous year, the difference becomes from the increment of salaries per month for every founder (of the company) and the result of refund the initial investment plus a 15% of interest. Remark that, the present business plan assumes part of the capital from the founders (15.000€).

In last term, we can find 46.554,00€ as benefit for the third year, where we can appreciate the real rentability of the company after pay and refund the initial investment and credit. Remark the increment of the salaries for the workers (in that case the three founders).

Table 4: Consolidated Statements of Operations.

	Year 3	Year 2	Year 1
Revenue	283.250,00 €	243.000,00 €	152.500,00 €
Credit and investors			37.000,00 €
Cost of sales	- 36.378,00 €	- 36.378,00 €	- 43.878,00 €
Gross profit	246.872,00 €	206.622,00 €	145.622,00 €
Operating expenses :			
Administrative expenses	- 168.000,00 €	- 147.000,00 €	- 72.000,00 €
General	- 16.800,00 €	- 16.800,00 €	- 18.200,00 €
Amortization			
Total operating expenses	- 184.800,00 €	- 163.800,00 €	- 90.200,00 €
Operating profit (or loss)	62.072,00 €	42.822,00 €	55.422,00 €
Other payments:			
Investment refunds (15%)	- €	- 17.250,00 €	- €
Credit refunds (10%)	- €	- €	- 24.200,00 €
Profit (or loss) from continuing operations before tax , share of profit (or loss) from associates and non-controlling interest.	62.072,00 €	25.572,00 €	31.222,00 €
Income tax expense	- €	- €	- €
Profit (or loss) from associates, net of tax	- €	- €	- €
Profit (or loss) from non-controlling interest, net of tax	- €	- €	- €
Profit (or loss) from continuing operations	- €	- €	- €
Profit (or loss) from discontinued operations, net of tax	- €	- €	- €
Tax applicable	- 15.518,00 €	- 3.835,80 €	- 4.683,30 €
Tax %	25%	15%	15%
Profit (or loss) for the year	46.554,00 €	21.736,20 €	26.538,70 €

b. Estimated Cash Management

In that point, it is developed for the three first years of the company an estimation of the cash management, taking count all the economics aspects. Applying the incoming forecast and of course the simulation of all kind of liabilities.

As it can be appreciated in the next pages, the total cash flow for the first year, it ends up with a positive value of 31.222,00€ (before taxes). Furthermore, in this present year, all the bank credit it is paid with an interest of 10% over total of 22.000€ from the initial credit.

Remark the payroll is not started to appear until the four months. That decision is taken in order to pay the credit as soon as possible, and also taking count the company workers are the three founders. At year 2 and 3 we will see how the salaries are increased and the initial inversion (5000 € each one of the founders) is refund with an interest of 15%.

At the end of the second year, the cash is 56.794,00€ (before taxes). Although could seem a good quantity, it is necessary 36.000€ for each year in order to obtain the software license.

In last term we can look at the total cash (before taxes) for Year 3 being 118.866,00€ where we can say it is a good benefit margin as shown at the Estimated Income.

To conclude, we can appreciate a big difference of the total cash flow for the first and second year compared with the third year. That difference comes out under the decision to have the less credit possible from a bank and refund it as soon as possible, making a relative low cash margins compared with the third year. This decision can be more graphic to see if we take a look at the break-even point, where the total cost is recuperated at month 10, so in order to have negative numbers of cash flow, we decide to pay the credit in the first year, delate to pay the 3 first salaries and refund the money coming from the investors at the second year (to ourselves).

c. Estimated Balance Sheet

The balance was made to reflect the last period of the first year for the Engineering Consultancy company.

Table 8: Balance sheet.

BALANCE SHEET

ENGINEERING CONSULTANCY		Month 12, Year 1	
ACTUAL RELATION	2,18	CASH RELATION	1,28
		OPERATIONS FUND	24.722,00 €

ACTUAL RELATION: 2,18

CASH RELATION: 1,28

ASSETS		LIABILITIES	
CURRENT ASSETS		CURRENT LIABILITIES	
Cash in hand	26.936,83 €	Payroll	9.000,00 €
Bank account	0,00 €	Accounts payable	1.431,50 €
Accounts receivable	18.750,00 €	Short term credit	4.033,33 €
Finished projects	0,00 €	Short term DEBT	6.500,00 €
TOTAL CURRENT ASSETS	45.686,83 €	TOTAL CURRENT LIABILITIES	20.964,83 €
FIXED		OWNERSHIP	
Machinery (Computers)	7.500,00 €	Profit and loss	31.222,00 €
Intangibles (Software)	36.000,00 €	Retained earnings	0,00 €
Buildings & Equipment	0,00 €	Capital	37.000,00 €
Land	0,00 €		
TOTAL FIXED	43.500,00 €	TOTAL OWNERSHIP	68.222,00 €
TOTAL ASSETS	89.186,83 €	TOTAL LIABILITIES	89.186,83 €

d. Break Even Analysis

The break-even point shows (Figure 7) the recuperation of the initial investment will be at the end of the month 10. As we said before and according with the total income forecast part of the money from investors will be refunded at the second year in order to advance the break-even point.

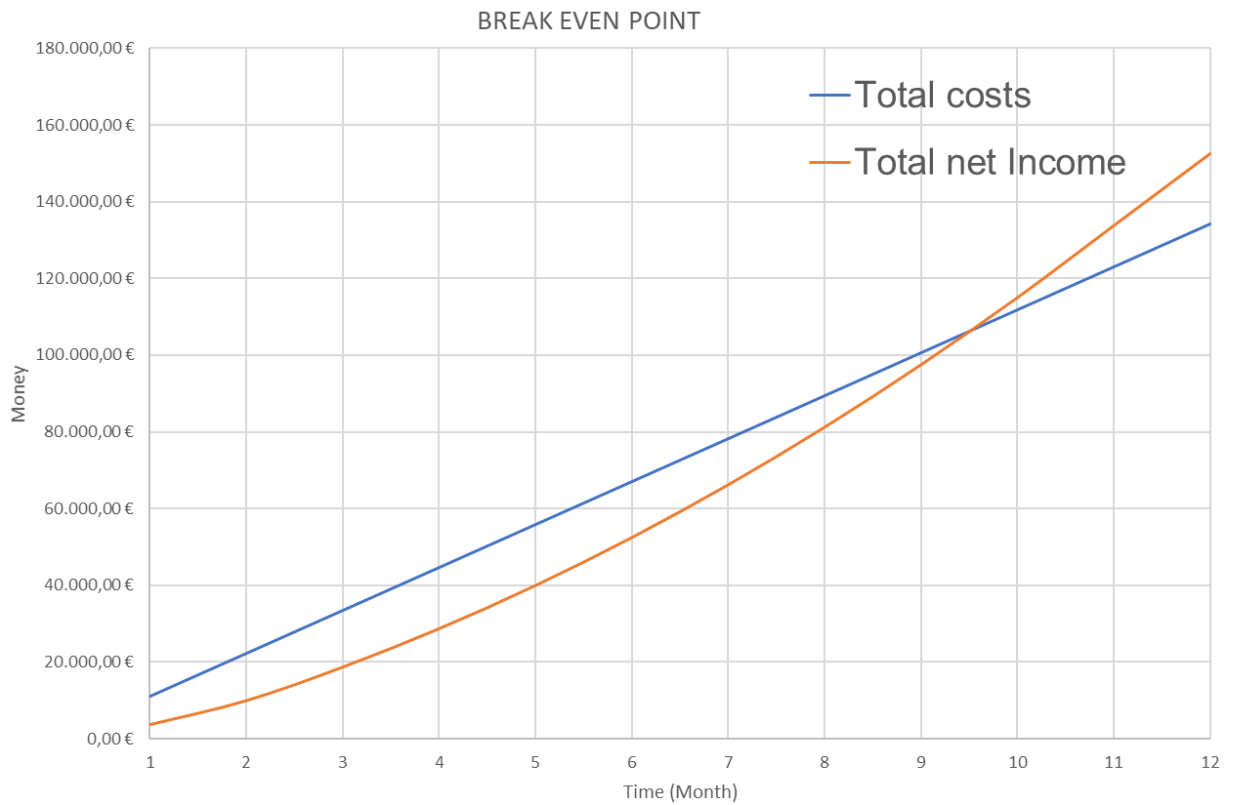


Figure 7: Break-even point.

e. Cost Control System

More than 70% of the total investment are for the machinery (computers and software) of the company. So the control system is based in give a long life of use to all components and adequate maintenance it is include a fix flat rate for pc maintenance on the company costs).