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Universidade de Coimbra

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Dissertation presented to the  
University of Coimbra in  
order to complete the  
necessary requirements to  
obtain the degree of Master  
in Biomedical Engineering.

Coimbra, September 2010







## Acknowledgments

First, I would like to express my gratitude to BlueWorks for the opportunity gave to improve my knowledge and skills that will be of the utmost importance in my future career. Also, I would like to thank for all the support and the good moments spent together in this last year. To Eng<sup>o</sup> Edgar Ferreira, Eng<sup>a</sup> Armanda Santos, Eng<sup>a</sup> Carla Pereira, Eng<sup>o</sup> Pedro Sá, Eng<sup>o</sup> Frederico Lopes, and especially to Eng<sup>o</sup> Paulo Barbeiro, a mentor and a friend, that had a major part in the success of this odyssey, helping when the help was most needed, and contributing to my growth as person and as a professional, you have my thanks.

To my fellow colleague and friend Pedro Rodrigues, for being with me all these years from high school until now, being a part of my group of friends and having worked together so many times, know that I hold your friendship in high regard.

Also, a word of appreciation for Professor Miguel Morgado, for his constant availability to the students, and dedication shown to the Biomedical Engineering course.

To all my friends: Ricardo Amaro, Cátia Costa, Carolina Portela, Catarina Duarte, Andreia Carreiro, Margarida Martins, Miguel Lourenço, Rui Lavrador, Dora Pires, André Santos, Andreia Costa, Mário Fernandes, João Silva, Luís Vale, Gil Matos, Filipe Cruz, Jorge Costa, Tiago Costa, Rui Costa, Miguel Rebelo and Miguel Fiolhais, for all the moments spent together in all these years, whether good or bad, and hope that our friendship lasts for many years.

A special and sincere thank to Sara, for all the support and love shown, that is the glue that allows me not to fall appart in the worst of times, and enjoy the simplest things of life.

To my family, especially my father, mother and sister, I keep the most special thanks. For supporting me when it was needed and restraining me when it was necessary, I will never be able to repay you for making me the person which I am today. I hope that I will make you all proud, as I am proud of having you as my kin.

## Abstract

We live in a world where the business dynamics are always changing and evolving. In order to keep up with them, organizations have the necessity of someone executing a specific set of work that ideally comprises all the stages of the product development until its commercialization. That is the work of a Business Developer.

This report describes the work carried out for the Biomedical Engineering's Project class. This work, integrated in the BlueWorks' project called Business Development, aims a preliminary approach to this matter.

In order to sustain the continuous growth of the company, several tasks were developed regarding the different products that constitute BlueWorks portfolio, as well as basic strategic analysis of the company *per se*.

As is, tasks related to market analysis, such as: market segmentation, delineation of the target market, determination of the market positioning, market dimensioning, competition analysis, as well as some financial projections and the application to several business ideas contests were some of the tasks developed to the products in development by the BlueWorks team.

Despite the conclusion of the project, the work in the area of Business Development does not end, and should be a constant practice inside a company. Hopefully, the effort dispended in performing the planned tasks will bear fruits, helping the company in its strategic decisions, while optimizing the products cycle and reducing the necessary time-to-market.

Keywords: Ophthalmology, Business Development, Business Strategy, Market Analysis.

## Resumo

Vivemos num mundo onde a dinâmica dos negócios está em constante mudança e evolução. De modo a conseguir responder adequadamente às necessidades do mercado, as empresas têm a necessidade de alguém que execute um conjunto específico de tarefas que, idealmente compreendem todas as fases do desenvolvimento do produto até sua comercialização. Essa é a tarefa de um “*Business Developer*”.

Este relatório descreve o trabalho realizado no âmbito da Cadeira de Projecto do Mestrado Integrado em Engenharia Biomédica. Assim sendo, todo o trabalho desenvolvido foi parte integrante do projecto da BlueWorks intitulado: “*Business Development*”, cujo objectivo passou por uma uma abordagem preliminar a esta questão.

Para sustentar o crescimento contínuo da empresa, foram executadas diversas tarefas relativas a diferentes produtos constituintes do portfólio da BlueWorks, bem como uma análise estratégica de base, direccionada à empresa em si.

Como tal, tarefas relacionadas com análise de mercado, tais como: dimensionamento de mercado, segmentação e delineação do mercado, determinação do mercado alvo, determinação do posicionamento de mercado e análise da concorrência, bem como algumas projecções financeiras e a aplicação a vários concursos de ideias de negócios, foram alguns dos trabalhos executados para os projectos em desenvolvimento pela equipa da BlueWorks.

Apesar do término deste projecto, o trabalho na área de Desenvolvimento de Negócios não é deve parar, mas sim ser encarado como uma prática constante dentro de uma empresa. Desse modo, é esperado que o esforço dispendido na realização das tarefas previstas renderá os seus frutos, facilitando a empresa nas suas decisões estratégicas, bem como ajudar à optimização do ciclo de produtos e redução do tempo necessário para o início da sua comercialização.

Palavras-Chave: Oftalmologia, Desenvolvimento de Negócios, Estratégia Empresarial, Análise de Mercado.

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## Definitions and Acronyms

AAC	Associação Académica de Coimbra
ACIC	Associação Comercial e Industrial de Coimbra
AEP	Associação Empresarial de Portugal
AMD	Age-Related Macular Degeneration
ANJE	Associação Nacional de Jovens Empresários
API	Application Programming Interface
CE	Comunidade Europeia
CEC	Conselho Empresarial do Centro
CEO	Chief Executive Officer
CRM	Customer Relationship Manager
DICOM	Digital Imaging and Communications in Medicine
EBITDA	Earnings before interest, taxes, depreciation and amortization
EBIT	Earns Before Interests and Taxes
EEVC	Eurecan European Venture Contest
EIS	European Innovation Scoreboard
EPR	Electronic Patient Record
ePRO	Electronic Patient Reported Outcome
FDA	Food and Drugs Administration
GATS	Gabinete de Apoio às Transferências do Saber
GERD	Gross Domestic Expenditure on R&D
HFA	Henrique, Fernando & Alves, S.A.
HIS	Hospital Information Systems
HL7	Health Level Seven
IAPMEI	Instituto de Apoio às Pequenas e Médias Empresas e à Inovação
IME	Industrial Management Engineering
IP	Intellectual Property
IPN	Instituto Pedro Nunes
ISA	Intelligent Sensing Anywhere
NERSANT	Associação Empresarial da Região de Santarém
OCT	Optical Coherence Tomography
OPEN	Associação para Oportunidades Específicas de Negócio
PEC/SGP	Plano de Estabilidade e Crescimento/Stability and Growth Plan
PIB/GDP	Produto Interno Bruto/Gross Domestic Product
PME	Pequenas e Médias Empresas
QREN	Quadro Estratégico de Referência Nacional
R&D	Research & Development
RIM	Reference Information Model
ROE	Return on Equity
ROI	Return on Investment
RRP	Recommended Retail Price

# CHAPTER 1

---

## 1 INTRODUCTION

### 1.1 Scope

This project was developed within the scope of the Integrated Master in Biomedical Engineering of the Physics Department of the University of Coimbra.

The student responsible for carrying it out was João Fernandes, under the supervision of Engineer Paulo Barbeiro and the guidance of Professor Miguel Morgado.

Business Development is a project that was developed inside the premises of the company BlueWorks – Medical Expert Diagnosis, and was created with the intention of enhancing its area of business development, which, for reasons of size and organization had been reduced up to the date. Therefore, among other tasks, the student performed certain basic analysis whose execution is almost mandatory for a product to reach its final stages with the necessary foundations, reducing the risk and easing its commercialization.

### 1.2 Motivation

In the field of commerce, the specialist area of business development comprises a number of techniques and responsibilities which aim at attracting new customers and at penetrating existing markets, therefore being a combination of strategic analysis, development of partnerships, and sales. (1) (2). As Luis G. Batista, President of LMT Corporation, states: “A sound organization, aiming to withstand competitors, never stops business development, but engages in it as an ongoing process”.

Ultimately, the job of a business development professional is normally to identify new business opportunities, new markets, and new

partnerships with other companies, new strategies to spread to the already existing markets, or even new product or service offerings to reach a superior fulfillment of the needs of existing markets, and then try to exploit those opportunities for increasing the revenue (1).

Aknowleging this and adding the fact that Blueworks did not possessed any specif structure to address this field of knowledge and, consequently, there was related work that needed to be developed, this project appeared as a preliminary approach with the objective of developing this area.

### 1.3 Objectives

The initial range of objectives of this project comprised an inclusion of the student's participation throughout all the process of transforming ideas into products, and products into sales, and it was expected that activities focused mainly on the monitoring of the medical hardware and software certification process, market studies, and the prospecting of partnerships aiming to reduce time-to-market, among other tasks.

As a draft of the work plan, the project consisted essentially in the following tasks:

1. Familiarization with the process of validation of medical devices in Europe and the U.S.;
2. Familiarization with the process of medical software validation in Portugal;
3. Monitoring of any validation processes taking place during the course of the project;
4. Market research and contact with potential clients / partners;
5. Participation in the definition of a marketing plan for some binomials product-market;
6. Elaboration of the project's report/thesis.

However, due to the dynamic nature of the business development area, which is core dependent of the market trends, some tasks were accomplished at the expense of non-perform others previously planned.



Also, due to changes in the planning of technical development of the medical devices to be certified, the tasks 1, 2 and 3 have been postponed.

## 1.4 Document Structure

This document is divided into chapters and subchapters organized in the following structure:

Chapter 2 – Labels all that is related to the project management, i.e., the constitution of the team, the entity that hosts the project, the initial project plan and the work developed.

Chapter 3 – Describes the background of all the BlueWorks projects, in order to understand the kind of work developed, and where it applies in the development of the projects.

Chapter 4 – Defines the theoretical concepts that are needed to comprehend the work that has been developed, for example the strategic analysis such as PEST, Porter or SWOT analysis, as well as the definition of concepts related to a market study, such as market dimensioning, market positioning or market segmentation.

Chapter 5 – It refers to the work developed, and it comprises each of the BlueWorks projects and the work developed that was related to them, and also a set of activities that are not related to any project in specific but to the Company in general, as for example the strategic analysis carried out or the elaboration of a first version of the Business Plan, or even the application and participation in several Business Ideas Contests.

Chapter 6 – Is where the conclusion of the work developed during the year is stated, as well as a set of suggestions for work to develop in the future and also a final appreciation relatively to the project.

# CHAPTER 2

---

## 2 PROJECT MANAGEMENT

### 2.1 Project Members

The team was composed by the following elements, whose identification and function presented in the table below:

Table 1- Project's Team

Name	Role in the Project	Contact
João Fernandes	Student/Project Developer	<a href="mailto:joaopfernandes@gmail.com">joaopfernandes@gmail.com</a>
Eng. Paulo Barbeiro	Project Supervisor	<a href="mailto:pbarbeiro@blueworks.pt">pbarbeiro@blueworks.pt</a>
Prof. Miguel Morgado	Project Leader	<a href="mailto:miguel@fis.uc.pt">miguel@fis.uc.pt</a>

### 2.2 Involved Entity: BlueWorks – Medical Expert Diagnosis

*Blueworks – Medical Expert Diagnosis* was founded in Coimbra during April of 2007, and is dedicated to create innovative technology for Ophthalmology, with a special focus in interoperability and compliance validation.

The company's development has been performed in a close contact with several expert Ophthalmologists, and products are adjusted to the mode demanding needs of this market segment.

With three years of experimental development and prototyping for 4 distinct products performed by a small team, BlueWorks is now starting to commercialize developed technology.

## 2.3 Project Planning

As mentioned in the Subchapter 1.3, the area of business development is very dynamic and the initial planning has suffered some setbacks. As a result, from the initial work plan, all that involved validation of medical devices – software and hardware – was not approached, having the project supervisor decided to follow other paths that passed through the realization of some market analysis and viability studies of projects, that are of extreme importance for the proper grounding of a product.

In the first semester, there was not a plan in the literal sense, but rather a series of activities that needed to be implemented, with priorities dependent of external influence.

As for the second semester, the main planned task was the development of a market study for the product Atlas 3D. In this sense, the planning included a contextualization with the project, followed by a competition analysis comprising the identification of the competitors, a compilation of the competing products and also a research of their target market, sales volume, partnerships and clients. The planning also included a research of financial data regarding the competitors. The next point of the planning covered the dimensioning of the market.

Also related to this project's context, it was planned to explore an emergent branch of the online social networks – the medical social networks. Hence, the work plan predicted that the student analyzed and identified the main medical social networks already established in this market niche, their dimension, contents and type of users, and also the generally used business model.

## 2.4 Work Developed

In the first semester, the initial activity, after the reception and taking note of the projects and activities developed by BlueWorks, was the continuation of the development of the Business Plan (BP). This was not made from scratch since there was already a partially developed BP, but only for one of the existing products – EyeDropper. Meanwhile, it was also carried out the review of various documents related to side tasks in course, as well as the attendance to workshops addressing subjects such as marketing and business strategy, within the scope of “Formação PME” of AEP (Associação Empresarial de Portugal).

Later in the semester, it was made the application, presentation and participation in several business contests, such as “Arrisca Coimbra ‘09” Contest, *Eurecan European Venture Contest* (EEVC) Semi-Final in Lisbon or even INOVPOINT by TaggusValley. During this, the development of the Business Plan was being continually carried out, namely the financial aspects of the Company.

In the beginning of the second semester, an analysis regarding the contacts of pharmaceuticals that work with clinical trials with eye drops was made, followed by the elaboration of a set of surveys intended for physicians and people involved in clinical trials. After finishing this task, the contextualization with the Atlas project began, and from thereon it was elaborated the competition analysis, the market dimensioning using the previously defined target market of the Atlas 3D and employing the tools at disposition for the investigation and data extrapolation. The next developed task was a research concerning the medical social networks, since they are an emerging branch that enables health professionals to connect, exchange ideas and collaborate in a global scale. Also during the semester, the student accompanied and helped with the work of a student of Industrial Management Engineering (IME), which consisted in the completion of a set of strategic analysis regarding the company BlueWorks.

Towards the end of the semester, there was also developed the application to the business ideas contest: “Arrisca Coimbra ‘10”, as well as the development of the preliminary contact with possible clients for the OphthalSuite project.

# CHAPTER 3

---

## 3 BACKGROUND CONTEXTS OF BLUEWORKS PROJECTS

### 3.1 Business Development

As mentioned in the Subchapter 1.2, the three overlapping layers within the business development itself are: sales, partnerships, and strategic planning. Ideally, all three should be blended together, although, if it serves a company's purposes, one of the areas may be emphasized (2).

#### **Sales**

In companies where this area is accentuated, business development might be better described as business-to-business sales, being the business development team and the sales team one and the same (2).

The concept of cold-calling, i.e., a call from someone trying to sell an outsourced development service, or prospecting for potential clients, members, or partners is often a task that fails to be effective nowadays. As Alex Iskold, a business advisor, CEO of AdaptiveBlue and featured writer for *Read/Write Web*, states: "The reason we all hate cold calls so much is because they are very intrusive. A stranger interrupts our flow, and takes precious seconds away from our lives." (2) (3).

That is why we are entering an age of business development 2.0. Using a targeted email which avoids the spam box has a higher chance of getting a response than a call. Another strategy with a more "warm" introduction is using the social networks, such as "LinkedIn". Being an online and self-managed tool, LinkedIn offers a method of maintaining the business connections and has become a very helpful tool for business introductions. Beyond connecting on LinkedIn there are other modern ways of connecting with other people. For instance, sending a Facebook message, Twitter @response, a comment on a photo or blog

post, etc., are some of the means of getting someone's attention. However, in some cases, they can be unwelcome (3).

So, the question is: "How can a small startup that has no capacity to knock on doors sell to big companies?" A promising solution can be the use of a web service or an API (application programming interface) (Figure 1) (3). The basic model is to have a web service which is accessible via API, where the clients sign up to use the service, agreeing to the stated terms, in order to obtain a "key". Using the provided "keys", clients can use the service programmatically to send and get data from it (3).



Figure 1 - Web Services used by Business Developers (Source: Alex Isokold for Read/WriteWeb)

## **Partnerships**

It's a fact that despite the size or the industry of a company, their businesses are being built around partnerships, and it is often a business developer responsibility to initiate and manage such relationships.

Typically, the biggest challenge facing business developers is negotiating the terms of partnership deals, since getting another company interested in a partnership is just the beginning. Drafting a contract and negotiating its terms is a process that can drag on for months, and the business development team must work with the company (e.g., product management, marketing, and operations) in order to oversee the successful meeting of the terms of the partnership (2).

## **Strategic Planning**

Strategic/Business planning jobs are found mostly at large, established companies seeking to expand and diversify their business, and a strategic planner spends a lot of time thinking about top-level strategy issues, such as: new business activities to pursue, the positioning of the company, which new technologies to invest in, etc. At some companies, strategic planning may be carried out by the corporate finance department, in which case, business development jobs may resemble investment banking functions such as mergers and acquisitions (2).

For instance, if a company wants to acquire a new business unit, it is the strategic planning task to analyze the market in order to discover a suitable business to acquire, determine an appropriated asking price for the company in question, and follow through with the negotiation process. If the acquisition takes place, strategic planning may also help with the integration of the two companies (2).

Strategic planning may also involve institutional investment – that is, parceling out the company's money to fund outside startups.

For instance, when well established companies decide to invest in a startup, strategic planners may perform due diligence on potential partners, determine how much to invest in a particular venture, and finalizing by negotiating a stake in the startup company (2).

Not anything remains static in our world, with the society, and technology always evolving. At the same time, business development evolves along with everything else and has been changing along with the rest of the world. Despite the new approaches brought by the evolving of the communication methods, there are no fundamental changes in the sales cycles and traditional risks for startups that choose to go the old-fashioned route of knocking on the doors of large companies still remain unchanged. And so, the fundamental question, "*If we build it, will they come?*" still remains unanswered (3).

### 3.2 EyeDropper

Vision impairment, or low vision, means that even with eyeglasses, contact lenses, medicine or surgery, one won't see well. Vision impairment can range from mild to severe (4).

In spite of the progress made in surgical techniques in many countries during the last ten years, cataract (47.9%) remains the leading cause of visual impairment in all areas of the world, except for developed countries.

Other main causes of visual impairment in 2002 were (Figure 2): glaucoma (12.3%), age-related macular degeneration (AMD) (8.7%), corneal opacities (5.1%), diabetic retinopathy (4.8%), childhood blindness (3.9%), trachoma (3.6%), and onchocerciasis (0.8%). The causes of avoidable visual impairment worldwide are all the above except for AMD. In the least-developed countries, and in particular Sub-Saharan Africa, the causes of avoidable blindness are primarily, cataract (50%), glaucoma (15%), corneal opacities (10%), trachoma (6.8%), childhood blindness (5.3%) and onchocerciasis (4%) (5).

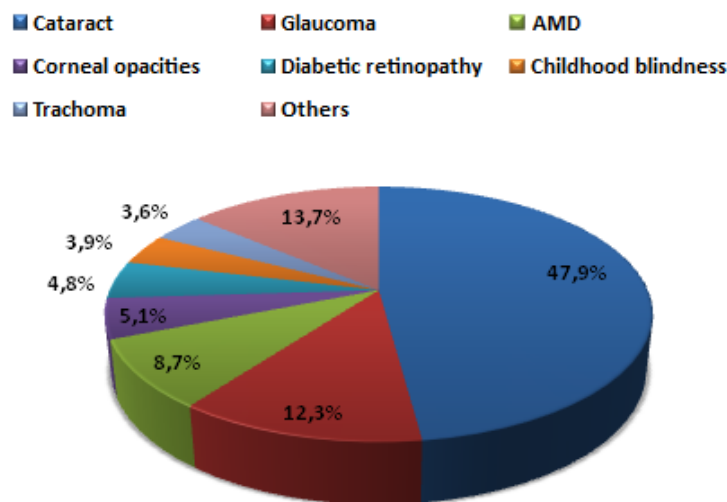


Figure 2 - Main diseases causing blindness and visual impairment (2002) (6).



*“The number of people with primary glaucoma in the world by the year 2000 is estimated at nearly 66.8 million, with 6.7 million suffering from bilateral blindness. In developed countries, fewer than 50% of those with glaucoma are aware of their disease. In the developing world, the rate of known disease is even lower. “*

*Wilmer Institute  
Johns Hopkins University School of Medicine  
Baltimore USA*

*“Glaucoma is the leading cause of irreversible blindness in the world. The Eye Disease Prevalence Research Group estimated that in the year 2000, glaucoma affected 2.22 million people in the United States. This number is projected to increase to 3.36 million by 2020.*

*Overall, it is estimated that almost 10% of the visual loss from glaucoma is the result of noncompliance with medications.”*

*Health Benchmarks  
Blue Cross Shield of Illinois*

In the above context, the problem we are addressing is the assessment of eye drop application success, opposed to the existing “release of drop assessment”.

The importance of this change in the problem definition is of utmost importance, due to the inherent difficulty of applying a drop to an eye. Whereas in pill medication, as soon as a patient grabs the pill and a glass of water it is assured (maybe in 99.99% of the cases) that he will be successful taking his medication, in eye-drops that is not the case.

Even for a healthy young patient, It is not easy to align the flask and the eye while tilting back the head, it is not easy to stay immobile while squeezing the flask, and it is also not easy to avoid blinking while drop is about to fall. If one takes in consideration that most of the vision-related diseases affect the elderly population, these difficulties - and thus the failure probability – are greatly increased.

This difficulty evaluating success causes the absence of unequivocal compliance assessment methods, which has several repercussions on medical care and research.

Some of those preventable actions that might be the consequence of poor compliance are:

- Patients may become blind
- Physicians may increase the amount and type of drugs prescribed to patients due to poor (or absence) of favorable evolution.
- Patients may be compelled to undergo surgery due to poor (or absence) of favorable evolution.
- Insurance companies may be compelled to pay for these additional treatments
- Research Centers may have unreliable data to perform their analysis of new therapeutic procedures or drugs.

In previous work regarding the state-of-art, several solutions and workarounds that are currently used to get an idea of patient compliance, were found:

- Evaluation of applied drug by weighting the drop-flask between visits, and correlating the difference in weight with amount of drops taken;
- Evaluation of compliance by requiring patient to keep a diary registering drop application date and hour, symptoms, and other information;
- Evaluation of compliance by using a electronic device attachable to a drop-flask to record date and time of flask-squeezing;
- Evaluation of compliance by using a opto-electronic device attachable to a drop-flask tip, to record date and time of drop release;
- *In-loco* application of drops by a reliable person (nurse or physician):
  - May require patients to daily dislocate themselves to the clinical-trial center;
  - More seldom used, a hotel or private healthcare unit can be rented to accommodate volunteers and nurses for the whole trial duration.

Due to the above mentioned difficulty applying drops, only the *in-loco* solution can effectively be used to assess compliance. The other

approaches are just indicators of a possible compliance attempt, without objective assurance of success.

Despite being the more objective of the aforementioned, the *in-loco* solution also presents drawbacks, being the more important one is related to the related costs. In this kind of solution, besides the usual research costs, all volunteers' dislocations must be paid, requires more staff available in small periods of time (e.g. for drops applied every 8 hours, staff must be available around 00:00, 8:00, and 16:00) and has a big impact on day-to-day routine of volunteers.

One could also refer the lack of objective documentation of procedures prone to human-error, but Clinical Trials Supervisors are likely enough to assure all procedures are correctly performed.

Being the problem and current solutions explained a question remains:

*“How to accurately assess compliance with a minimum impact on patient’s daily life, and with costs below current ones?”*

BlueWorks solution consists in an autonomous portable device, small sized (nearly the size of a regular cell-phone), capable of recording a fast sequence of images every time a drop is squeezed out of the flask, where these images will depict drop’s trajectory from the tip of the flask until it hits or misses the eye.

These videos will be used to evaluate the success of drop application, both by drop presence, drop location on each frame, drop-eye point of contact, and *palpebrae* position in that instant to rule out blinking interference. By replaying the video and analyzing each frame, one can objectively assess the success of the recorded instillation attempt.

These videos may either be provided to physicians, nurses, or researchers for human evaluation, or be automatically analyzed by computer algorithms (which BlueWorks is now developing).

Having the drop-application success information, knowing its date and time by each video timestamp, and correlating it with prescription schedule, objective compliance assessment in Ophthalmology can be achieved.

Acquired videos have well-enough resolution to allow the identification of the person by iris pattern, and since irises are different for left and right eye, laterality may also be retrieved.

This concept can be implemented with incremental levels of complexity in different products, each one having distinct associated advantages.

### 3.2.1 Glaucoma

Glaucoma is a disease which affects the optic nerve, usually caused by an increase of fluid pressure inside the eye, reduction in irrigation and other accessory factors, which ultimately leads to a progressive and irreversible loss of vision (7) (8). While glaucoma can affect people of every age (1 in 200 people with less than 50), the risk is superior for people over 60 years old (1 in 10 people affected) (9). Often there are no symptoms at first, but a comprehensive eye exam can detect it.

Glaucoma can be divided roughly into two main categories:

- Open Angle - It is undoubtedly the more common of the two (90%) and results from the loss of efficiency of the outlet area of aqueous humor. This disorder will result in a slow but progressive increase in the intraocular pressure, with consequent damage to the optic nerve. Since it is painless, patient may not notice that they have lost vision until the disease has progressed significantly (7) (8).
- Closed Angle - It can appear suddenly and is habitually painful. It is caused by a sudden blockage of the outlet area with significant increase in intraocular pressure (> 45 mmHg) which, in terms of symptoms, translates in: blurred vision, headaches, internal eye pain, colored halos, nausea, vomiting, red eye, etc. The treatment of an acute attack of glaucoma is considered an emergency in ophthalmology (7) (8).

There is also the secondary glaucoma. Usually, it arises due to an eye infection, inflammation, a tumor, a large cataract or any disease that interferes with drainage of fluid from the anterior chamber of the eye. Normally, inflammatory diseases such as uveitis are among the most common diseases. Other frequent causes often include obstruction of

the ophthalmic vein, eye injuries, eye surgery and internal eye bleeding, although some medications, such as corticosteroids, may also increase internal eye pressure (10).

The treatment of this kind of glaucoma depends on the cause. For example, when the cause is inflammation, usually the used treatment is resorting to corticosteroids or other eye drop drugs to reduce the pressure. However, sometimes it is necessary to recourse to surgery (10).

For these reasons it is imperative to achieve an early diagnosis in order to avoid a loss of vision that can be entirely preventable. Thus, it becomes mandatory, after reaching the age of 40, in the ophthalmology consultation, to measure the intraocular pressure (tonometry), to evaluate the optic nerve state (ophthalmoscopy) and to inspect the drainage angle of the eye (gonioscopy) (7).

Poor compliance with medications and with follow-up visits to the ophthalmologist is major reason for vision loss in glaucoma patients. A 2003 study found that half of the patients in a health maintenance organization (HMO) failed to fill their prescription the first time and 1 in 4 patients failed to refill their prescriptions a second time (11).

Therefore, patient education and communication must be ongoing to sustain successful treatment plans for this lifelong disease with no early symptoms (7).

### 3.3 Atlas 3D

An important part of an Ophthalmologist training involves the recognition of diseases. For retinal ones, this education process involves the analysis of images provided by diagnosis equipment, depicting each of the clinical cases.

Many students and ophthalmologists resort to Ocular Diseases Atlas, which are usually very specific – for example, dedicated to one exam modality only (e.g. OCT Atlas) – and addressing several pathologies.

There have been several limitations to high-quality atlas, and the more important is related to the physical support for the information: paper.

Paper atlas have limited size for images, limited resolution and limited number of images, do not provide “search” options, and more important, do not allow to interactively manipulate images as one would do in the equipment software.

Other angle of the same problem is related to patient education. When ophthalmologists want to explain their patients several details of the disease, they may find themselves lacking the resources to do so besides the clinical images that are of complex analysis.

In these cases, a simplified 3D animation of the pathologies (based on the resources used to create a high-quality atlas) can be of invaluable usefulness to educate patients, since is common perception that better informed and educated patients tend to better comply with prescribed therapeutic regimen, and have a better Physician-Patient relationship (12).

In these guidelines, BlueWorks is interested in exploring the viability of products that aim to educate – academically speaking – not only the medical students, but also medical residents and full time physicians, improving moreover the interaction of the physicians with their patients, as well as the interaction with other physicians, facilitating the access to information, its transmission across the globe and raising its quantity and quality.

### 3.4 OphthalSuite

Generally speaking, in all medical specialties information for diagnosis comes from a multitude of devices that gather clinical-relevant data. Ophthalmology, as a highly image dependent specialty, with a high number of types of equipments (Tonometers, Refractometers, Retinographs, Rngiographs, Field Analysers, Electroretinographs, Ecographs, etc...), as even a more relevant need to store medical data in an organized way. Most of this data consists in examination results acquired from diagnosis equipments within the clinic, which generally speaking have their own proprietary and closed database, without automated tools to share data across a network and “populate” the existing Electronic Patient Record (EPR) with it.

In these scenarios, a tool that gathers, organizes and makes all data available without quality loss is of a vital importance. Moreover, this data has the potential to be used for research, and low-tech data gathering solutions or workarounds don't answer this need. For example, using a solution that resorts to "print screens" the numerical data becomes unavailable to be sorted and organized, and therefore has no further use for business intelligence purposes.

If one looks into the national market, there are only a few options to provide interoperability to Ophthalmology. The more common solutions are remote viewers for one machine or several machines all from the same manufacturer, which the physicians may use to have remote access to some exams. The disadvantage of this solution is the fact that a regular ophthalmology unit possesses equipments from several manufacturers, thus making it impossible to have remote access to all information.

Therefore, the more common solution used in Portugal to access digital exams is: paper.

All exams are printed and stored on an archive, and physicians analyze paper exams. If higher quality data is needed, they have to dislocate themselves to the diagnosis equipments, wait for the ongoing exam to finish, and search and review patient data.

In an international scope, there are other companies and solutions to archive, access and manage ophthalmology practices, and most of them focus on the clinical practice (consultation annotations and appointment management) and use the low-tech approaches to interoperability – print screens and PDF files.

Following the trend for standardization of communication between diagnosis equipments, there are some standards emerging nowadays (e.g.: DICOM). However, these are still not 100% developed and still have very poor adherence by manufacturers.

BlueWorks - OphthalSuite aims to solve these stated problems that ophthalmologists are aware, and already provide them with an answer for the near-future needs – not only they will want to remotely access data, but they will want to have all this data organized so it can be used for research or increased quality eye care providing. As a result, we envision the future of this product in a broader-scope involving data-

mining, image processing, and artificial intelligence to achieve diagnosis support.

### 3.5 Child Vision-Screening Tool

In what concerns children eye problems in Portugal, 20% of the children suffer from refractive errors, and 5% of newborns every year have factors for amblyopia. According to the Portuguese Society of Ophthalmology, nearly 5000 of children may become amblyopic every year due to the lack of screening. If one analysis a more populated country, as for instance the United States of America, it is documented that eye problems affect more than 12 million children only in that country (13) (14).

Some eye problems may be present at birth (congenital) or related to conditions at birth, such as prematurity, and many are quite distinct from adult eye diseases. Others include diseases, allergies and injuries. Left untreated, these problems can lead to permanent vision loss, or to less serious but still substantial problems such as learning difficulties that may be attributed to a disability (15).

Eye problems unrelated to allergies include amblyopia (also known as “lazy eye”), strabismus (also known as “crossed eyes”), refractive errors (such as myopia, hyperopia and astigmatism) and others (15).

The symptoms that a child displays vary depending upon the underlying condition affecting the eye. Examples of symptoms that may indicate an eye problem in a child include abnormal alignment of the eyes, pupils that are white instead of black, watery eyes, itchiness and burning and redness. Behaviors that may indicate eye problems include frequent rubbing of the eyes, closing or covering one eye, and complaints of blurry vision, but one must keep in mind that children do not always indicate that their eyes are bothering them, specially of their eye disease was congenital (they cannot compares their current vision to the theoretical perfect one, since they have always seen the world through their faulty visual system) (15) (16).

It's mainly due to these difficulties that about 65% of Portuguese parents have never taken their children to the ophthalmologist in order to evaluate a possible vision disorder. (17).



Therefore, since they are most treatable in early stages, eye problems in children should be identified as early as possible through regular examination and management of ocular problems in children. This kind of exams also have its unique needs, since besides obvious vision problems, children also have problems such as head turns, head tilts, squinting of the eyes, or preferred head postures (torticollis) (18).

Most of these eye problems are diagnosed through a vision test. This is a standardized examination used to evaluate and monitor a child's vision and to detect potential diseases or disorders that may affect the eyes (18) (19).

BlueWorks intends to help the early detection of eye diseases in school children by creating a simple software tool that will run preferably on the computer “Magalhães” (for results standardization), where children will manage to use correctly when supervised by an adult that reads and understands the software usage instructions, being this software tool calibrated to the hardware to which it is distributed, and containing a direct link to the National Health Services to allow them to contact the school or family when the results indicate a possible vision defect.

### 3.5.1 Amblyopia

Amblyopia, also known as “Lazy Eye” disease, is an eye condition characterized by reduced or indistinct vision in an eye that is possesses no physical abnormality and is caused by the eye and the brain not being working together properly (20) (21).

Amblyopia affects mainly children with ages up to 6 years old – since this is a critical period of the brain development – and has been estimated to affect approximately 2 to 3 out of every 100 children, which translates into 1–5% of the world population, making it the most common cause of visual impairment in childhood (20) (21) (22).

Commonly, amblyopia is caused by either a misalignment of the child's eyes – such as strabismus – or from a difference in the quality of the image obtained by each eye – anisometropia –, being that one eye focus better than the other. Occasionally, amblyopia may also be caused by other eye conditions such as cataract. As a result, one eye

becomes stronger, suppressing the image of the other eye, ultimately leading to blindness of the weaker eye (20) (23). Although in general only one eye is affected, it may happen that the condition manifests with reduction of vision in both eyes if both are similarly deprived of a good and clear visual image (21) (22).

In terms of symptoms, amblyopes usually suffer from poor spatial acuity, low sensitivity to contrast, problems of binocular vision such as limited stereoscopic depth perception, usually have difficulty seeing the three-dimensional images in hidden stereoscopic displays such as autostereograms and in some cases may also experience some "higher-level" deficits to vision such as reduced sensitivity to motion (21).

Since amblyopia usually occurs in one eye only and can be mild, many amblyopes are not even aware they have the condition until tested at older ages. Also parents of the affected children may be unaware of the condition since the vision in their stronger eye is normal. For that reason, many parents fail to take their infants to the physician for an early comprehensive vision examination, thus leading to many children being undiagnosed in time for an effective treatment (21) (20).

Regarding the treatments, they involve correcting the optical deficit and making the child use the eye with the reduced vision (amblyopic eye).

To first treat the underlying cause, i.e., the optical deficit, glasses are the most common prescription to improve focusing or misalignment of the eyes. However, it may be necessary to recur to surgery on the eye muscles to straighten the eyes if non-surgical means are unsuccessful, being that this approach can also help in the treatment of amblyopia by allowing the eyes to work together better (23).

For the treatment of amblyopia itself, there are currently two ways to do this (20) (21):

- Atropine – The treatment consists in the topical application of this drug in the stronger eye to temporarily blur the vision so that the child will favor the use of the eye with amblyopia. Treatment with atropine also helps the development of the part of the brain that manages vision by stimulating the use of the weaker eye.
- Patching – Comprises the use of an opaque, adhesive patch over the stronger eye for weeks or even months. With the same objective of the atropine treatment, this therapy forces the child to

use the eye with amblyopia, also helping the part of the brain that manages vision to develop more completely.

Until recently, eye care professionals often thought that treating amblyopia in older children would be of little benefit. Yet, results from a recent clinical trial demonstrate that, many children with ages comprised between 7 and 17, suffering from amblyopia, may obtain improvements in eye condition from treatments that are more commonly used on younger children. The conclusion to withdrawal is that age alone should not be used as a factor to decide whether or not to treat a child for amblyopia (24).

# CHAPTER 4

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## 4 PROJECT'S THEORETICAL CONCEPTS

### 4.1 Market Analysis / Viability Study

#### 4.1.1 Definition/Concepts – What is a Market Analysis?

The main strategic decision that a company has to face is the careful selection of the needs that will satisfy and the products and services that will sell to their customers. (25)

A marketing analysis is a documented investigation concerning a specific market, and is used to inform a company's planning activities, particularly regarding decisions in relation to: inventory, purchase, work force expansion/contraction, facility expansion, purchases, promotional activities, and many other aspects of a company (26).

The ultimate goal of a market analysis is to determine the attractiveness of a market and to understand its evolving opportunities and threats and how they are related to the strengths and weaknesses of the company.

David A. Aaker, a consultant and author on the field of marketing (27) outlined the following dimensions of a market analysis (28):

1. Market size (current and future)
2. Market growth rate
3. Market profitability
4. Industry cost structure
5. Distribution channels
6. Market trends
7. Key success factors

## 1. Market Size

Regarding the evaluation of the size of a market, this aspect is usually constructed focusing on two main aspects: present sales and potential sales (if an expansion of the use of the product would occur). For this analysis there are some information sources that can be used for determining the size of a market (28):

- Government issued data;
- Data collected from trade associations;
- Financial data from major players (when possible);
- Customer surveys;
- Etc...

## 2. Market Growth Rate

In order to forecast the market growth rate, the most used method is extrapolation of the obtained data. However, this process has significant flaws, since it does not predict important turning points. Another method with improved results is the study of growth drivers. For instance, collection of information on demographics, information on the sales growth of complementary products, price pressure caused by competition, changes in brand loyalty, the emergence of substitute products, market saturation, etc. This second method uses the growth drivers as leading indicators, which provides more accurate results than simply extrapolating data (28) (29).

## 3. Market Profitability

Although different companies in a given market will have different levels of profitability, the average profit potential for a market can be used as a guideline for knowing how difficult it will be for a company to make money in the market in which it acts. The Five Forces of Porter can be used as a useful framework for evaluating the attractiveness of an industry or market, since they can be used to identify the five main factors that have greater influence in the market profitability. They are (28) (30):

- Power of the clients;

- Power of the suppliers;
- Barriers to entry;
- Threat of substitute products;
- Rivalry among competitor companies.

#### 4. *Industry Cost Structure*

The cost structure in the industry is important for identifying key factors for success, helping the company formulating strategies to develop a competitive advantage. With this goal, a useful tool for determining where value is added and for isolating the costs is Porter's value chain model (28).

#### 5. *Distribution Channels*

Theoretically, the choice of the used distribution system is very important, and will influence a market analysis. These channels are not restricted only to physical products, but may also be important for moving a service from the producers to the end-users in some sectors or industries, as both direct and indirect distribution systems may be used. Therefore, there are some aspects that must be considered (28) (31):

- "Existing distribution channels - can be described by how direct they are to the customer.
- Trends and emerging channels - new channels can offer the opportunity to develop a competitive advantage.
- Channel power structure - for example, in the case of a product having little brand equity, retailers have negotiating power over manufacturers and can capture more margins." (28).

#### 6. *Market Trends*

The relevant trends in this type of analysis are usually dependent of the industry in which the analysis is applied, and are important due to the fact that they are generally a source of new opportunities and threats (28).

The upward and downward market trends are usually described, respectively, by the terms: *bull market* and *bear market*. Some examples of market trends include: modifications in price sensitivity (e.g.: changes in the financial power of the clients) or demand for diversity (e.g.: due to market saturation) (28) (32).

## 7. Key Success Factors

In every industry, there are elements inherent to certain companies that are what differentiate them from the competitors and help them to achieve their marketing objectives. These success factors may suffer changes as the product progresses through its life cycle, so they are not permanent aspects (28) (33). Some of the factors that can make a difference in a company's success are (28):

- Access to key distribution channels;
- Access to essential unique resources or materials;
- Ability to easily achieve economies of scale;
- Improved technological progress;
- Etc...

### 4.1.2 Objectives – What are the objectives of a market analysis?

The analysis of a market can also be used as a tool that enables the structuring of a company's trade policy, according to the following aspects (34):

1. Start a new business;
2. Prepare to enter a new market by reducing the risk in management decisions;
3. Launch a new product/service by determining its market viability and defining the optimum marketing strategy;
4. Ascertain market information that will assist in the sale of the product or service;
5. Detect problems and new business opportunities, defining the basis of the commercial action of the company by gradually developing the following strategies:

- Identifying of the existing products or services in the market;
- Setting prices and conditions of sale;
- Deciding the used distribution channels;
- Determining the “image” and brand of the company and products;
- Preparing the process of establishment and exploration of a “customer relationship management” (CRM);
- Determining a forecast on the turnover, accordingly to the scenario chosen.

## 4.2 Sectorial and Environment Analysis

In the business that the companies operate, the management of the permanent interaction with the surrounding environment is the most determining factor that underpins the concept of strategy (35).

This permanent connection obliges the organizations to adjust their behaviors according to the signs and characteristics of the surrounding environment, to ensure survival and success (25).

The sectorial and environment analysis can be divided in two levels (25):

- Contextual environment (PEST Analysis);
- Transactional environment.

### 4.2.1 Contextual environment study - PEST Analysis

The purpose of the analysis of the contextual environment (macro-environment) is to understand which factors of the surrounding environment of a company have greater influence in the definition of the course of the business activities, both at the present and in the future. Analyzing these aspects allows the identification of the opportunities and the threats from the macro-environment of an organization (36) (25).

The contextual environment is common to all organizations in the different industries and can be divided into four distinct contexts (36):

- **P**olitical-legal;



- Economic;
- Socio-cultural;
- Technological.

### **Political-legal context**

Political-legal factors can have a direct impact on the way a business operates. They usually are used to determine the allocation of power, but can also be used to determine the legal framework of the society. Its main variables are: political stability, economic policies and legal framework (36).

Other additional variables that affect the activity of most companies – whether they act in the public or in the private sector businesses – may include (37):

- Taxation policy – corporate and consumer taxation;
- Governmental influence on supply and demand:
  - The political environment can influence the demand in several ways. Government legislation defines all that can or cannot be bought, and in what circumstances the transaction can be made. Through taxation and the welfare system, government also determines the distribution of wealth and income in a country.
  - There are three main ways in which government affects supply:
    - Legislation on how firms should operate, what can be produced and how to produce it, and legislation concerning the inputs an organization can use;
    - Specification on how certain groups should operate through emitting safety standards;
    - Variation of taxes and subsidies which affects the operating costs of an organization;
- Competition regulation by the proper entity;
- Wage legislation;
- Intellectual property protection;
- Pressure groups;

## **Economic Context**

All businesses are affected by economic factors, nationally and globally. They determine the extension of the exchange of goods and services, money and information in society. For example, if the economy is in a “boom”, the consumers are more likely to spend. However, if the economy is in recession, then consumers’ confidence and the purchasing power in the economy also suffer a “slump” (36) (37).

The following are some of the main variables that must be taken into consideration, which, according to the specific function of each organization, may have a greater or lesser impact on their development (37):

- Gross domestic product;
- Inflation rate;
- Economic growth;
- Budget allocation;
- Interest rates - governmental monetary policy;
- Taxation – corporate and personal;
- Unemployment levels;
- Exchange rates – effects on demand by overseas customers;
- Money Supply.

## **Socio-cultural context**

Social factors reflect the values, customs and traditions of society, which is constantly evolving, suffering demographic and cultural changes. In that sense, even the slightest variation in the macro-environment may have an outcome – in a degree more or less pronounced – on the performance of companies, affecting their productivity and product quality (36) (37).

Of the variables that make up this context, the following have the greatest impact and should be highlighted: the lifestyles, social values, birth rates and age structure. Nonetheless, in order to accomplish a thorough analysis, one should also take into account factors such as (37):

- Income distribution;
- Literacy/educational levels;
- Labor and social mobility;
- Changing nature of occupations;

- Attitudes in career and leisure;
- Internal/external emphasis on safety;
- Internal/external attitudes to change;
- Fashions and trends;
- Health consciousness;
- Population growth rate;
- Gender distribution;
- Family size and ethnic composition;
- Consumerism.

### **Technological context**

Technological factors are essential for competitive advantage, and are a major driver of change and efficiency. They reflect the technical progress of society and affect the way a business operates. For example, the appearance of the internet introduced a change in the market and in the sales for many organizations, which in many cases translated in the appearance of new business opportunities (36).

Technological innovations and modernization of the manufacturing processes are two important factors of differentiation in the market, if properly exploited.

Any business has the need to adapt and respond to technological vicissitudes in order to survive and thrive. In a technology analysis it is ought to highlight (37):

- How technology affects the R&D activity in the industry;
- How technology affects the production of goods or services;
- How technology spawns new competition;
- Implementation of quality standards
- Automation;
- Technology incentives;
- Government spending on research;
- Government and industry focus on technological effort;
- Technological change;
- Impact of changes in information technology;
- New discoveries and developments.

## 4.2.2 Transactional environment analysis

The analysis of the transactional surroundings is specific to each industry and relates to a set of elements and factors that have a direct influence on the company.

There are four main elements that comprise it: customers, suppliers, competitors and communities (36).

### **Customers**

These should encompass all the current and potential consumers of goods and services offered by a company, and constitute the market's demand.

Different customers present different characteristics which are subject to their specific goals and needs. Consequently, it becomes necessary to group them into specific market segments in order to suit the company's management trends (36) (37).

### **Suppliers**

These are economic agents who provide services or sell products to the industry, contributing to the development of the offer.

They must always maintain a broad perspective of the inputs required by firms in order to detect trends in the markets (36) (37).

### **Competitors**

These should encompass all the current, potential competitors and substitute products, and constitute the industry's offer.

While collecting information about the competition, the capacities, objectives, strategies and assumptions of each competitor ought to be analyzed and compiled. It is also important to understand the operation of new competitors and identify potential substitute products that compete with the already existing products, how and how well they will satisfy the same customer needs (36) (37).

### 4.2.3 Porter Analysis

Porter Analysis (Five Forces Analysis) is a systematic way of analyzing the external environment of an organization, which seeks to measure the attractiveness of a particular sector and allows assessment of the competitive structure of a market (38).

It has similarities with other ways for environmental assessment – such as PEST analysis – but tends to focus on the whole business rather than a single product or range of products.

Porter Analysis helps to understand an organization's competitive position and how it can gain a competitive advantage over the competitors operating in the same market.

The Model of Porter considers five forces (Figure 3). The joint action of these forces influence the pricing of the products or services, as well as the costs and necessary investments in a business, factors that will define the Return on Investment (ROI), and allow to determine the intensity of competition and hence the profitability and attractiveness of an industry (36).



Figure 3 - The Five Forces of Porter

Therefore, the forces considered by Porter are (38):

- Potential for new entries - Possibility of new companies starting to compete in the industry;
- Pressure from substitute products - Impact of the existence of alternative goods which meet the same consumers' needs in the industry;
- Bargaining power of suppliers - Capacity of suppliers to influence the terms under which their products or services are sold to industry;
- Bargaining power of customers - Capacity of customers to influence the terms under which the products or services of the industry are acquired;
- Rivalry among existing competitors - Competitive intensity in the midst of the companies operating in the industry.

Higher the intensity of the forces, more competitive the business environment will be, which, in its turn, will lead to a lower profit margin of the companies acting in the same industry (37).

### **Potential for new competitor entries**

*“How easily can new entries start to compete? Which barriers do exist?”*

This point is probably the most critical, reflecting the nature of the fundamental competitive factors of the business, assuming, in essence, barriers to entry for new competitors in the industry.

Barriers to entry can be stated as objections or charges by the other stakeholders in the industry. The potential threat of the entry of new competitors is determined by the quantity and intensity of existing barriers to entry, as well as the reaction of existing competitors (37).

Examples of barriers to entry are (39):

- Intelligence Protection (patents, rights, etc.) – The most attractive segment is one in which the used technology is not patent protected.
- Economies of scale – If it is not easy to achieve economies of scale, the segment will be less attractive.
- Brand equity – When a brand is well known and has a positive reaction by the consumer, the segment is less attractive for new competitors.
- Switching costs or sunk costs – If the customer incurs in a high cost in switching brands, he is reluctant in doing it.
- Capital requirements – When capital requirements are high, they make the entry of new competitors difficult.
- Access to the state-of-the-art technology – A new organization is less likely to have access to the technology, which is good for established firms. Technological innovation can be decisive for new competitor act on the new industry, because a new technology process, either production or commercialization, may take obsolete the barriers to entry.
- Access to distribution channels – If the firm has preferential or monopolistic access to distribution channels, it is more resistant to competition. Generally, distribution channels are controlled by the already established firms.
- Customer loyalty to established brands – If there is brand loyalty by customers, they will resist the switching.
- Learning curve advantages – Products or services that have a high rate of learning (in the average person) will easily penetrate the new market since they do not require added effort by the end user.
- Expected retaliation by incumbents – If the segment is dominated by big and experienced companies, the new competitors will expect more retaliation.
- Government policies – Governments can preserve or restrict competition. It is important to know if there are new laws that may weaken the firm's competitive position.
- Industry profitability – The more profitable the industry, the more attractive it will be to new competitors.

## **Substitutes – threat of substitutes**

*“How easily can a product or a service be replaced?”*

If there are alternative products with lower prices and/or better performance parameters for the same necessity, there is a threat that the consumer will choose the substitute product. All industries are under pressure due to the threat of substitute products, which is a limitation of the industry profitability, both at short and at medium term. As an ultimate consequence, with the increase of the pressure from substitute products, the attractiveness of an industry will be led to decay (36) (37).

This pressure from substitute products depends primarily on (37) (39):

- Relationship price/performance of substitutes;
- Brand loyalty of customers;
- Cost of change;
- Product-for-product substitution;
- Substitution of need;
- Availability of close substitutes;
- Financial power of the sectors that create substitute products.

## **Suppliers - bargaining power of suppliers**

*How strong is the position of the suppliers? Are there many or only few potential suppliers? Is there a monopoly?*

All businesses need raw materials and other resources, such as labor components or services. Therefore, suppliers affect the structural profitability of an industry through their sale pricing guidelines, charging policies, delivery procedures and product quality policies (38) (39).

If the power of suppliers is high, they are able to determine the conditions and prices of products/services they sell in their favor. On the other hand, if the power of suppliers is low, it will be possible to negotiate better conditions of supply (38) (39).

The bargaining power of suppliers depends of the following factors (39) (37):



- Number and size of suppliers – If the supplier industry is dominated by few companies and their concentration is higher than the industry client, the bargaining power of supplier's is higher.
- Availability of substitutes for the supplier's products – When the supplier industry does not face pressure from substitute products, their power is greater.
- Differentiation or switching costs of supplier's products – If it is difficult for the firm to switch to other suppliers, the current suppliers have higher power;
- Supplier's threat of forward integration – When suppliers might potentially turn into competitors, they become less reliable and need to be looked at strategically.
- Supplier's contribution to the quality of the industry products - If the product or service from the suppliers is crucial for the maintenance of quality of industry products, then this will increase supplier power.
- Total industry cost contributed by suppliers - Quantitative perspective of the importance of suppliers in the business. Greater status results in higher bargaining power.
- Importance of the industry to supplier's profits – If the supplier industry is highly dependent, their bargaining power is lower.

### **Customers - bargaining power of customers/buyers**

*How strong is the position of buyer? Can they work together to order large volumes?*

Customers may affect the attractiveness of an industry through their purchase price policies and their quality and pricing demands (38).

The bargaining power of customers depends of the following factors (37) (39):

- Number of important customers – If the industry is dominated by a few client companies and their purchases account for a high percentage of sales, the power of the company to manipulate prices is reduced.
- Availability of substitutes for the industry products and switching costs – The possibility of product being replaced by a substitute from a competitor affects the demand and the price elasticity for

a company's products. The customer bargaining power is high when the acquired products are undifferentiated and/or there are no switching costs.

- Customer's threat of backward integration – When the industry client has the full information on the supplier industry, customers may become able to manufacture the products themselves.
- Contribution to quality or service of customers' products – If the products of the supplier industry are not relevant to the quality of the products and service of the customer industry, the power of the customer's industry is higher.
- Customer's profitability – The most profitable customers are those who are willing to pay more for their products. The customers bargaining power is high when customers have low margins and are very price-sensitive.
- Importance of the product to the customer – If the product does not possess strategic relevance for the customer, the customer's bargaining power is high.

### **Competitive Rivalry - rivalry amongst the existing competitors**

*Is there a strong competition between the existing competitors? Is one competitor very dominant or all are equal in strength and size?*

The rivalry derives from the context in which competitors seek to act directly on the customers, and is subject to the degree of aggressiveness of the methods used to capture these customers in short term (38).

A great rivalry in an industry is influenced by the direct management of the competitors in dispute, but its causes are objective and external to the will and capacity of the companies present in an industry (25).

In a thorough competitor analysis, it is important to consider the following aspects (37):

- Market Concentration;
- Competitive Advantage;
- Rivalry Intensity.

### **Market concentration**

This factor measures the market share that organizations have in a given market (25):

- If a small number of organizations have a high market share then the concentration is high and the market assumes the form of a monopoly;
- If the market share is spread across organizations, then the concentration is fragmented and the market is competitive.

### **Competitive advantage**

Gaining an edge over rivals can be obtained by (25) (37):

- Changing the pricing policy in order to increase a company's competitiveness;
- Through product differentiation: for example improving the original features of a product;
- Improving distribution channels;
- Exploiting relationships with suppliers.

### **Competition intensity**

In the market, the rivalry is influenced by ten main factors (25) (37):

1. Dimension, number, concentration and balance among competitors – If there is only a single large competitor, then the industry is monopolized by it. If there are many companies of about the same size, the competition between existing players is high;
2. Market growth – Slow market growth entails more pressure on the existing companies;
3. Product differentiation – If the existing products are highly differentiated, markets are somewhat segmented. On the other hand, if there are low levels of product differentiation, then there is a greater price competition;
4. Barriers to exit\* – If the barriers for exit are high (e.g. expensive and highly specialized equipment), then competition between existing companies is likely to be high;

5. High fixed costs – If the expenses that are not dependent on the level of goods or services produced by the business are high, there will be more rivalry between companies operating in the same market;
6. High storage costs or highly perishable products – This will increase the rivalry since it will affect the costs and the pricing of the products, which can lead to lower profit margins;
7. Low switching costs – If the customers do not incur in great costs in switching between different companies in the same market, the rivalry will increase;
8. Strategic stakes are high – Higher the repercussions of the strategic decisions, higher will be the competition between companies;
9. A diversity of rivals.
10. Market shakeout – Market shakeout is a market mechanism, which eliminates the situation of an offer in excess, usually due to high practiced pricing of the products or services, or due to being an outdated organization, using obsolete technology (40).

\* As stated, barriers to exit contribute to put emphasis on the rivalry between companies operating in the same industry. Some examples are (37) (41):

- Economic barriers (e.g.: specialized companies with high degree of focus, workplace agreements and restrictions from government, etc.);
- Strategic barriers (e.g.: inter-relationships between companies operating in the market, etc.);
- Emotional barriers (e.g.: high emotional connection to the activity, reluctance in changing, fear of not succeeding, etc.).

## 4.3 Market Analysis

### 4.3.1 Market Segmentation

The marketing concept calls for understanding customers and satisfying their needs better than the competition, yet different customers have different needs, and it rarely is possible to satisfy all customers by

treating everyone the same mode (42). Thus, the need for grouping customers based on common characteristics comes to be essential.

Market segmentation is the identification of portions of the market that are different from one another (segments), allowing the firm to better satisfy the needs of its potential customers (42).

Each of these portions or segments segment meets all of the following criteria: it is homogeneous, exhibiting common needs and products/service requirements; it is distinct from other segments, since different segments have different needs; it responds similarly to a market stimulus, and it can be reached by a market intervention (43).

The segmentation must be based on detailed, specific information collected in an objective manner.

Market segmentation is a part of Target Marketing, which enables control over limited resources. In other words, it is assured that all the elements comprising the marketing mix - price, distribution, products and promotion - are designed to meet particular needs of different customer groups. Hence, the market segmentation concept is related to product differentiation (42) (43).

The division of the market into homogeneous segments depends on the market in study, that is, the criteria considered to split the market into subdivisions are different for distinct markets. We can have (44):

- Consumer Market Segmentation;
- Industrial Market Segmentation.

Comprising the market into these fractions enables companies to identify new business opportunities, to attain appropriate positioning and enhance communication strategies, and allows optimizing resource allocation, focusing on key marketing activities (44).

### **Consumer Market Segmentation**

This segmentation can be performed on a *product specific* basis, that varies among groups within a market, but that is consistent within groups. One can identify four primary bases on which to segment a consumer market (42) (44):

- Geographic segmentation – Is based on regional variables. For example:
  - Region: by continent, country, state, or even neighborhood;
  - Size of area: segmented according to size of population;
  - Population density: often classified as urban, suburban, or rural;
  - Climate: according to weather patterns common to certain geographic regions;
  
- Demographic segmentation – Is based on variables such as:
  - Age;
  - Gender;
  - Family size;
  - Family lifecycle;
  - Generation: baby-booms, Generation X, etc.;
  - Income;
  - Occupation;
  - Education;
  - Ethnicity;
  - Nationality;
  - Religion;
  - Social class;
  
- Behavioral segmentation – Is based on actual customer behavior toward products. Some behavioristic variables include:
  - Benefits sought;
  - Usage rate;
  - Brand loyalty;
  - User status: potential, first-time, regular, etc.;
  - Readiness to buy;
  - Occasions: holidays and events that stimulate purchases;
  
- Psychographic segmentation – To group customers according to their lifestyle. Some psychographic variables include:
  - Activities;
  - Interests;
  - Opinions;

- Attitudes;
- Values;

The optimal bases on which to segment the market depend on the particular situation and are determined by marketing research, market trends, and managerial judgment (42) (44).

### **Industrial Market Segmentation**

In contrast to consumers, industrial customers tend to be fewer in number and purchase larger quantities. They evaluate offerings in more detail, and the decision process usually involves more than one person. These characteristics apply to organizations such as manufacturers and service providers, as well as resellers, governments, and institutions.

Many of the consumer market segmentation variables can be applied to industrial markets. Industrial markets might be segmented on characteristics such as (42) (44):

- Location – Is based in variables like the shipping costs, since this may be a purchase factor for vendor selection for products having a high bulk to value ratio, so distance from the vendor may be critical. In some industries firms tend to cluster together geographically and therefore may have similar needs within a region.
- Company type – Customer businesses can be classified according to type, as follows:
  - Company size
  - Industry
  - Decision making unit
  - Purchase Criteria
- Behavioral characteristics – In industrial markets, patterns of purchase behavior can be a basis for segmentation. Such behavioral characteristics may include:
  - Usage rate
  - Buying status: potential, first-time, regular, etc.
  - Purchase procedure: sealed bids, negotiations, etc.

The identified market segments are summarized by profiles, often given a descriptive name. From these profiles, the attractiveness of each

segment can be evaluated and a target market segment selected (42) (44).

### 4.3.2 Competition Analysis

A Competition Analysis is an important part of the strategic planning process. Some companies think it is best to get on with their own plans and ignore the competition. Others become obsessed with tracking the actions of competitors (often using underhand or illegal methods). However, most companies are contented solely tracking the competition, “copying” their moves and reacting to changes in the environment (45).

While in highly fragmented commodity industries the moves of any single competitor may be less important, in concentrated industries competitor analysis becomes a vital part of strategic planning (46).

This sort of analysis provides both an offensive and defensive strategic context, through which to identify opportunities and threats. Competitor profiling coalesces all of the relevant sources of competitor analysis into one framework, in the support of efficient and effective strategy formulation, implementation, monitoring and adjustment (47).

A competitive analysis aims at identifying and analyzing the competitor's marketplace strategy. It permits the prediction of the behavior of competitors (47).

For that purpose, it is necessary to answer to the following questions (46) (47):

- Who are the competitors?
- What is the profile of our competitors - strengths and weaknesses?
- What are the objectives of our competitors - what threats do they pose?
- How is the firm compared to these competitors?
- What can be learned from competitors?
- How are our competitors likely to respond to any changes to the way we do business?



If not executed properly and thoroughly, a competitive analysis may generate some problems, i.e., it may result in a poor identification of significant competitors and bad assumptions about the competition or mistakes about the customer's "wishes" and they really "need" (45) (46) (47).

A competitive analysis implies collecting data regarding competitor's strategies and trends. The most competitive companies are those that efficiently transform the collected data into strategically relevant decisions (45) (46) (47).

Davidson (1997) describes how the sources of competitor information can be neatly grouped into three categories (45):

- Recorded data - Easily available in published form either internally or externally. For example, competitor annual reports and product brochures;
- Observable data - Generally must be actively sought and often assembled from several sources. For example, the competitor pricing;
- Opportunistic data - Usually requires a lot of planning and organization. Much of it is "anecdotic", coming from discussions with suppliers, customers and, perhaps, managers or previous managers of competitors.

The following examples are sorts of competitor information that would help businesses to complete a competitor analysis (45):

Things that companies probably know their competitors:

- Overall sales and profits;
- Sales and profits by market;
- Sales by main brand;
- Cost structure;
- Market shares (revenues and volumes);
- Organization structure;
- Distribution system;
- Identity / profile of senior management;
- Advertising strategy and spending;
- Customer / consumer profile & attitudes;
- Customer retention levels;

Things that companies would like to know about competitors:

- Sales and profits by product;
- Relative costs;
- Customer satisfaction and service levels;
- Customer retention levels;
- Distribution costs;
- New product strategies;
- Size and quality of customer databases;
- Advertising effectiveness;
- Future investment strategy;
- Contractual terms with key suppliers
- Terms of strategic partnerships

Competitive analysis is also used to reflect on and learn about a company's own business, whether they are its vulnerabilities, its limitations, or its capabilities when compared with the current and the potential competitors (45) (46) (47).

It is important to “keep an eye” on the competition, so that a company can foresee and react to an intensification of competition or arise of new competitors. This can happen when (46) (47):

- The market is new or experiences an expansion;
- When there are relatively few businesses in a large market, so that the gains in terms of profit can be very high;
- The market is set to change, whether as an effect of developments affecting patents and intellectual property rights, or as a result of political or legal changes, such as privatization.
- The market is shrinking or there is over-capacity in the market.

The following figure represents a framework devised by Michael Porter (Figure 4), which considered these following four key aspects of a competitor as the most important in a competition analysis (47):

- Competitor's objectives
- Competitor's assumptions
- Competitor's strategy
- Competitor's capabilities

Objectives and assumptions are what drive the competitor, and strategy and capabilities are what the competitor is doing or is capable of doing.

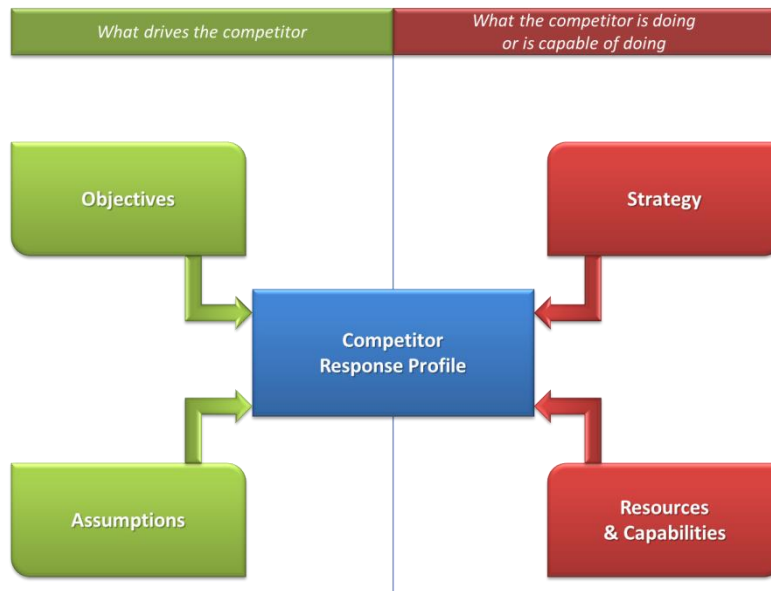


Figure 4 - Porter's framework for competitor's analysis (Adopted from (48)).

### **Strategy – Business Purpose**

It is of utmost importance for a company to know the strategic goals of competitors. The two main sources of information about a competitor's strategy are what the competitor "says" and what it "does" (47).

What a competitor is saying about its strategy is revealed in:

- annual shareholder reports;
- financial reports;
- 10-K reports (in USA);
- interviews with analysts;
- statements by managers;
- press releases;

What the competitor is doing is evident in where its cash flow is directed, such as in the following tangible actions:

- hiring activity;
- R & D projects;

- capital investments;
- promotional campaigns;
- strategic partnerships;
- mergers and acquisitions;

### **Objectives – Current and future goals**

A profound knowledge about the competitors' goals is certainly beneficial for a company since it facilitates a better prediction of how likely it is for them to modify their business strategy, in reaction to different competitive moves. For example, a competitive attack will more likely have generate a reaction from a competitor that is focused on reaching long-term profitability objectives, since companies looking for short-term financial goals might not be willing to spend much money, instead focusing on the products with positions that they can defend better (46) (47).

By observing, for example, which functions report directly to the chief executive officer (CEO), it is possible to determine what the company deems to be the more important occupations, i.e., the competitor's organizational structure, which provides clues if their goals are financial or other types (e.g.: growth rate, market share, technology leadership, etc.). Another way to determine the competitor's objectives is by observing other aspects of the company, such as: risk tolerance, management incentives, backgrounds of the executives, composition of the board of directors, legal or contractual restrictions, etc (45) (46) (47).

### **Assumptions**

The competitors' perceptions and assumptions about industry and business conditions their strategic decisions, i.e., what a competitor's managers hold about their firm and their industry help to define the moves that they will consider advantageous (47).

These assumptions are inaccurate in some cases and, consequently, may result in business opportunities. For instance, a case in which a company failed to introduce a new type of product in the past. New entrants may perceive that the industry executives most likely assumed that there is no market for the product and will have the opportunity to introduce a product similar to the previously unsuccessful

one without retaliation, due to the fact that their threat may not be taken seriously by incumbent firms (35) (46).

A competitor's assumptions may be based on a number of factors, including any of the following (47):

- beliefs about its competitive position;
- past experience with a product;
- regional factors;
- industry trends;
- rules of thumb;

A thorough competitor analysis also would include assumptions that a competitor makes about its own competitors, and whether that assessment is accurate (47).

### **Resources and Capabilities – Strengths and weaknesses**

Profiling the competitors, i.e., knowing what are its assumptions, objectives, and current strategy provides an understanding in how it might “want” to respond to a competitive attack. Still, it is its resources (financial reserves, capital equipment, work force, brand loyal and management skills, etc.) and capabilities (competences within each of major functions: R&D, production, marketing and distribution, etc.) that define its aptitude to react effectively (46) (47).

It is the competitor's strengths and weaknesses in the several functional areas that define its capabilities (see SWOT analysis in subchapter 4.4). With some further investigation, the SWOT and financial analysis can be used to assess the competitor's ability to increase its strengths in a given area, as well as revealing its viable growth rate (35) (46).

It is also important to evaluate the capacity of a competitor to react to changes in the environment. Given that the competitive environment is dynamic, some firms may be less prone to changes and linger for many years in the same direction before adjusting, while others may be capable of mobilizing and “find their feet” very rapidly (49).

## **Competitor Response Profile**

After collecting all the previous mentioned information regarding competitors, it can be compiled into a response profile of probable strategic decisions – both potential offensive and defensive moves – that might be made by them. This profile should provide an edge over the competitors due to the improved ability to predict their behavior and should even be of use to influence that behavior to the company's benefit (47).

### **4.4 Strategic Analysis – SWOT Analysis**

#### *SWOT - Strengths, Weaknesses, Opportunities and Threats*

Times are uncertain for all businesses worldwide. If strategic reflection has always been important, nowadays there are countless factors that caused it to have become indispensable for any business. The increased demand of customers and their diminutive loyalty, as well as a climate of economic deceleration are only a few examples of the factors that companies have to consider nowadays. It is therefore essential to give copious attention to the analysis of the company and its surroundings, thus allowing a SWOT analysis to be carried out successfully (36).

This analysis is the first stage of planning and helps marketers to focus on key issues. SWOT stands for: strengths, weaknesses, opportunities, and threats. Strengths and weaknesses are internal factors. Opportunities and threats are external factors (macro-environment) (50).

SWOT analysis devises some key objectives, which present a broad array of benefits and are defined below (37):

- To generate a synthesis of internal and external analysis, thus constituting, a valuable tool for development of a business strategy;
- To identify the key elements in the management of the company, allowing the establishment of priorities of action;
- To formulate strategic options - SWOT analysis allows to see clearly what risks should be taken into account and which problems

should be hastily solved, as well as the business advantages and opportunities to empower and explore;

- To provide a key element to forecast sales in conjunction with market conditions and the intrinsic capabilities of the company.

## **Strengths**

A company's strengths are its resources and capabilities that can be used as a basis for developing a competitive advantage. Examples of such strengths given by Thompson and Strickland (1998) include (37) (51):

- Technical skills or knowledge import – Know-how of low cost of production or technology, good customer service, development of innovative products, techniques of the merchandising and advertising;
- Physical assets – Facilities, equipment, locations and natural resources.
- Organizational assets – Systems of quality control, patented technology, customer base, production systems and computer-assisted design, information's systems and technologies.
- Human assets – Labor-qualified and experienced, talented and motivated employees in key areas, know-how built over time and implemented in the organization, management capacity and collective learning.
- Intangible assets – Brand image, the company's reputation, the loyalty of employees, positive climate work and culture organizational.
- Attributes that puts the company at an advantage position of the market – competitive capacities – Development of new products in a short space of time span, R&D, full utilization of production capacity, good relations with suppliers, organizational flexibility in response to the changing market conditions and emerging opportunities.
- Alliances or cooperation between companies – Development of protocols that convey advantages – technical, marketing, etc. – to the companies involved.

## **Weaknesses**

The absence of certain strengths may be viewed as a weakness. For example, Thompson and Strickland (1998) consider the following factors as weaknesses (37) (51):

- Deficiencies in technical skills or knowledge import;
- Absence of physical, human, organizational or intangible assets, which may be important from the competitive standpoint;
- Weak or nonexistent competitive aptitudes in key areas.

The ideal situation for a company is when its strengths compensate the weaknesses in a large scale. The strengths and weaknesses, resulting from the way the company manages its economic and financial resources, will be the basis of work that will ensure the viability and stability of the company over time.

However, in some cases, a weakness may be the flip side of a strength. Considering the case of a company that possesses a large amount of manufacturing capability; While this capacity may be considered a strength that competitors do not share, it also may be considered a weakness if the large investment in manufacturing capacity prevents the firm from reacting quickly to changes in the strategic environment (51).

## **Opportunities**

The external environmental analysis may reveal certain new opportunities for profit and growth. Some examples of such opportunities include (51):

- An unfulfilled customer need;
- Development of new technologies;
- Change of Legislation;
- Removal of international trade barriers;
- Business and product development;
- Etc.



## **Threats**

Changes in the external environmental also may present threats to the firm. Some examples of such threats include (51):

- Shifts in consumer tastes away from the firm's products
- Emergence of substitute products:
- New regulations;
- Increased trade barriers;
- Market demand;
- Socio-economic changes;
- Etc.

### **4.4.1 How to implement the SWOT analysis**

The SWOT analysis should be made and interpreted in an integrated manner, combining the elements of internal and external analysis, so that the diagnosis is clear and a reliable source of information and support, appropriate to the needs of strategic management, which in its term deals with decisions that will shape the future of the organization in the medium and long term (36)).

## **External Analysis**

Regarding the external analysis within the SWOT analysis – which aims to identify the major opportunities and threats which, at a given time, arise before the organization – it can be said that its importance is linked to the necessity that, whenever possible, managers and other decision makers should be able to predict possible forthcoming developments that may have greater or lesser impact on the future of that organization (36) (52).

An organization which realizes that the external environment is constantly changing and has the ability to adapt to this change, will seize more opportunities and will suffer with less impact the consequences of the threats, thence the enormous significance of the analysis of the external environment (52).

The implementation of SWOT Analysis can follow the following steps:

### **Step 1 - Compiling all the external factors of influence for the business**

In this stage, the sources of information will gather information regarding the Environment, the Market, the Competition and Consumers (37).

- Environment – The examination of the surrounding environment is based on PEST Analysis.
- Market – It is important to gather and synthesize information about:
  - Generic characteristics of the market - Determination of its full dimension, as well as characterization of the existing distribution channels;
  - Decomposition of the market in segments – Early detection of new market segments that can provide good opportunities for the company;
- Competition – Investigation on the status of the competitors, i.e., the products they produce and sell, their market positioning, their objectives, etc., since that these can constitute opportunities or threats for the company.
- Customers/Consumers – Thorough characterization of each of the existing market segments. For example, the determination of which are the most appreciated product's characteristics by the customers in their purchases (37).

### **Step 2 - Distinguish the threats from opportunities**

In this step, after completing the identification of the external factors with the ability to influence the business, they must be categorized as threats or opportunities (37).

After this classification, the next step will be the internal analysis of the company.

## **Internal Analysis**

In terms of inner analysis, SWOT analysis proposes the identification of key Strengths and Weaknesses characterizing the organization at a given time (52).

The identification the strengths and weaknesses has particular relevance for the aspects most directly related to the critical success factors of the organization. It is also important to note that consideration of a particular characteristic of the company as strength or weakness is always relative and potentially changeable, especially insofar as that major changes at the level of competition and its behavior may occur over time (52).

The correct classification of strengths and weaknesses gives the organization an important element for defining to its strategic direction, which will naturally tend to take maximum advantage of the strengths and mitigate the most of the weaknesses.

### ***Step 1 - Compiling all the internal factors of influence for the business***

In this stage, there will be made the identification of the factors that provide advantage to any company that operates in the same sector.

To carry out this internal audit must be taken into consideration issues such as (37):

- The recent development of the quantitative performance of the company;
- Sales volume and market share;
- “Penetration” of the company’s products in the potential customers or number of clients (evolution);
- Degree of “penetration” of the company’s products in key distribution channels;
- Analysis of costs and profitability of different products.

Points of interest in the company's internal review (37):

- Sales & Marketing Area - Product, price, ticket and communication;

- Financial Area - Profitability ratios, average collection period, payment;
- Shopping Area - Degree of dependence on suppliers, cost of packaging, quality of the materials and rupture of stocks;
- Area of Human Resources - Definition of the functions of each job, number of employees and human resources customer-oriented;
- Production Area - Meeting deadlines, economies of scale and facilities/equipment.

### **Step 2 - Distinguish the threats from opportunities**

Analogously to the internal analysis, after completing the identification of the internal factors with the ability to influence the business, they must be categorized as strengths or weaknesses (37).

After this classification, the next move will be the building of the SWOT matrix and its analysis.

### **Building and analyzing the SWOT matrix**

The SWOT matrix will be build based in the previous analysis and will be devised in 3 stages, being that the third step will be the analysis of the built matrix, which will have an aspect similar to the following picture (Figure 5):



Figure 5 - Example of a SWOT matrix template (53)

### Step 1 – Identify the impact of all the factors on the business

In this stage, there will be made the assessment of the level of impact that each factor has on the company or on the product (classified using a scale. For example: high impact, medium impact, low impact) (37).

### Step 2 – Identify the future trends of these factors on the conduction of the business

Since the level of impact of a particular factor suffers fluctuations over time, after classifying the current impact of each factor, it must be carried out the determination of the elements that can change the degree of impact of that factor (tendency to increase, maintain or decline) (37).

### Step 3 – Development of strategies based on the analysis made

Focusing on the objective of developing strategies that take into account the SWOT profile, a variation of the SWOT matrix can be constructed. This variation of the SWOT matrix (also known as a TOWS Matrix<sup>1</sup>) is shown below (Figure 6) (37) (51):

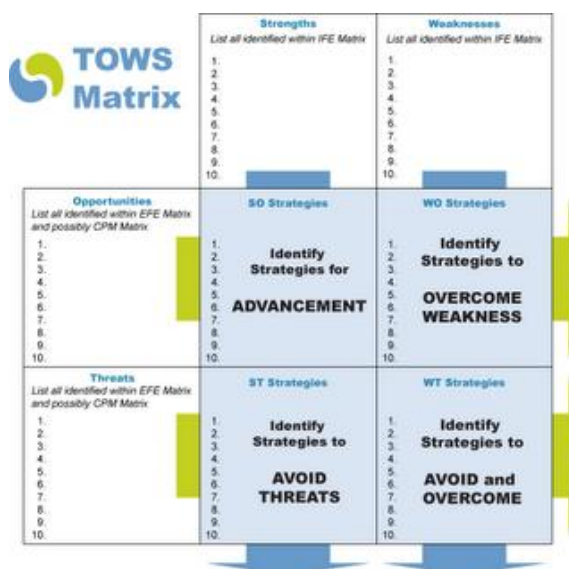


Figure 6 - Template of the TOWS matrix (54)

<sup>1</sup> TOWS Analysis is a variant of the classic business tool, SWOT Analysis. TOWS and SWOT

**S-O strategies** – Seizing opportunities that are a well fitted to the company's strengths so that the company can evolve and become more competitive (55);

W-O strategies – Seizing possible opportunities in order to overcome the existing weaknesses (55);

S-T strategies – Development of tactics using the company's strengths with the goal of reducing the vulnerability to external threats (55);

W-T strategies – Establish of a defensive plan to prevent the firm's weaknesses from making it exceedingly susceptible to external threats (55);

SWOT analysis can be very subjective since the final version depends on the person that executed the analysis. TOWS analysis is extremely similar, being the main difference between them the fact that in a TOWS analysis, the negative factors must be taken into account first, in order to turn them into positive factors. Therefore, for building a successful SWOT or TOWS analysis, there are some aspects that should not be forgotten (55):

- “It is imperative to be realistic about the strengths and weaknesses of the organization when conducting a SWOT analysis.
- SWOT analysis should distinguish between where the organization is presently, and where it could be in the future.
- SWOT should always be specific, avoiding “grey areas”.
- SWOT should always be applied in relation to the competition i.e. *better than* or *worse than* the existing competitors.
- SWOT should be kept short and simple, avoiding complexity and over analysis.”

## 4.5 White Paper

A white paper is an authoritative report or guide that usually states concerns and presents the best method to solve them. A white paper classically argues a specific position or solution to a problem. Granting white papers take their roots in governmental policy, since the beginning of the decade of 90, the term "white paper" has also started to be employed when in reference to documents used by companies as a marketing tool, asserting that the benefits of their technology or product are superior for solving a specific problematic (56) (57).

Being a marketing tool, a commercial white paper will highlight information favorable to the company, and can be of three types (56):

- Business-benefits: Makes a business case for a certain technology or methodology;
- Technical: Describes how a certain technology works;
- Hybrid: Combines high-level business benefits with technical details in a single document.

As Michael Stelzner, author of *“Writing White Papers: How to Capture Readers and Keep Them Engaged”* states: “There are really only two ways to write white papers: by focusing on your self-interests or by concentrating on the interests of your readers” (57). He then declares that the self-interest approach usually focuses exclusively on a product, service or solution by clarifying its benefits, features and implications, and normally is an ineffective approach to writing that turns most readers off immediately. Therefore, he recommends focusing on the needs of the readers, which can be effectively accomplished by leading with the problems that the presented solution overcomes, rather than the details of the actual solution itself (57).

# CHAPTER 5

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## 5 PROJECT DEVELOPMENT

After presenting the BlueWorks projects and the concepts inherent to their correct understanding and interpretation, this chapter is an exposition of the work completed this year, divided by project.

### 5.1 EyeDropper

#### 5.1.1 Market Segmentation

In this segmentation, it was tried to group the possible clients for EyeDropper in homogeneous groups, using the common needs/requirements as a key factor for segmentation. Hence, given the characteristics of the devised clients, it was decided to use the Industrial Market Segmentation.

Therefore, the existing markets for a product with characteristics such as EyeDropper (see Subchapter 3.2) can be grouped in three main categories:

- Pharmaceutical Research Companies (with eye-deliverable drugs);
  - Clinical Trials groups
- National Health Systems (Clinical);
  - Public Hospitals
  - Private Ophthalmologist/Ophthalmology Clinics;
- Others
  - Health Insurance Companies;
  - General Public;

The benefits of using such system are directly related to the field of application of the technology, but in general will be related to a decrease in costs, and an increase in data quality.



We will briefly cover the benefits expected in the three main fields of application of this technology.

### **Pharmaceutical Research Scenario:**

- Location: not relevant.
- Company Type:
  - Size – Average of about 7850 volunteers that participated in clinical trials involving the application of eye drops, just for the five largest pharmaceutical companies in the last 3 years.
  - Decision making unit – Few decision makers (clinical trials responsible or management board).
- Behavioral Characteristics:
  - Usage rate – Expected 10% of market share (Average of 785 devices active at least half of the year).
  - Purchasing Procedure – A set of devices would be sold or rented to the entity responsible for the clinical trial, and a fee would be charged by user/drop.
  - Buying status – Very attractive potential buyer. Average expenditure of 384 M € / year in research of new drugs for topical application in the field of ophthalmology.

During the development process of a new drug, there are several clinical trials that must be performed. These trials are divided in phases (zero to four), where first phases are related to safety and tolerability in humans, and the last ones to effectiveness and long-term safety surveillance (58).

As a drug progress through the several phases, the number of persons included increases but the detail in monitoring decreases. As an example, in a phase zero clinical trial, volunteers might be permanently monitored for vital signs, but in a phase 4 they are permanently at home, and dislocate themselves to the clinical trial center once a week.

In both cases, there is always a strict need to assure patients are complying with the prescript regimen, and if in the initial phases this assurance is made by physicians, nurses and researchers, in the latter

ones, and due to the number of patients involved, this is a more difficult issue to solve.

Our research in current solutions - which will be explored in more details in this document - showed that they range from hotel renting, through paying volunteers for daily dislocations, flask weight and performing no control at all.

Accordingly to a new company devoted to pill compliance validation (59):

*“Estimates of the number of patients enrolled in clinical trials who do not take the study drug as prescribed range from 15% to 50%. Trial participants not taking the study drug as prescribed confound results, which can drive an increase in enrollment by as much as 40%.”*

Advantages of BlueWorks solution are a reduction in current costs and the assurance of quality data, which in turn may lead to new specificity awareness, new drugs, and better healthcare in general.

### **Clinical Scenario**

- Location: not relevant.
- Company Type:
  - Size – There are 2.2 hospitals per 100 thousand inhabitants, in a total of more than 221 public hospitals (60) and around 10 thousand private units (61) in Portugal only.
  - Decision making unit – Few decision makers (management board of hospital or private unit)
- Behavioral Characteristics:
  - Purchasing Procedure – Preferably the device or set of devices would be bought and an annual fee for maintenance would be charged.
  - Buying status – Attractive potential buyer.

As mentioned in the Subchapter 3.2, a substantial extent of patients fails to correctly auto-administer drops to the eye, which in for some diseases (e.g. glaucoma) may lead to irreversible blindness. In these cases, physicians may adopt more aggressive drugs and treatments (surgeries) due to their erroneous perception of

pharmaceutical ineffectiveness, which translates in an unnecessary increase of therapeutic costs and waste of resources.

A device which allows to correctly assessing patient compliance greatly reduces the mentioned possibilities, and will allow more people to retain their sight.

### **Others Markets Scenario**

- Location: not relevant.
- Company Type:
  - Size – There are several Insurance Companies in Portugal that deal with Health Insurances, being 9 of them the most well-known<sup>2</sup> (62) and representing 17,2% of the total direct insurance of the non-life branch (63). In the case of the public in general, worldwide, 66.8 million people suffer from primary glaucoma, being that 6.7 million suffer from bilateral blindness;
  - Decision making unit – Few decision makers in the case of Health Insurance Companies and many decision makers in the case of general public.
- Behavioral Characteristics:
  - Purchasing Procedure – In the case of Health Insurance Companies, the device would be rented for a given time, and a fee would be charged per drop. For the general public, the device would be bought and an annual fee for maintenance would be charged.
  - Buying status – Not able to determine in the case of Health Insurance Companies. Not attractive for the public in general.

For this product, there are other possible markets. In the case of Health Insurance Companies, there might be a possible interest in a product with these characteristics in order to follow up an insured patient after a surgery, with the objective of assessing the compliance, thus eliminating the possibility of non-compliance in case of necessity of a second surgery due to the progression of the disease. Due to lack of

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<sup>2</sup> Allianz Saúde, Vitalplan, Açoreana Imed, Seguro BES Saúde, Caixa Seguro Vida, Multicare, Plano de Saúde Médicis, Protecção Saúde, Soluções Saúde Tranquilidade

experience, we are unable to determine the attractiveness of this market. On informal discussions we have obtained mixed feedbacks, with people for and people against the definition of this market as one to explore.

On the other hand, the general public represents an even smaller slice of market, and for an even more specific segmentation it should be used Customer Market Segmentation. However, being that the cost/benefit for the end-user in this market makes the commercialization of the product almost impracticable, causing the market to be non-attractive for BlueWorks, the segmentation of the general public into smaller segments was not carried out.

### 5.1.2 Delineation of the Target Market

Following what was said in the previous sub-chapter, we were able to devise six distinct markets for EyeDropper, each with its different gains. The Clinical Trials Market, however, is sub-divided since in the same market there are two business models or approaches that can be made. Therefore, in order to approach any of these, there's the need of using a dynamic strategy, with different arguments and business models. The devised markets are (Table 2 to Table 7):

Table 2 - Clinical Trials Market

<b>Market 1</b>	Clinical Trials - Compliance solution for Pharmaceutical / Contract Research Organization (CRO)
<b>Market Location</b>	Worldwide
<b>Distribution</b>	Direct sales, commissioned sales forces
<b>Who will buy?</b>	Pharmaceutical companies that operates in ophthalmology clinical trials area
<b>Why will the costumer buy?</b>	EyeDropper can be used in ophthalmology clinical trials aiding in the assessment of voluntaries compliance providing objective and in real-time data.

	As an alternative, it also can be used as an auxiliary tool in case of a revalidation of a drug, since 60-70% of drugs fail in phase 2.
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**Table 3 - Clinical Trials Market as an add-on**

<b>Market 2</b>	Compliance add-on for ePRO's <sup>3</sup> providers
<b>Market Location</b>	Worldwide
<b>Distribution</b>	Not applicable (n.a.)
<b>Who will buy?</b>	Companies that deals with ePRO products.
<b>Why will the costumer buy?</b>	EyeDropper can be useful to "players" already consolidated in this market, since it brings to "the table" the added value of the compliance assessment as an add-on to already marketed product ePRO

**Table 4 - Private Units Market**

<b>Market 3</b>	Private Ophthalmology care providers
<b>Market Location</b>	Worldwide
<b>Distribution</b>	Direct sales, commissioned sales forces
<b>Who will buy?</b>	Private ophthalmology clinics
<b>Why will the costumer buy?</b>	Increased vision-retention rate by the patients, with a return of investment in the first year.

**Table 5 - Public Units Market**

<b>Market 4</b>	Public Ophthalmology care providers
<b>Market Location</b>	Worldwide
<b>Distribution</b>	Direct sales, commissioned sales forces
<b>Who will buy?</b>	Public Ophthalmology units, Healthcare
<b>Why will the costumer buy?</b>	It allows a reduction in the number of unnecessary surgeries, and an improvement of resources

<sup>3</sup> "A patient-reported outcome or PRO is a questionnaire used in a clinical trial or a clinical setting, where the responses are collected directly from the patient" (64)

	<p>allocation, since it allows amelioration in efficacy of therapies.</p> <p>Also, active population blindness prevention has economic added value from tax income, instead of social expenses due to the impairment.</p>
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**Table 6 - Health Insurance Companies Market**

<b>Market 5</b>	Health Insurance Companies
<b>Market Location</b>	Worldwide
<b>Distribution</b>	n.a.
<b>Who will buy?</b>	Insurance Companies
<b>Why will the customer buy?</b>	Assurance of therapy success, allowing minimization of the spending with each patient.

**Table 7 - General Public Market**

<b>Market 6</b>	General Public
<b>Market Location</b>	Worldwide
<b>Distribution</b>	Over the counter – pharmacies, specialized shops dealing with vision-aid devices, etc.
<b>Who will buy?</b>	Medium-upper class individuals with any family member not home-cohabitant, with eye problems - requiring application of drops - that will evolve faster to blindness if not correctly treated.
<b>Why will the customer buy?</b>	If one uses this device in order to keep up with the therapy of a family member, he or she will have maybe 2 or 3 more years of vision before going blind.

The benefits of using the system are directly related to the field of application of the technology, but in general they will be related to a decrease in costs and an increased data quality, providing an objective evaluation of patients compliance (image) instead of the existent subjective methods (patients compliance diary, the weight of the flask between visits, etc...).

For the alternative market mentioned in the Table 3, it would be necessary to make physical changes in the device so that it would fit in the line of ePRO's, where it is believed that lies the future of medicine.

Increasingly, health care walks towards the emergence of the personalized medicine, something which is supported largely by the U.S. President Barack Obama. It would thus be interesting to adapt the EyeDropper so that it could be used as an "electronic journal" besides its basic role of compliance evaluator. In this scenario, there would be created a system of input that would allow the user to provide immeasurable physical data such as symptoms, state of mind, among others.

In this sense it could also be used for remote evaluation of other parameters, such as: the degree of eye inflammation – by redness of the eye – or to conduct surveys by voice, using the technology of "voice call" that already exists in mobile phones.

In order to achieve this market delineation, we resorted to discussions with ophthalmologists, with patients suffering from chronic eye diseases, discussion with clinical trials coordinators and with insurance companies' consultants.

### 5.1.3 Market Positioning

Although the validation of compliance in ophthalmology is still a small niche, there are already some solutions addressing this problem (See Subchapter 3.2).

In a concept comparison, EyeDropper is expected to be more precise and reliable assessing compliance than other devices, but is still in a preliminary stage of development, and it is expected to have a higher price of commercialization (due to its technical complexity).

The competition products have the same target market, although they are very less technologically evolved and have very big limitations regarding their subjectivity in the compliance evaluation.

In order to determine the products market positioning, we resorted to research on the competition, interviews to people with expertise in the area and surveys, among other approaches, and were able to devise

the following positioning in relation to the other existing solutions in the market (Figure 7):

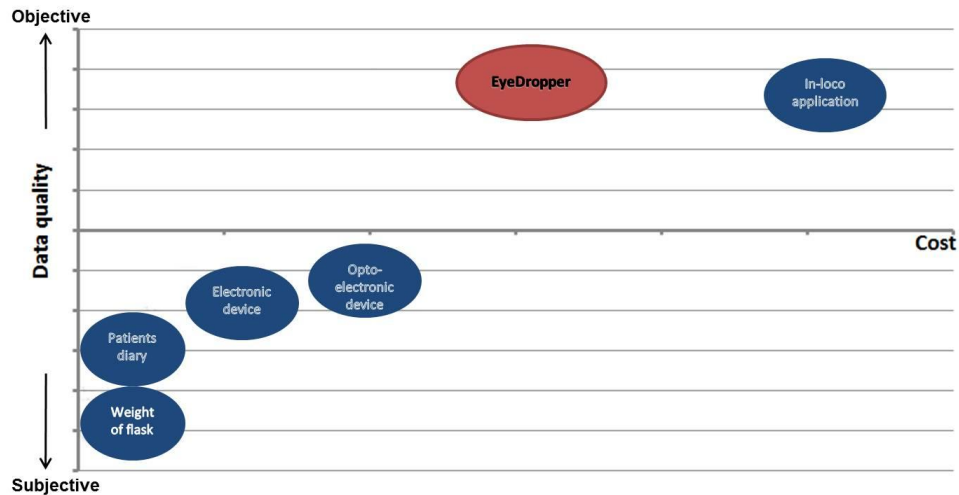


Figure 7- EyeDropper market positioning

### 5.1.4 EyeDropper's Financial Projections

The EyeDropper was developed from the beginning envisioning its internationalization due to the intrinsic global nature of the project. However, financial projections envisioning the commercialization of the product must be made, therefore, we established that the product will first be commercialized to the Iberian Peninsula, and then will be expanded to the rest of the European Union (EU), and from there to the rest of the world.

With this in mind, the Market Dimensioning was calculated, and based in it, it was estimated the sales volume and calculated the expected market share, as well as expected market commissions, calculated the gross income, the Cost Of Goods Sold (COGS), and some other financial ratios. Some of the projections were already previously developed using a template provided by ISA, so the work was not made from scratch, and in large part was only filling in the blank spaces with adequate values. Also in this case, the projections were mainly focused on EyeDropper (the previous work comprised EyeDropper and OphthalSuite), updating and tuning the values used in the whole financial plan, – i.e. expected sales, royalties, recommended



retail price (RRP), number of workers per year, etc. – being the expected market share, sales volume and the expected market commission the only projections made in full.

Noteworthy, only the clinical research scenario and the private and public health units' scenario were considered.

For example, for the Global Market Commission prevision, the obtained graphic is the following (Figure 8):

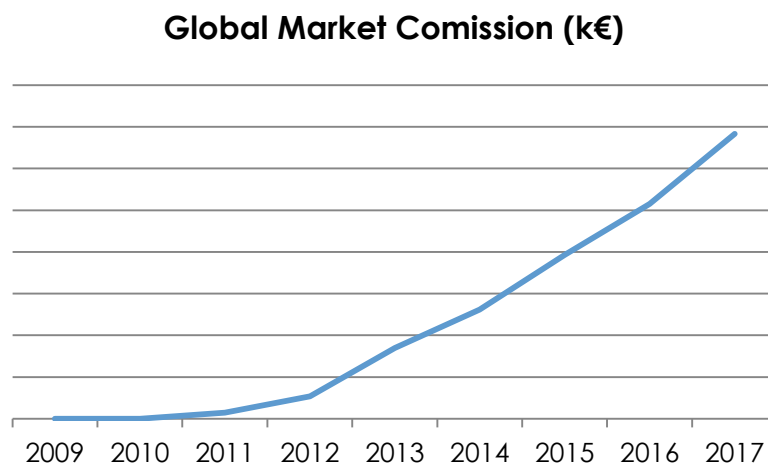


Figure 8 - EyeDropper's expected global market comission per year

Since the obtained results in detail are classified, the used scale was not displayed. However, depending on authorization from the BlueWorks Company, all the results can be consulted in the Annex G.

### 5.1.5 Preparation of Surveys for physicians and pharmaceutical companies representatives

The definition of the pricing model to apply to EyeDropper was and still is one of the biggest concerns in BlueWorks. Due to our lack of sensibility in that sense, we were unable to reach a consensus for the definition of the optimum price or business model to apply.

For that reason, pointing towards a better definition of the pricing model to apply to the EyeDropper while assessing its commercialization

viability, in addition to a meeting with the previous Head of Clinical Trials unit of BIAL, a primary set of two different online surveys was elaborated in order to send them to physicians and pharmaceutical representatives and, so, obtaining a certain “feeling” regarding the pricing to execute.

Later, the survey that initially comprised 8 Questions to Researchers and Clinical Trials Managers was transformed into a shorter version with 3 questions, due to the counseling and feedback given by one of BlueWorks partners.

The surveys can be consulted in the following links:

Physicians Survey – <http://bit.ly/ck9aBc>

Researchers and Clinical Trials Managers Survey – <http://bit.ly/9GEz4P>

Short Version – <http://bit.ly/cYhubx>

#### **5.1.6 Elaboration of a list of contacts of Domestic and Foreign contacts in the clinical trials field**

In order to obtain a significant amount of feedback from the surveys mentioned in the previous sub-chapter, it was important to send them to as many people – involved in the clinical trials area – as possible.

Hence, using the social networks (e.g.: LinkedIn) and Google research, a list of 103 contacts of several pharmaceutical companies that operate in the clinical trials area involving eye drops as created, mainly in Europe and USA.

The obtained results are property of BlueWorks, and can be found in Annex H (jury or students) upon request.

## 5.2 Atlas 3D

### 5.2.1 Competition Analysis

The developed report aimed to compile and analyze any kind of competition to the Atlas 3D project, whether it's direct or indirect competition, as well as the target market of each product.

Before depicting a company's products, a small summary of the company's profile, their clients and partners was made. Then, a predetermined set of features was analyzed in order to create a line of reliable comparison between all the competitors. This analysis was as complete and thorough as possible and a list of 12 companies and 16 products was compiled.

The chosen characteristics of the competitors to observe were devised to better answering the following questions that comprise a thorough competition analysis:

- Who are the competitors?
- What is the profile of our competitors - strengths and weaknesses?
- What are the objectives of our competitors - what threats do they pose?
- How is the firm compared to these competitors?

However, there are some questions that remained unanswered due to lack of experience, sensitivity in some aspects and lack of means to take the analysis to a further step (for example the inability to acquire any financial information regarding the existing competitors). The questions that are still without response are:

- What can be learned from competitors?
- How are our competitors likely to respond to any changes to the way we do business?

For instance, analyzing a direct competitor for Atlas 3D - therefore known as Company X – the obtained profile is something similar to the following:

- **Company Summary:** *Company X* brings qualified industry and medical expertise together with state-of-the-art creative services— in full color, high motion 3D animation, and it is based in Coimbra, Portugal with an International office in Madrid, Spain.

- **Contacts:** Street A, number 100.
  - Telephone: 239 123456
  - Fax: 239 654321
- **Partners:** Company Y, Company Z.
- **Clients:** The highlighted blue countries (Figure 9)

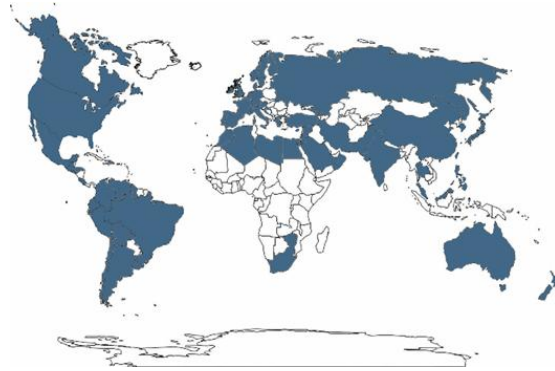


Figure 9 - The selected blue countries currently have a working relationship with “Company X”.

The product commercialized by Company X – therefore known as Product X – was depicted similarly to the following:

**URL:** [www.companyx.org/productx](http://www.companyx.org/productx)

**Target market:** Ophthalmology professionals (patient education).

**Type of Atlas:** Fully Online.

**Eye Diseases covered:** Astigmatism, Cataracts, Diabetic Retinopathy, Glaucoma, LASIK Eye Surgery, Low Vision, Macular Degeneration, Near / Far Sightedness, Ocular Implant, Presbyopia.

**Strengths:** Over 50 animated topics, oral explanation of disease and its symptoms, 3D videos.

**Weaknesses:** Lack of interactive models of the eye.

**Price/Business model:** \$ 125/month – 10 licenses. More computers can be added at any time in increments of 5 licenses.

## Screenshots:

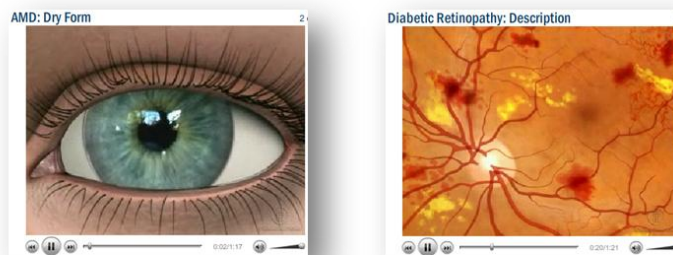


Figure 10 - Screenshots of "Product X" by "Company X"

Noteworthy, the depicted profiles of Company and Product are merely fictional. The completed profiles possess confidential information, but can be consulted in the Annex I depending on authorization from the BlueWorks Company.

### 5.2.2 Market Dimensioning

In the elaborated report, it is also presented the market dimensioning for the 3D Eye Atlas product. This analysis is relevant to all of BlueWorks projects, since the common strand between the various projects relates to the fact that all these R&D projects define, as the expected output, a set of innovative products with a broad spectrum market.

As is, the target market consists in ophthalmologists, medical students and medical residents, and its expansion will be sub-divided into the following phases:

1. First Phase:
  - i) Portugal;
  - ii) Remaining European Union<sup>4</sup>;

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<sup>4</sup> Since not all countries in the EU would be attractive as a market for a product with these characteristics, we opted to analyze the countries with a PIB *per capita*  $\geq$  80% of Portugal's PIB *per capita*, or the EU recent entries. The considered countries were: Austria, Belgium Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, Turkey, Ukraine, and United Kingdom.

- iii) USA;
- 2. Second Phase:
  - i) Latin America, with particular focus on Brazil and Argentina;
  - ii) Middle East and Asia, with particular focus on India, China and Japan.

The data obtained from this research (33 countries analyzed) was extrapolated up to the year of 2015 and the results obtained were presented in the form of tables and graphics.

The following is an example of a graphic – real and extrapolated data – regarding the number of ophthalmologists, medical students and medical residents in Portugal (Figure 11):

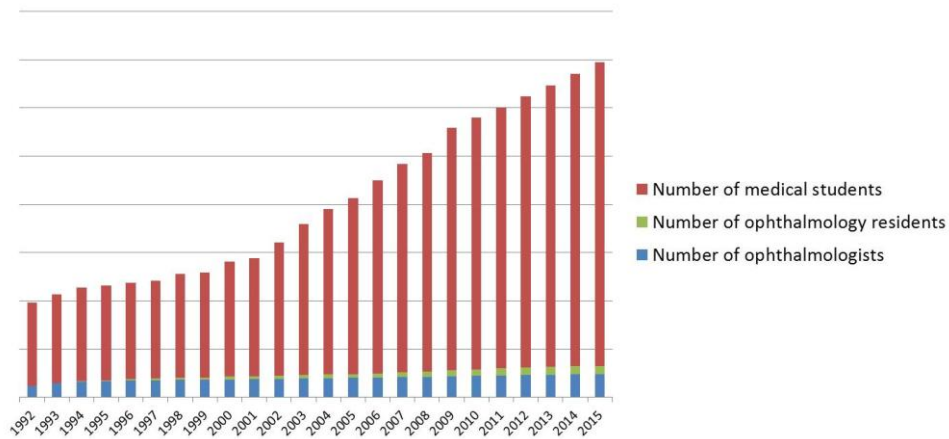


Figure 11 - Ophthalmologists, medical students and medical residents in Portugal.

Worth mentioning, being this classified information, the units are not shown here in the represented graphic. However, these and the rest of the market dimensioning results can be consulted in the Annex J upon authorization from the BlueWorks Company.

### 5.2.3 Web 2.0

The recent growth of online social networks has been remarkable, with sites such as MySpace, Linked-In, and Facebook receiving millions of members. Alongside these general networks, were created the medical social networks that play an important role, enabling health professionals to easily connect, exchange ideas conveniently, collaborate across the globe and find information on the basis of trusted relationships. For that reason, a research of the existing medical social networks, their common features, specialties covered and average number of members and the generally used business model was made. Around 15 medical social networks were found, some exclusive for physicians, others opened to all healthcare personnel, being that most of the networks use sponsored publicity as an autonomous business model, despite one using a subscription fee. A research of the common features between the existing networks plus a compilation set of possible features to implement was also elaborated.

The elaborated report contains classified information classified but can be consulted in the Annex K depending on authorization from the BlueWorks Company.

## 5.3 Ophthalsuite

### 5.3.1 White Paper

For marketing purposes, it was decided to write a White Paper on the OphthalSuite. Since that neither element of BlueWorks had any previous experience in this field, it was used the “How to Write a White Paper – A White Paper on White Papers” by Michael Stelzner as a guide, and some White Papers on IT solutions found on the internet.

The developed White Paper can be consulted in the Annex A.

## 5.4 Other Tasks

### 5.4.1 Business Plan

The first task addressed in this project, was continuing the previously developed draft of the company's business plan. This previously developed work had a narrow scope, limited to the EyeDropper and therefore did not comprise all the products from the BlueWorks portfolio. In a later stage, due to the very different nature of these, it was decided to separate them in different business plans, although this was never done.

Despite the work developed regarding this issue, the Business Plan is still a work in progress, and being property of BlueWorks, it can be found in Annex L (jury or students) upon request.

### 5.4.2 Application and participation in “Arrisca Coimbra” contest, '09 edition

The contest named “Arrisca Coimbra” is an annual business ideas competition that targets to encourage the development of business concepts, and whose main goal is the creation of new business companies.

Applicants could be single persons or collective entities that aimed at exploring an idea or business concept. Applications could be submitted by individuals or teams of up to 5 promoters of the idea presented to the competition, in which at least one must be a student or recent graduate of the Higher Education of Coimbra for less than three years.

Therefore, the application for this contest using the EyeDropper idea was developed, following a provided template that comprised the subsequent points:

- Identification of the promoters;
- Brief description of the business idea;
- Description of the competitive advantages of the business idea;
- Preliminary analysis of the economic viability of the idea;



- SWOT Analysis of the Idea;
- Motivation of the promoters and their involvement in the realization of the idea.

The evaluation of the various proposals was made by a jury that took into account the following aspects:

- a) Feasibility;
- b) Originality;
- c) Profile of Promoters;
- d) Ability to synthesis;
- e) Sustainability.

After submitting the application, BlueWorks received the news that it had passed the first evaluation and was now scheduled to make an oral presentation to the jury. On the due day, it was presented the business idea which was well received since BlueWorks was later contacted with an invitation to the awards ceremony, where a presentation with audiovisual support would take place. In awards ceremony, after a final presentation to the presents, BlueWorks and the EyeDropper project were contemplated with the *iParque innovation prize*.

Following up the presentation, BlueWorks was also invited to present the company to the FINICIA platform (see next subchapter).

The application and presentation can both be consulted in the Annex B.

### 5.4.3 Presentation to the FINICIA Platform

FINICIA is a program that facilitates access to financing solutions and technical assistance in setting up businesses or companies in early stage of its life cycle that have differentiator business projects, close to the market and with potential economic valuing.

As been said in the previous subchapter, BlueWorks was invited to make a presentation of the project eyedropper to a collective of entities within the platform FINICIA. There were also presented all the remaining projects of the company and the synergies between them (Ophthalsuite, Child Vision-Screening Tool and Atlas 3D).

The entities present in the meeting were:

- Francisco Pegado – IAPMEI
- Deolinda Estevinho – GATS, University of Coimbra
- Isabel Sá – CEC
- Cristina Crespo – OPEN

The received feedback from representatives of these bodies was positive. The project was praised and branded as "a project with an innovative character", "interesting" and "with value to the society."

Of note, this presentation was developed directed to attract possible investors – using an ISA presentation with the same objective as a guide – and can be consulted in the Annex C.

#### 5.4.4 Application and participation in the EEVC Semi Final in Lisbon '09

The *Eurecan European Venture Contest* (EEVC) is organized by Europe Unlimited and Eurecan, with the intent of finding, evaluate and award world-class innovative companies with the potential to dramatically impact their industry and contribute to increasing European competitiveness and growth. It also aims to help the Companies by providing access to top-level international partners, advisors and financiers.

The elaboration of the application to this contest was carried out using the EyeDropper project and was later presented in Cascais. As in this contest a more profound demonstration of the company's status and growth rate was necessary, the developed presentation focused more on this aspects rather than the technology involved in the developed products. Therefore, some graphics on the predicted Sales Volume per product (Figure 12) and Sales Forecast for both OphthalSuite and EyeDropper (Figure 13) were prepared and included in the presentation:

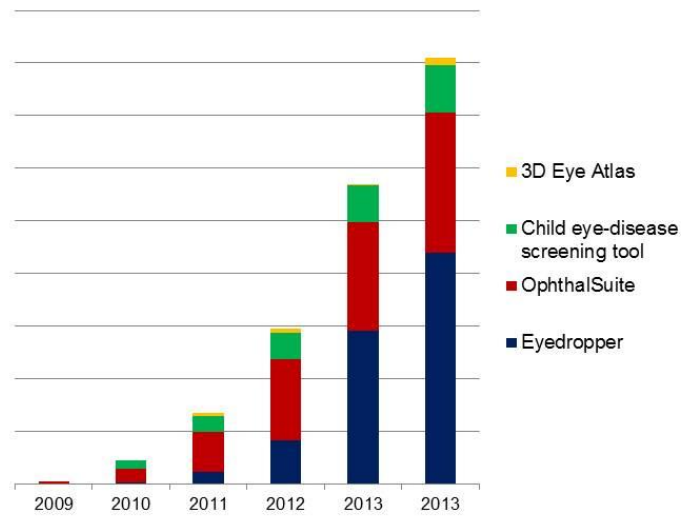


Figure 12 - Sales Volume per Product.

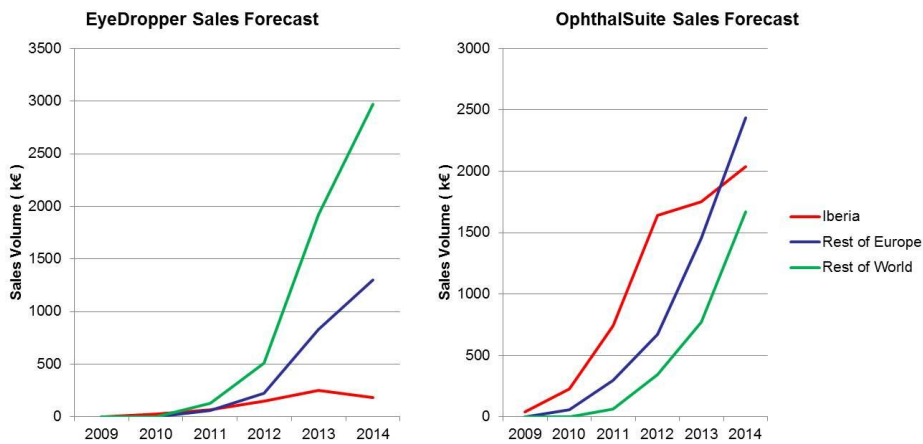


Figure 13 - Sales Forecast for EyeDropper and OphthalSuite

BlueWorks has not won any award but the developed contacts during the presentation day were a valuable compensation. They were:

- The Responsible by the Transaction Advisory Services of Ernst & Young in Portugal;
- A Partner of Transactions Advisory Services of Ernst & Young;
- The Academic Computer Science Program Manager (Microsoft);
- The Microsoft EU Grants Advisor;
- The CEO of Prodigentia.

The elaborated presentation can be found in Annex D and the feedback report, being property of BlueWorks, can be consulted in Annex M (juri or students) upon request.

#### 5.4.5 Application and Participation in the INOVPOINT Contest organized by TaggusValley

TAGUSVALLEY is the manager and promoter entity of the "Tecnopolo do Vale do Tejo".

This Technopole was created from a partnership between the Municipality of Abrantes, the NERSANT – Region Business Association of Santarém – and the Polytechnic Institute of Tomar, and consists in a Technology Park which offers a set of infrastructure childcare facilities and services of high quality and innovation to the businesses and to the economic and social actors in the region.

INOVPOINT is a Center of Innovation and Incubation for up to 28 companies, whose promotion went through the conduct of a series of workshops on the formation of corporations and business strategies, culminating with a competition between companies, in which the BlueWorks took part on November 27.

This initiative included a set of seminars, and a demonstration to a jury. A presentation of the EyeDropper concept and a business plan using the given template were elaborated, which granted the Second Prize to BlueWorks.

The elaborated presentation can be consulted in the Annex E.

#### 5.4.6. Application and participation in “Arrisca Coimbra” contest, '10 edition

This is the third edition of "Arrisca Coimbra", being this year's edition sponsored by: University of Coimbra, Academic Association of Coimbra (AAC), Polytechnic Institute of Coimbra, IPN Incubator, Coimbra iParque, Commercial and Industrial Association of Coimbra (ACIC), Businessmen

Club of Coimbra and the National Association of Young Entrepreneurs (ANJE).

The contest premises are maintained and in the 2010 edition, there are 13 monetary prizes, with value amounting to 38 500 Euros.

This year, BlueWorks will enter the contest with the “Child Vision-Screening Tool”. The template for the application has some differences in relation to the '09 edition, including the inclusion of a summary of the business idea to publicity effects, which in BlueWorks case will be the following:

“With the emergence of government-sponsored computers for children (in Portugal there is the “Magalhães”, a standard notebook that is distributed to all children once they enter primary school at 6 years of age), the existence of a platform with a homogeneous hardware and available to all children, presents as a great opportunity to the so called medicine 2.0.

In this project, BlueWorks, along with several partners, intends to develop a concept conceived by the current president of the Portuguese Society of Ophthalmology: Create a computer game installed on these standardized computers, that when “played” by the children (as long as supervised by a teacher) may collect information regarding their visual function, allowing early detection of eye tracking, some of these (5%) corresponding to potential amblyopia, which in case they are left untreated will develop into complete and irreversible monocular blindness.”

The contest will only occur on October, and the rest of the application form can be consulted in the Annex F.

## 5.4.7. Strategic Analysis

### 5.4.7.1. Contextual environment study - PEST Analysis

As mentioned in the Sub-Chapter 4.2.1, the contextual environment of a company in a PEST analysis can be divided into four distinct contexts:

- **P**olitical-legal;
- **E**conomic;
- **S**ocio-cultural;
- **T**echnological.

#### **Political-Legal Context**

In order to develop a careful study of this issue and correctly analyze the political stability, economic policies and legal framework surrounding the company, it was decided to consult the *Stability and Growth Plan (SGP)* (in Portuguese: *PEC – Plano de Estabilidade e Crescimento*) so there would be an enhanced understanding of the labor market policies and economic policies imposed on this sector.

It was concluded that the new SGP – that has been recently approved by the Portuguese Government – bases its assumptions on the expansion and technological development with some new guidelines implemented for this plan to become feasible and meets its objectives.

Some of the measures outlined in the SGP are (64):

- Diversification and technological improvement of exports;
- Reforms in the labor market;
- Improvement in the business and reduction of the cost of contexts;
- Promotion of internationalization;
- Betting-on technology and innovation;
- Encouraging private investment;
- Public initiative investments.

It should be stressed that, despite the economic conjecture nationally and internationally and prevailing uncertainties that still

surround the society, the company based in Portugal is positively supported by the SGP. This is enhanced by the following paragraph withdrawn from the SGP that quotes:

*“The resumption of economic growth should focus on increasing exports, the recovery of private investment, boosting investment in modernizing public initiative, as well as in reducing foreign/external dependence on key areas for growth, as for instance, goods and services in technology and energy. This process will be supported by policies aimed at improving the competitiveness factors of domestic production, namely innovation, qualification, scientific and technological capacity, business environment and enhancing productivity growth in a context of wage moderation.” (64)*

It was also consulted the “*Doing Business 2010: Reforming Through Difficult Times*”, which is an annual report investigating regulations that enhance business activity and the ones that restrain it. The research on this report was with the main objective of assessing the mean time that is required to the opening of a new business and all parameters that are associated with this activity.

We can see in the table below the indicative figures for Portugal, for the average number of days it takes to open or close a business of small / medium size, as well as the number of procedures that are required, the cost in terms of % of income per capita and some other aspects (Table 8 and Table 9).

**Table 8 - Indicatives on Starting a Business in Portugal (65)**

<b>Starting a Business</b>	Procedures (number)	6
	Time (days)	6
	Cost (% of income per capita)	6.4
	Min. capital (% of income per capita)	33.5

**Table 9 - Indicatives on Closing a Business in Portugal (65)**

<b>Closing a Business</b>	Recovery rate (cents on the dollar)	69.4
	Time (years)	2.0
	Cost (% of estate)	9

It can be seen that nowadays, a business takes an average of 6 days to be legally running. Comparing this data with data from previous years, there can be verified an improvement in the bureaucracy and time needed, as well as a reduction in the cost involved, which favors the appearance of new businesses (Table 10) (65):

Table 10 - Starting a Business data in Portugal (65)

Starting a Business data	Doing Business 2008	Doing Business 2009	Doing Business 2010
Rank	..	39	60
Procedures (number)	7	6	6
Time (days)	7	6	6
Cost (% of income per capita)	7.0	7.0	6.4
Min. capital (% of income per capita)	34.7	34.3	33.5

Also analyzing the same report, we thought deems to refer the ease of doing business in Portugal. Therefore, in the image below (Figure 14), it can be noted that, in terms of "ease to do business", Portugal is ranked in 48<sup>th</sup> place worldwide, noting that in the first places in this ranking are well developed countries, whose policies are based primarily in optimizing the aspects necessary to constitute a business and their economic and political reality is based on different premises (65).

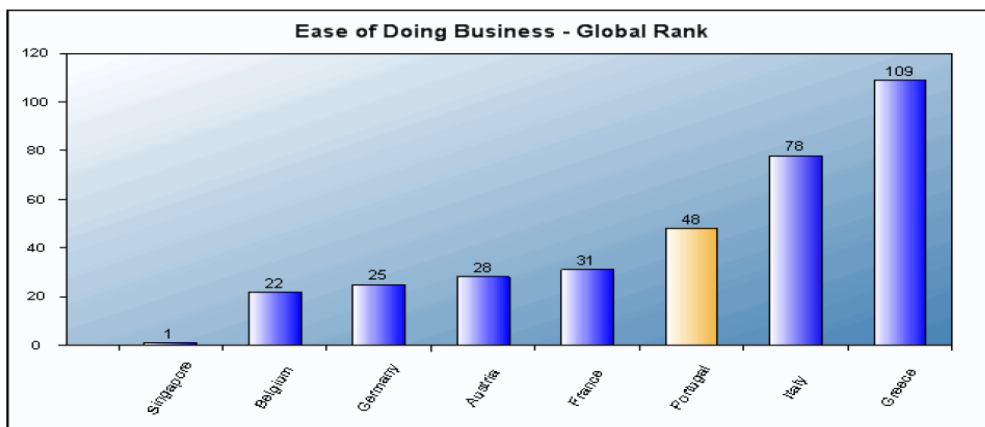


Figure 14 – Portugal's rank of "Ease of doing business" (65)



Speaking in terms of worldwide rankings, the following table illustrates several rankings of Portugal in different areas related to the business reality (Table 11) (65):

**Table 11 - Portugal's rankings in "Doing Business 2010" report (65)**

Rank	Doing Business 2010
Ease of Doing Business	48
Starting a Business	60
Dealing with Construction Permits	111
Employing Workers	171
Registering Property	52
Getting Credit	87
Protecting Investors	41
Paying Taxes	80
Trading Across Borders	19
Enforcing Contracts	25
Closing a Business	22

### **Economic context**

For this macro-economic analysis of the Portuguese economy policy, a series of questions were devised, to which we tried to respond and justify. These were:

- What is the Gross Domestic Product (GDP) growth?
- What is the unemployment rate?
- What is the public and private investment?
- What is the rate of demand?
- Which values of private consumption and public consumption?
- What are the effects of the SGP?

With these subjects in mind, the SGP was then consulted in order to assess the economic situation of Portugal in the considered timeline of four years (from 2010 to 2013). In the following image (Figure 15) there can be seen several economic indicators (64):

	2010	2011	2012	2013
<b>Hipóteses externas e técnicas</b>				
Procura externa (bens) (taxa de variação em volume)	1,7	4,5	4,5	4,6
Preço do petróleo Brent (US\$/bbl)	76,6	82,0	84,8	86,5
IHPC área do euro (taxa de variação)	1,1	1,2	1,4	1,6
Taxa de juro mercado monetário - Euribor 3 meses	1,2	2,4	2,9	3,2
Taxa rendibilidade Obrigações Tesouro a 10 anos	4,5	5,1	5,3	5,2
Taxa de câmbio efectiva para Portugal (taxa de variação)	0,0	0,0	0,0	0,0
Taxa de câmbio do EUR/USD	1,4	1,5	1,5	1,5
<b>Despesa Nacional - taxa de variação em volume</b>				
Consumo privado	1,0	0,8	0,9	1,0
Consumo público	-0,9	-1,3	-1,5	0,2
FBCF	-0,8	1,0	1,6	1,8
Procura Interna	0,3	0,4	0,6	1,0
Exportações bens e serviços	3,5	4,1	4,5	4,6
Importações de bens e serviços	1,7	1,9	1,9	2,0
<b>PIB</b>	<b>0,7</b>	<b>0,9</b>	<b>1,3</b>	<b>1,7</b>

Figure 15 - Economic indicators of Portugal (rate of change, %) (64)

Analyzing this figure from the SGP, one can see the predicted increase in the Gross Domestic Product (GDP) (in Portuguese: *PIB – Produto Interno Bruto*), as well as in the values of Private and Public Consumption. This change in the volume of GDP has as main contributors (Figure 16) (64):

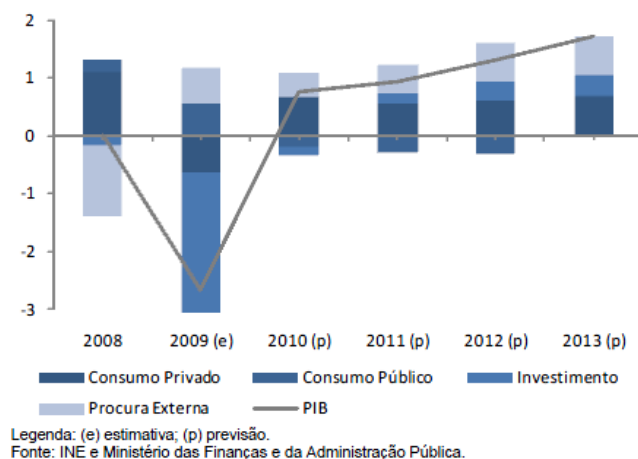


Figure 16 - Contributions to the change in GDP (percentage points) (64)

One of the key indicators present in Figure 15, which shows that the economic situation tends to improve, is the large increase of the external demand and also the increase – even if smaller – in the internal demand.

Also, even though the imports of goods and services will increase, this will be a lesser increase when in comparison to the exports.

Yet another aspect, though less clear, is the increase in the interest rate, which alone does not necessarily means an improvement in the economic situation, but together with the other previously mentioned aspects it can mean that this crisis will slowly but steadily be overwhelmed.

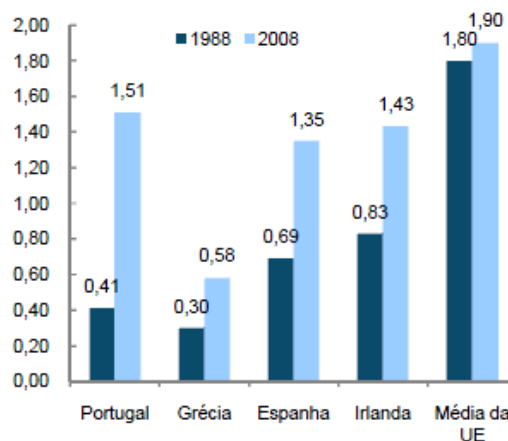
In the following table (Table 12), we can verify that the labor market, after an improvement seen in 2008, was marked in 2009 by a serious decline, with unemployment rate reaching 9.5% on average, and total employment to fall 2.8% over the previous year. This can be justified by the scope and speed with which the economic crisis that affected (and still affects) all sectors at a global scale, which translates in a reduction of the activity and increased unemployment rate (64).

**Table 12 - Active population, employment and unemployment (year growth rates in %) (64)**

	2007	2008	2009	2008				2009			
				I	II	III	IV	I	II	III	IV
População activa	0,8	0,1	-0,8	0,2	0,8	-0,3	-0,2	-0,4	-1,0	-1,1	-0,5
Emprego total	0,2	0,5	-2,8	1,1	1,4	-0,1	-0,2	-1,8	-2,9	-3,4	-3,0
Taxa de desemprego (%) <sup>1</sup>	8,0	7,6	9,5	7,6	7,3	7,7	7,8	8,9	9,1	9,8	10,1

Legenda: (1) População Desempregada/População Activa.  
Fonte: INE, Inquérito Trimestral ao Emprego.

Another positive indicator to BlueWorks is the high amount of investment in R&D in Portugal, as it can be verified in the following figure from de SGP (Figure 17):



**Figure 17 - Spending on Research & Development (% of GDP) (64)**

Moreover, through the analysis of the European Innovation Scoreboard (EIS) 2008 Database, it can be seen that the expenditure in IT (% of GDP) has maintained, which is a good sign due to the economic crisis (Table 13):

**Table 13 - IT expenditures (% of GDP) (Adapted from (66)):**

	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>
<b>Portugal</b>	1,8	1,8	1,8	1,8	1,8	1,8	1,8

Note: **Blue** – Imputed data

**Red** – Extrapolations

And so, through the analysis of the SGP and the EIS Database, it can be concluded that the Portuguese economic situation tends to improve, largely because of the participation in the EU, and also due to the inclusion of the very laws of the SGP, with a view to instigate development and ultimately surpassing the economic crisis that affects the whole world.

### **Socio-Cultural Context**

On the topic of this subject, a set of factors was defined as being relevant to the socio-cultural context applied to the environment surrounding the company BlueWorks. These are:

Portugal (67) (68):

- Population: 10.674.316 inhabitants (2010)
- Average Birth Rate: 10.8‰
- Average life expectancy: 78.04 years
- Average household size: 3.1 persons
- Unemployment rate: 9.8% (2010)
- Illiteracy rate: 10%
- Dominant religion: Christianity
- Human development index: 0.909 – 34<sup>th</sup> in the world ranking

## Technological Context

Analyzing the national technological context, it can be seen definite improvement over past years, due mainly to the high amounts of investment in R & D that has been taking place in Portugal – as discussed in the Economic Context – a fact which leads Portugal's Gross Domestic Expenditure on R&D (GERD) to have grown 16.3% between 2000 and 2006, above the average of the European Union countries (Figure 18) (69).

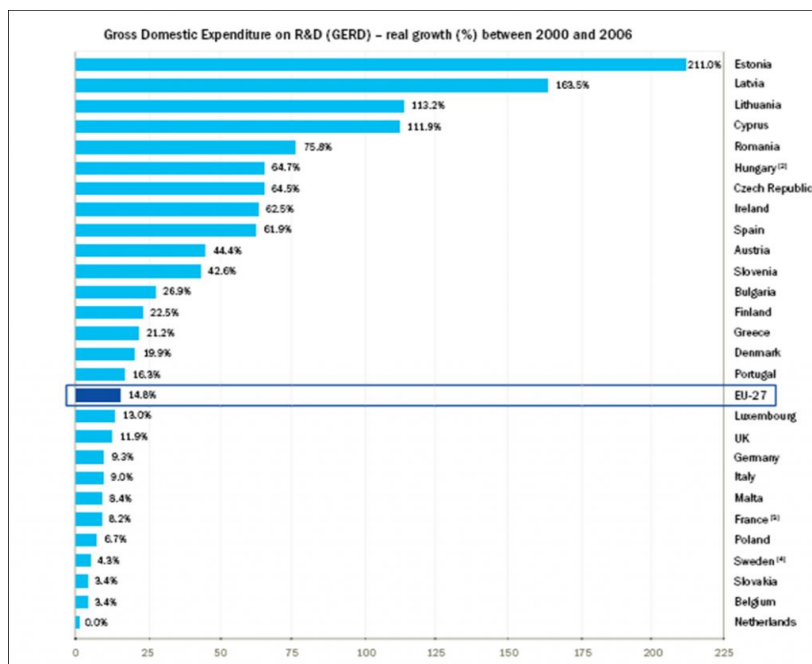


Figure 18 – Gross Domestic Expenditure in R & D per European Country (in %) (69)

This growth in the GERD comes as a result of the increasingly sustainable policies to sustain the economic growth, but also, in a more indirect way, due to the policies to encourage the literacy of the population, which help by improving the level of basic knowledge of the population, and consequently, the technologic evolution of the country.

Analysing the SGP, it can also be seen an increase in the technological intensity in the transactions made by Portugal with foreign countries (Figure 19):

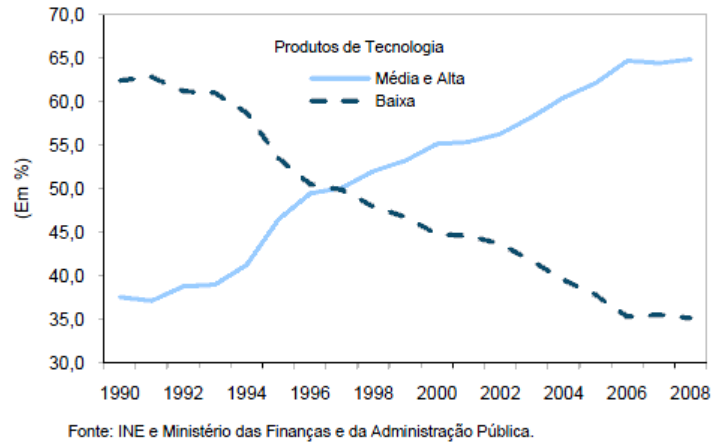


Figure 19 - Increase of technological intensity of Portuguese Exports (64)

This trend, – an increase in technology solutions and subsequent complexity – can be verified by consulting the chart below (Figure 20) where it can clearly be perceived the increase of progress in terms of technological performance of Portugal in 2008 (70).

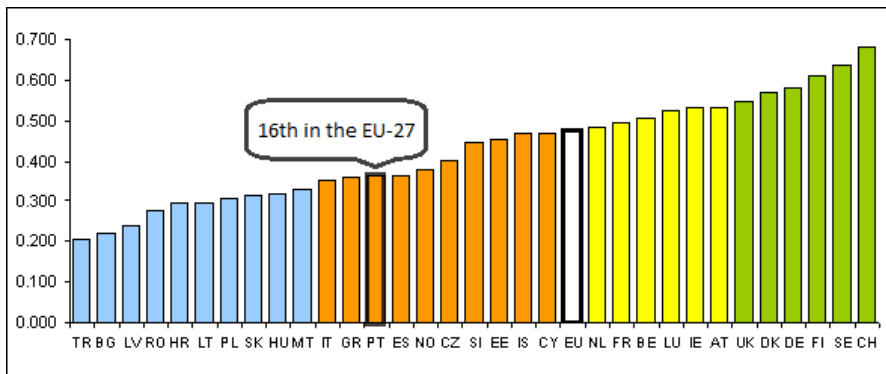


Figure 20 –Technological Innovation Performance of Portugal (Adapted from (70))

Despite being above average in Europe, in terms of technological Innovation, Portugal has grown much since 2007 (70). Regarding the line of technology in which OphthalSuite is inserted, the trend that has been observed, translates into the appearance of new technologies, such as: DICOM, HL7, User-Centered Repositories (e.g.: Microsoft Health Vault), Electronica Patient Records (EPR), Reference Information Model (RIM), Hospital Information Systems (HIS), Worklists, etc. In the line of EyeDropper, it translates into the development of products, such as E-Eyot® or new technologies, such as the use of nebulizers.

The aforementioned information can be compiled in comparative tables like the following (Table 14 to Table 17):

**Table 14 - Political-Legal Context**

<b>Context</b>	<u>Political-Legal</u>
<b>Trends</b>	<ul style="list-style-type: none"> <li>• Increase in the easiness to create and develop a business</li> <li>• Decrease of the cost to open a business</li> <li>• Promotion of internationalization</li> </ul>
<b>Positive Impact</b>	<ul style="list-style-type: none"> <li>• Reduction of bureaucracy</li> <li>• Promotion of the country abroad</li> </ul>
<b>Negative Impact</b>	<ul style="list-style-type: none"> <li>• Appearance of new businesses (competitors)</li> </ul>

**Table 15 - Economic Context**

<b>Context</b>	<u>Economic</u>
<b>Trends</b>	<ul style="list-style-type: none"> <li>• Increase in gross national product (GNP)</li> <li>• Increase in the internal and external demand</li> <li>• Increase of exports</li> <li>• Increase of imports</li> <li>• Increase of interest rate</li> </ul>
<b>Positive Impact</b>	<ul style="list-style-type: none"> <li>• Economic growth</li> <li>• Increased buying power</li> </ul>
<b>Negative Impact</b>	<ul style="list-style-type: none"> <li>• Increase of the indebtedness</li> </ul>

**Table 16 - Socio-Cultural Context**

<b>Context</b>	<u>Socio-Cultural</u>
<b>Trends</b>	<ul style="list-style-type: none"> <li>• Aging population</li> <li>• Decrease in unemployment</li> <li>• Increase of environmental concerns</li> </ul>
<b>Positive Impact</b>	<ul style="list-style-type: none"> <li>• Increasing consumption</li> <li>• Improved quality of life</li> </ul>
<b>Negative Impact</b>	<ul style="list-style-type: none"> <li>• Increased costs with environmental legalizations</li> </ul>

**Table 17 - Technological Context**

<b>Context</b>	<u>Technological</u>
<b>Trends</b>	<ul style="list-style-type: none"> <li>• High investment on the new technologies sector</li> <li>• Increased spending on R&amp;D</li> <li>• Increase in technological complexity</li> </ul>

	<ul style="list-style-type: none"> <li>• Appearance of new technologies</li> </ul>
<b>Positive Impact</b>	<ul style="list-style-type: none"> <li>• Creation of products with high added value</li> <li>• Increase of Portugal's competitiveness abroad</li> </ul>
<b>Negative Impact</b>	<ul style="list-style-type: none"> <li>• Increased training costs</li> </ul>

#### 5.4.7.2. Transactional environment analysis

### Client Analysis

For fulfilling the transactional environment analysis, one will start by doing the study of the possible BlueWorks clients.

For this study to be relevant and strategically valuable, it becomes important to appeal to seven general criteria: Who, What, To Whom, When, Where, Why and How. These parameters may or may not all be used, for the complete characterization of the clients, depending if they are applicable to industry in study.

The choice of these variables is not random, since they are of extreme importance for the characterization of the client to be efficient. It is also noteworthy that due to the different nature of the BlueWorks projects, there is not a fixed range of clients, being this aspect dependent of the project in question. Also, since at the date of the work development, Atlas 3D and the Child Vision-Screening Tool were in a preliminary stage and not yet ready to be commercialized, this analysis is restricted to OphthalSuite and EyeDropper.

Consequently, using the defined criteria, the general Client analysis for BlueWorks is:

- Who: Pharmaceutical Industry; Public or Private Ophthalmologists; Hospitals/Public or Private Ophthalmology Clinics; Health Insurance Companies; General Public;
- What: Products supplied by the company; After-sales services;
- To Whom: Physicians and patients;
- Why: Physical needs; Psychological benefit; Cost/benefit ratio.

The variables When, Where and How do not apply or are irrelevant in the analysis of a company with a range of products and services with these characteristics.



## **Supplier Analysis**

As was previously mentioned, the suppliers may be divided in products or services suppliers. In this case, it is not possible to generalize the Suppliers of products. Therefore, this analysis was divided into the two products in consideration. The supplier analysis is:

- Suppliers of products:
  - For EyeDropper: Hardware components for experimental development. For example: Texas instrument, Farnell, Logitech, etc.
  - For OphthalSuite: Products for software development. For example: Microsoft; Open source software providers.
- Service providers: Companies providing mass production, logistics (distribution), marketing services, helpdesk services to 3<sup>rd</sup> parties, etc. For example: HFA; ISA.

## **Competitor Analysis**

To best meet the profile of the contestants, it is important to know: *Who they are, What are their capabilities and What are their objectives*, being also important to lookout for new potential competitors.

- Who they are:
  - For EyeDropper: Medical devices companies. For example: Alcon; Multidee Inventors; Etc.
  - For OphthalSuite: Software development companies. For example: IFA Systems; Oisi; José Cotta; Etc.
- What are their capabilities:
  - Where they have major aptitudes: Experienced companies already established in the market;
  - Where have greatest weaknesses:
    - For EyeDropper: Inferior ratio quality/price of their products, fewer features in the commercialized products;
    - For OphthalSuite: Inferior ratio quality/price of their products and less degree of customization of solutions: either products low-tech (with data quality loss) or non web based;
- New potential competitors:

- For EyeDropper: Multidee Inventors; Companies that explore the use of nebulizers instead of eye drops.

### 5.4.7.3. Porter Analysis

With the brief introduction and explanation made in the Subchapter 4.2.3, established in order to improve the perception of this issue when applied to a real company, it becomes necessary the creation of a scale to perform a correct execution of the analysis. In this case, the scale defined was:

**0-1** → Indispensable

**2-3** → Very good / very important

**4-5** → Good / Important

**6-7** → Median

**8-9** → Weak

**9-10** → Irrelevant

After deciding on the scale to use, it became fundamental to select the sub-forces to analyze using of each of the above points, as well as defining the weight of each of these for a better characterization and better tuning of the model. The weight of each of the three categories was defined using the acquired experience and knowledge of both students.

It is now demonstrated the practical application of the Porter model:

#### PNE - Potential for new entries

- (40%) Initial investment - 2.5

- (40%) Access to information - 1
- (20%) Product differentiation - 3.5

Regarding the values of the categories, for the initial investment, since the necessary capital to create a business in this area is elevated; the value of 2.5 was applied. The access to information is indispensable in a business with these characteristics; hence the value 1 was applied. The product differentiation is also important, although, as we understand, not as important as the previous two categories, hence the value 3.5.

#### PSP - Potential of substitute products

- (30%) Level of competition for the same product - 5
- (10%) Cost of change - 3
- (60%) Price/Quality ratio – 1

Being that the level of competition is not an utterly important issue, due to the fact of this being a market niche; it was decided to apply the value 5. On other hand, the cost of change has greater importance, since the investment and effort required in changing the used solution is elevated; hence the value 3. Even more important (extremely important) is the price/quality ratio, being a decisive factor for possible clients; therefore the value 1.

#### BPS - Bargaining power of suppliers

- (70%) Number of suppliers - 2
- (30%) Importance of buyers to the suppliers - 7

Regarding the number of suppliers, BlueWorks products do not require any specific components restricted to a single manufacturer, being the number of suppliers is very good; therefore the value 2 was chosen. However, the importance of the buyers to the suppliers is not very significant, due to the nature of this specific industry; consequently the value 7 was applied.

#### BPC - Bargaining power of customers

- (5%) Customer loyalty to the brand - 10

- (25%) Rate of product differentiation - 3
- (70%) Sensitivity to price – 1

Regarding the loyalty of the customer to the brand, this issue is completely irrelevant, and there are not reported cases in which this factor helped to close a business; so, the value 10 was applied. On other hand, the rate of product differentiation is very important and a decisive factor for the buyers in choosing a solution; thus the value 3. An even bigger concern is their sensitivity to the price, being this factor of utmost importance, which is why the value 1 was applied.

#### RAC - Rivalry among existing competitors

- (70%) Number of competitors - 3
- (30%) Rate of growth of the industry - 2.5

The number of competitors is an important category, due to the fact of this being a small market; hence the value 3. Also, due to this same fact, the rate of growth of the industry gains also a big importance; therefore, the value 2.5 was chosen.

Shown below are the weighted results, as well as the total of the exercise (Table 18):

**Table 18 - Results of Porter Analysis**

<u>PNE</u>	$(0,4 \times 2,5) + (0,4 \times 1) + (0,2 \times 3,5)$	<b>2.1</b>
<u>PSP</u>	$(0,3 \times 5) + (0,1 \times 3) + (0,6 \times 1)$	<b>3.5</b>
<u>BPS</u>	$(0,7 \times 2) + (0,3 \times 7)$	<b>2.45</b>
<u>BPC</u>	$(0,05 \times 10) + (0,25 \times 3) + (0,7 \times 1)$	<b>1.95</b>
<u>RAC</u>	$(0,7 \times 3) + (0,3 \times 2,5)$	<b>2.85</b>
<b>TOTAL GLOBAL</b>	<b><math>\frac{(2.1 + 3.5 + 2.45 + 1.95 + 2.85)}{5}</math></b>	<b>2.57</b>

As a conclusion, it can be said that this industry is quite attractive, since it presents low values in the results of the application of the model, which, translating to the real case is read as being very attractive. This is because attractiveness varies as an inverted proportionality relatively to the values that result from the exercise.

The highest value that is presented is in terms of the rivalry among existing competitors, which points out that this point is a fundamental point that must be taken into account in this industry. However, it is important to emphasize that the definition of the scale and the attribution of the values was made based in the little knowledge possessed at the time of the analysis execution.

#### 5.4.7.4. SWOT Analysis

As it has been previously mentioned, at this early stage, factors that constrain the judgment of whom makes the analysis should be disregarded. Also, it should be gained some perspective regarding the reality of the company, in order to identify which factors actually give an advantage or disadvantage to any entity acting in the same sector of activity. Ideally this list should be made using market studies that quantitatively 'prove' the positive and distinctive contribution to the business and objectively assess what are the constraints that exist. However, due to the limited tools at disposal, for this SWOT analysis were considered only two of the BlueWorks projects (OphthalSuite and EyeDropper), and it based solely on empirical knowledge and business sensitivity.

Thus, examining internally the various points of interest for the analysis, we obtained the following:

- Marketing and Sales Area: In this area specifically and in comparison with other companies, even if not direct competitors, it can be seen that generally speaking, the pricing models adopted by BlueWorks, for both products considered, are not competitive, but it can be justified mainly due to a very high degree of complexity and customization of its solutions. Still, due to this same fact, BlueWorks has good potential of acceptance in the market due to the good quality/price ratio of the products, as well as their high degree of functionality.
- Financial Area: Regarding this area, the company's present financial situation is not relevant to the study, since it is a spin-off, being relatively young and not yet with commercialized products.

- Shopping/Purchases Area: Being a R&D company, BlueWorks is somewhat depend of the suppliers. Despite the fact that the goods and services that are needed for the production and commercialization of its products do not require any parts specific of a single manufacturer, after the beginning of a project and after choosing the product specifications, the cost of change of a supplier of a component may be very elevated depending of the stage of the project and the type of component. It may even require a restructuring of the project.

For example, for EyeDropper, the internal components may not be from one supplier only. However, due to the fact mentioned above, at this stage of the project the cost of change – if necessary – would be very elevated.

For OphthalSuite, the type of the software used is mainly from Microsoft. In the present scenario, it is very unlikely that the given company would stop providing its services. But if that would happen, the consequences would be severe, due mainly to the lack of alternatives of the necessary software providers.
- Human Resources Area: Presently, BlueWorks counts with the collaboration of 10 people – 7 full-time collaborators and 3 interns – being that human resources customer-oriented are 1 in 2010 and it is expected that this figure rises to 3 in 2011, mainly for the reason that there is an expected increase in sales volume. The development group project has elements of multidisciplinary backgrounds, incorporating Biomedical Engineers, an Electrotechnic Engineer and a Biochemist with previous experience in teaching.
- Production Area: The development of both products is made internally by the BlueWorks team. As for the industrial production, this type of indicator is irrelevant, due to the fact that all the services allocated to the production are fully outsourced to specialized companies.

## **Elaboration of the SWOT matrix**

Gathering up all the considerations, the elaboration of the matrix took place, which can be seen in the following table (Table 19):

Table 19 - Elaborated SWOT Matrix

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>• Price/quality product relationship</li> <li>• High degree of customization of products</li> <li>• Advisory board consisting of experts in various relevant fields</li> </ul>	<ul style="list-style-type: none"> <li>• Pricing model of EyeDropper</li> <li>• Little experience in business management</li> <li>• Weak financial autonomy</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>• Industry dominated by few firms</li> <li>• Booming market</li> <li>• Emergence of new policies based on health and welfare</li> </ul>	<ul style="list-style-type: none"> <li>• Well established major competitors</li> <li>• Penetration of the developing countries in industry</li> <li>• Trade barriers (CE, Infarmed, FDA, ...)</li> <li>• Appearance of new techniques</li> </ul>

In the next step, all the fields of the matrix – Strengths, Weaknesses, Opportunities and Threats – were considered in separate, in terms of their impact and future trends. These different points of the analysis can be seen in the following tables (Table 20 to Table 23):

Table 20 - Impact and Future Trends of the business Strengths

Strengths	Impact in the Business			Trends		
	High	Medium	Low	→	=	→
Price/quality product relationship	X			X		
High degree of customization of products		X		X		
Advisory board consisting of experts in various relevant fields		X			X	

Regarding BlueWorks strengths, it can be said that the one of the most important aspects in this industry is the ratio quality/price of the products, which the company possesses. Also, another aspect of importance is the high degree of customization of products. These facts that tend to increase even more, given that the market, as a small niche, will be likely to become saturated and BlueWorks will have to bet on differentiation to be more competitive. Another aspect that has relative importance is the advisory board that is composed by several experts in fields that, among other benefits such as the technological support, allow BlueWorks to make strategic decisions better informed and with more certainty regarding which is the best move.

Table 21 - Impact and Future Trends of the business Weaknesses

Weaknesses	Impact in the Business			Trends		
	High	Medium	Low	→	=	→
Price relative to competition	X					X
Little experience in business management	X					X
Weak financial autonomy		X				X

Weaknesses with a high impact on the business are the price models devised by BlueWorks and the little experience derived from the fact of being a young company. Nevertheless, these aspects will tend to



decrease with the growth of the company and subsequent acquired experience. This will also contribute to the increase of financial autonomy.

**Table 22 - Impact and Future Trends of the business Opportunities**

Opportunities	Impact in the Business			Trends		
	High	Medium	Low	→	=	→
Industry dominated by few firms	X					X
Booming market		X		X		
Emergence of new policies based on health and welfare		X			X	

Regarding the opportunities, it can be said that this niche is still dominated by few companies, fact that poses as an opportunity due to the small competition, but will tend to increase. Also, being a market in expansion, there are business opportunities that can be explored, fact supported by the emergent policies supporting R & D in health.

**Table 23 - Impact and Future Trends of the business Threats**

Threats	Impact in the Business			Trends		
	High	Medium	Low	→	=	→
Well established major competitors	X				X	
Penetration of the 3rd World Countries in industry		X		X		
Trade barriers (CE, Infarmed, FDA, ...)		X			X	
Appearance of new techniques		X		X		

As regards the existing threats, a major problem is that, though the market is filled with few companies, they are well established and experienced competitors that can pose a threat. Also, the effort involved in surpassing trade barriers (e.g.: CE, Infarmed, etc.), the

penetration of the 3<sup>rd</sup> world countries offering cheap labor and the appearance of new techniques and advanced technologies are a threat that cannot be ignored.

And so, taking the SWOT matrix constructed and transforming it into a TOWS matrix (see Sub-Chapter 4.4.1) one can more easily start the definition of strategies that lead to maximizing the opportunities of the environment, built on the strengths of the company and to minimizing the threats, trying hard to reduce or counteract the effect of the weaknesses of the company.

Therefore through the detailed analysis of all variables that make up the matrix, one can draw the following conclusions/suggestions for the future, listed below (Table 24):

Table 24 - Elaborated TOWS matrix

	<b>S</b> (Strengths)	<b>W</b> (Weaknesses)
<b>O</b> (Opportunities)	<p><b>SO (maxi-maxi)</b></p> <ul style="list-style-type: none"> <li>• Increase the sales volume;</li> <li>• Promotion of the internationalization of the company.</li> </ul>	<p><b>WO (mini-maxi)</b></p> <ul style="list-style-type: none"> <li>• Increase levels of specific training in the economic area;</li> <li>• Increase financial autonomy using government funds.</li> </ul>
<b>T</b> (Threats)	<p><b>ST (maxi-mini)</b></p> <ul style="list-style-type: none"> <li>• Betting on the high degree of customization of the products.</li> </ul>	<p><b>WT (mini-mini)</b></p> <ul style="list-style-type: none"> <li>• Creation of strategic alliances with some renowned companies in order to gain higher profile.</li> </ul>

# CHAPTER 6

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## 6 CONCLUSION

### 6.1 Work Conclusion and Future Work Suggestions

The purpose of this thesis is to demonstrate the work accomplished during this past year as a Business Developer at BlueWorks.

Whether applied to any of the products from the BlueWorks product portfolio, the main goal always was the compilation of useful contents to be used for the company's advantage.

Noteworthy, due to the lack of formal education or previous experience in these fields, and taking into account that the type of tasks in hand required a certain degree of sensitivity to the problem, some of the achieved conclusions may not be consensual when analysed by more experienced professionals.

Regarding the work done in relation to the EyeDropper project, with all the analysis done, one can say that there is effectively a business opportunity and there are several markets with the "need" for a product with those characteristics. It presents several advantages when in comparison with the existing products in the market, and even with the products that are known to be in development. However, there is still a long way until the product is ready to be commercialized, with steps such as finishing the stand-alone prototype and defining an adequate pricing model yet to be finalized. It is this last aspect that I think it should be pressed in a near future.

In relation to the Atlas 3D, since it is a partnership between BlueWorks and TakeTheWind, there is not much that can be done in BlueWorks end, in order to reduce the time-to-market, since the product development is in charge of TakeTheWind. Nonetheless, the work made during the past year can be used to prepare the product to enter the market, providing a solid base for the development of the marketing strategies to adopt, as well as other aspects inherent to the product commercialization. Also, and although BlueWorks product portfolio retains projects that require different approaches and assumptions, there

is some common ground between them, and the analysis made for the Atlas 3D can be adapted, with more or less effort to the other existing and in development products.

Concerning the OphthalSuite, since it is on the verge of starting to be commercialized, the work developed was mostly small tasks such as elaboration of contact lists of possible buyers – whether in the Public or Private business – and the preliminary contact with them. Also, the elaboration of a White Paper, which can be used with marketing purposes to “educate” the market and enhance their receptivity to this technology. As a work for the future, it is the student's opinion that alongside the development and perfecting of the product, new marketing strategies should be devised, and maybe use a professional salesman in order to begin commercializing the product in the shortest time possible and achieve a significant market share, either by forcing the way into the market or by developing strategic alliances with the main competitors.

Concerning the work developed and results obtained in the other developed tasks, it were in the main part beneficial for the company itself and not to any project in specific, although some can be used in any of the existing projects. That being said, for example, the development of the Business Plan is something that ultimately brings benefits for the company in general, but can also be used as a pitch for the marketing of a specific product. Moreover, the applications and participation in contests, although in each it was used a single product, the ultimate goal was to give revenues or other positive prizes to the company, to help to achieve financial autonomy and to, in the long run, surpass successfully the so called “Valley of Death”.

Regarding the strategic analysis of the company, it is worth mentioning that all the work was developed together with a Student of Industrial Management Engineering, using mostly the empirical knowledge acquired during the academic formation, and practical knowledge of the company's dynamics, acquired through experience in the business in which BlueWorks is inserted.

This being said, BlueWorks has still plenty of aspects to improve and optimize. Any of these important analyses were never performed before and therefore, in the future, these should be tuned, perfected and taken to a deeper degree, using an expert for a correct validation of the same.

## 6.2 Final Considerations

It is common knowledge that some companies are destined to success and others to failure. There is a fine separating these two possibilities and the optimization of the investment of their human and technologic recourses into high added value for the society can make the difference.

It is my sincere desire that the work developed this year will serve in the future for a successful campaign of BlueWorks and that helps the company to make the correct strategic decisions with all the tools available to facilitate them.

This project allowed learning and grasping concepts that were previously unknown to me but are certainly invaluable in my future career. Also, it has provided me the first approach to the professional business world, in which I have learned some experience in the dynamics involved in businesses, as well as some experience in management. Finally, I have learned and enjoyed to work within a multidisciplinary team, which is a very important aspect since it is an intrinsic part of every company, where all the elements work together for the same end.

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## Attachments

### A. White Paper

# Automating Data Collection from Ophthalmology Diagnosis Equipments

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## *Support for Business Intelligence and Scientific Research*

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### *Executive Summary*

In order to perform Scientific Research, with papers publication contributing to the world knowledge of specific problems, and to have the ability to apply Business Intelligence techniques to enhance and optimize clinical and administrative management of patients and their medical conditions, it is mandatory the existence of organized and accessible data.

In an optimal scenario, all of this data exists in a central database, and the data flow from the equipments to this DB is transparent and takes no toll on the end users. However, the reality is quite different, with information existing in isolated "islands".

In what concerns the medical specialty of Ophthalmology, due to the great variability of equipments, manufacturers, and the amount of data that is produced, this problem cannot be effectively worked around with the traditional simple solutions.



Generally, Ophthalmology equipments are very limited in terms of their ability to connect to a central system.

The data that can be used in research comes from all types of equipments:



In this paper we aim to discuss the impact of having information available and editable, and the several approaches to accomplish this goal, as well as advantages and disadvantages of each.



## Introduction

In general, the act of diagnosing ophthalmologic pathologies requires the analysis of the results of complementary diagnostic tests.

Also, despite the advances in medicine *per se* and the exponential growth of medical technologies, the equipments where these tests are performed are very limited in terms of their ability to connect to a central system and in terms of interoperability between them.

The immediate consequence due to this limitation is the need for greater effort by health professionals in storing, accessing and analyzing data collected by the several existing equipment, which also causes enormous time consumption.

This problem is even greater when one is interested in analyzing data to extract knowledge. Numerical data is often stored only in printouts or digital images, and prior to the actual research, groups must invest significant amount of effort transforming this data into editable formats – which often occurs by resorting to manual digitalization or re-insertion of each numerical value.

Looking back to the evolution of medical technologies in general and, in particular, to the evolution of integration solutions, it is possible to verify the trend to the standardization of the protocols used in communication between different equipment.

However, the integration solutions that exist in the market are still far from this ideal, possessing several limitations, as being restricted to only one of the brands of equipment, having limitations in quantity and quality of data collected or having a very high negative impact on productivity.



There is a clear need for simplification of the storage and access to results of complementary diagnostic exams (images, video, numeric values, reports), performed on different equipment

It is important that an integration platform is able to send the data collected by each device to a secure central file, in an autonomous and transparent way.

In every ophthalmology units, it is blatant the continuous search for mechanisms intended to reduce the difficulty of accessing and analyzing the exams that are performed on their patients.



## Defining Interoperability

In general, interoperability refers to the ability of diverse systems or products to work together without any special effort on the part of the end-user (1, 2).

In the IEEE Glossary, interoperability comes defined as:

“The ability of two or more systems or components to exchange information and to use the information that has been exchanged” (1)

The term was initially defined for IT systems or services whose interfaces were completely understood and possessed the ability to work with other systems at any given time, without any restricted access or implementation (1, 2).

According to the existing definitions, interoperability can be categorized in three different types (3):

- **Technical interoperability:** It is the most basic, hardware-based form of interoperability. The focus of technical interoperability is on the conveyance of data, not on its meaning, similar to the level of interoperability provided by voice communications, e.g.: via a telephone.

*Technical interoperability neutralizes the effects of distance.*

- **Semantic interoperability:** Its purpose is to maximize the usefulness of shared information and to apply applications like intelligent decision support. Basically, it is the ability of information shared by systems to be understood, so that non-



Software Interoperability is attained through five interrelated methods (1):

1. Product testing;
2. Product engineering;
3. Industry/community partnership;
4. Common technology and IP;
5. Standard implementation.

James A. O'Brien and George M. Marakas define interoperability as (1):

“The ability to accomplish end-user applications using different types of computer systems, operating systems and application software, interconnected by different types of local and wide area networks.”

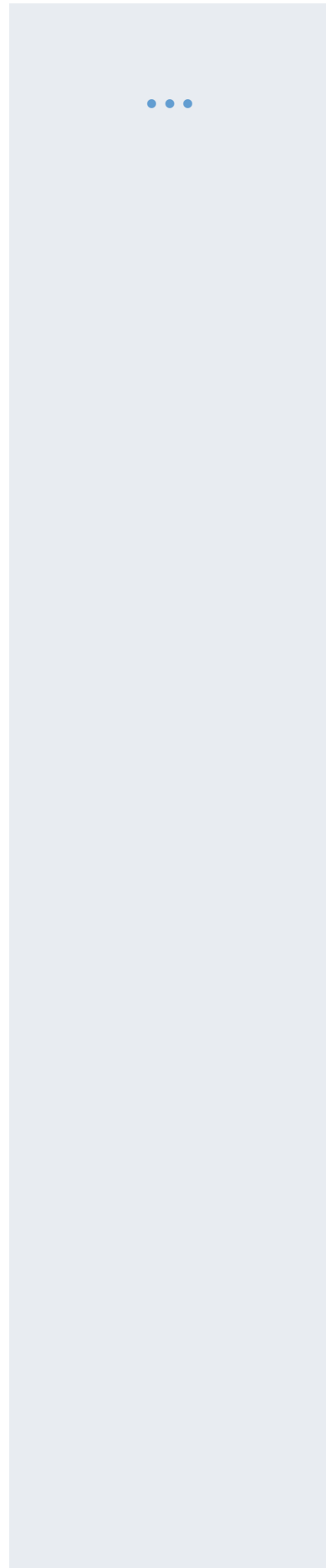
numeric data can be processed by the receiving system.

*Semantic interoperability communicates meaning.*

- **Process interoperability:** Optimizes not only the communication of information, but does this in a time-, event-, or sequence-oriented manner to coordinate the work processes, being almost a requirement for successful system implementation into actual work settings, and includes the following:
  - Explicit user role specification;
  - Useful, friendly, and efficient human-machine interface;
  - Data presentation/flow supports work setting;
  - Engineered work design;
  - Explicit user role specification;
  - Proven effectiveness in actual use;

*Process interoperability coordinates work processes.*

***“Together, these three types of interoperability are all required to the consistent and timely achievement of what has come to be called ‘Best Practice’.” (3)***





## Current Approaches

The creation of a solution that bridges these gaps would also have to take into account that the test results can have various formats - high resolution pictures, videos, tables of numerical values, etc.

As previously mentioned, in general, the mechanisms presently used to access the patient's exams in the main consist in printing and filing of paper documents or remote access to screenshots of images collected by the repetition of a sequence of steps for each individual picture to place on the central system.

Despite having the advantage of being very low cost solutions, the main disadvantages of these approaches are:

- The increased time required for implementation of each examination;
- The reduced number of images collected;
- The low quality of images collected, depleted during the export process;
- The lack of organization of numerical data in easily analyzable formats (e.g. Excel spreadsheets);

There are other more expensive methodologies, namely solutions that involve connection to a database, capture of the data sent to the printer or interpretation of exported files. These are more complex solutions that can be implemented by either the IT department of the Hospital or Clinic, or externally by a private company.

However, due to the nature of the equipments, its variability and the fact that they are constantly suffering changes (e.g.: software updates, etc.) the implementation by the IT



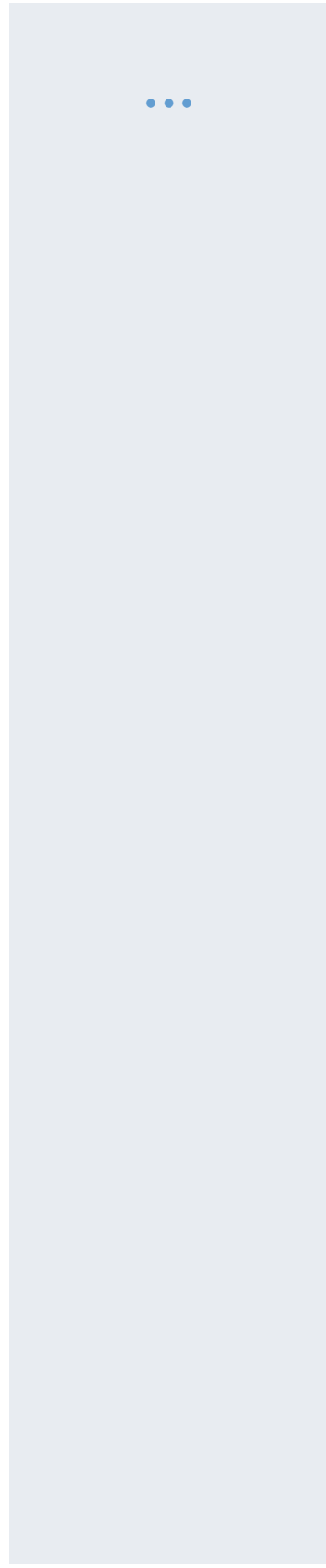
department is all but impossible with a reasonable budget.

On other hand, specialized companies are able to monetize the huge effort that is required for each one of these interfaces into various clients, to dilute the costs of developing, maintaining, and upgrading these software updates made by the manufacturers.

A pertinent question then rises: opting by an already fully developed solution or by hiring a company that will develop a personalized solution from scratch?

Although it may be more expensive, developing a personalized solution from scratch has more advantages, related to the fact that this area has very documentation deficits. Consequently, is not always possible in the planning stage to adequately define the effort required or ensure that one can successfully execute the implementation of a solution already fully developed.

Therefore, given the current conjuncture, it is patent the need of an integration platform capable of sending automatically the data collected by each device to a secure central file, in an autonomous and transparent way, where it would remain accessible to be remotely consulted, allowing for example storing the correspondence between tests on the equipment and on the electronic patient record (EPR).



## Who is doing it

There are some solutions with characteristics that meet these needs. However, they are developed by the manufacturer and restricted to their equipment. The obvious downside is that, when an ophthalmology unit has the need for equipment's of different brands (and this always happens since any manufacturer has the best equipment for everything) this sort of solution does not have the ability to integrate these machines and becomes inadequate.

In terms of solutions that are not restricted to the manufacturer of the equipment, one can point out OISI or IfaSystems. Though, these are experienced companies with international dimension, the systems they developed are focused in markets with different realities – namely the German and North American markets – and the nature of the solutions provided by them is somewhat more general, also focusing in aspects such as billing management,.

Regarding our closest market – Portuguese National market – the most well-known solution is the one by José Cotta. Nonetheless, as its approach to the interoperability is based on the data that go to the printer (in image form), it has limitations regarding the quality of the output image when in comparison to the image acquired by the equipment, and since it uses images and no raw data, it is unable to manipulate any numerical data that is given by the diagnosis machine.



Main companies with interoperability solutions for ophthalmology:

- OISI
- IfaSystems
- José Cotta

Their main disadvantages:

- Directed to markets with different realities (OISI and IfaSystems)
- Lack of focus in ophthalmology (OISI and IfaSystems)
- Approach with serious limitations in terms of quality of obtained data (José Cotta)

## Our Solution

In order to answer to the existent market need, BlueWorks created an application software - OphthalSuite - which consists in an integration platform that allows to automatically collect information from different devices and redirect it to a centralized database.

OphthalSuite is compatible with several equipment's and exams, such as fundus, angiography, tonometry, OCTs, electroretinography, perimetry, GDx, among others.

For some of these equipment's, it also allows to synchronize the databases in order to avoid repeating the registration of patients.

OphthalSuite requires a maximum of three "clicks" to define the patient (if the patient has an ID number in the equipment different from the ID number in the central system), store and print out an examination and the respective report, these being readily available for all physicians to consult them.

In the event of flaws in the internal network, OphthalSuite has the ability to keep up functioning with limited functionalities, resending automatically and in a transparent manner, the data that have been affected by failures, when the network connection is restored.

This application allows an organized and structured storage of information collected that becomes available to be accessed via its own OphthalSuite or other third-party solutions.



OphthalSuite is a reliable solution, simple to learn and use, extremely fast and flexible to adapt to physicians, technicians and internal working mechanisms of different health units.

#### Key Benefits:

- ✓ Speed, ease and convenience of access to examinations;
- ✓ Increase of 170% in quality of stored information;
- ✓ Increase of 500% in quantity of stored images;
- ✓ Safety, reliability and data integrity;
- ✓ Business Intelligence for

The main benefits of our solution consist mainly in four key points:

1. Time Saving
2. Quality and Quantity Increase of Available Data
3. Fault Tolerance
4. Business Intelligence - Research & Management Support

### 1. Time Saving

- Information available increases without increasing the time of export.
- In some cases the whole export process becomes faster.
- In some cases, the need to enter the patient's data on equipment's is eliminated.
- Reduction of time and complexity of accessing examinations by physicians.

### 2. Quality and quantity increase of Available Data

- The available information has a higher quality.
- We are able to acquire more images per exam.
- More data is acquired per exam (e.g.: numerical values)..
- The synchronization of the user's registration significantly reduces the likelihood of getting information associated with incorrect records.
- Greater ease in identifying and correcting nonconformities (missing data, duplicate patients, etc.).

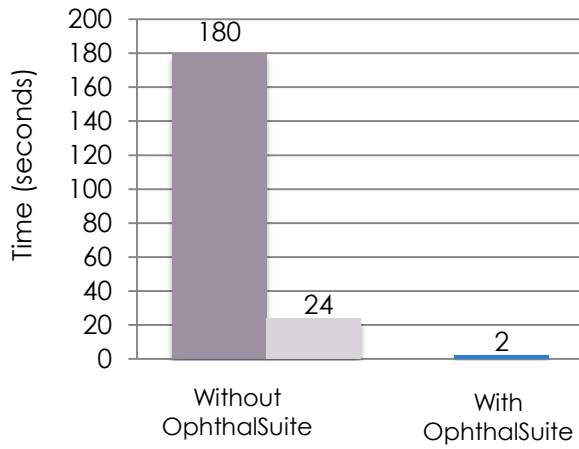


Currently, OphthalSuite is being used by:

- 24 diagnosis equipment;
- 7 Ophthalmologists;
- 200 consultations/day;
- 65.203 patients;
- 419.252 images.

Average Examinations	Per month	Per year
Before OphthalSuite	266	18416
After OphthalSuite	355	40353
<b>Increment</b>	<u>89</u>	<u>21937</u>

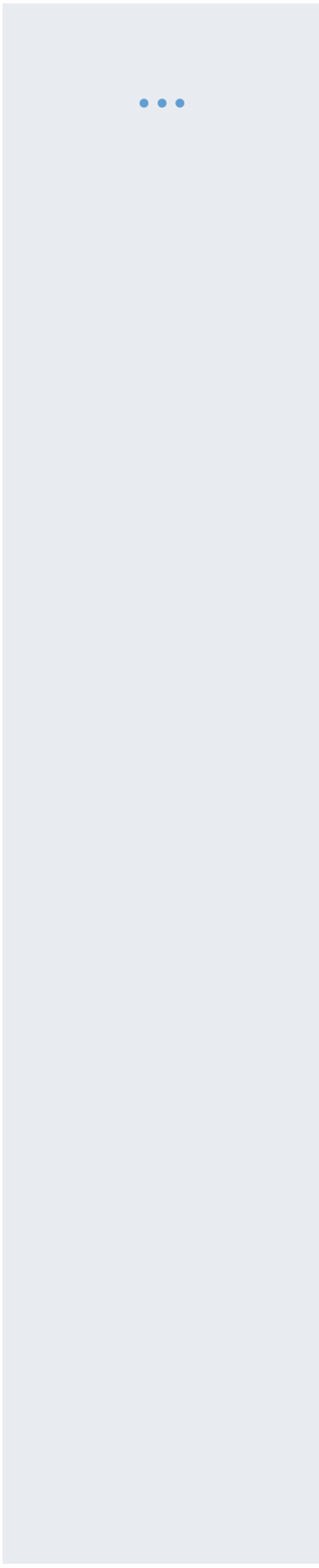
### Average examinations access time



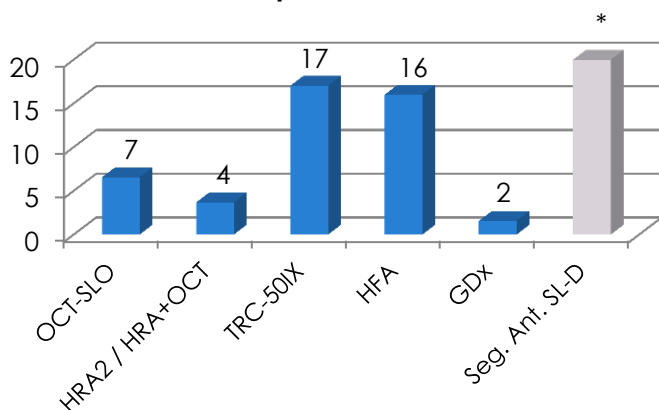
- Old Examination
- Examination held on the day
- Any Examination

Type of Examination	Quality of Image		Quality of image increase
	Before	After	
OCT-SLO	400x200	1024x512	655%
HRA2 / HRA+OCT	400x400	768x768	369%
TRC-50IX	320x250	1320x1032	1703%
HFA	600x795	2400x3180	1600%
GDx	200x200	250x250	156%
Seg. Ant. SL-D	*	2896x1944	*

\* Examinations whose content was not recorded before the OphthalSuite, so there is not a point of comparison.



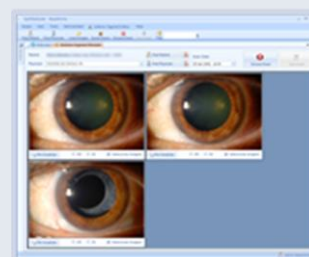
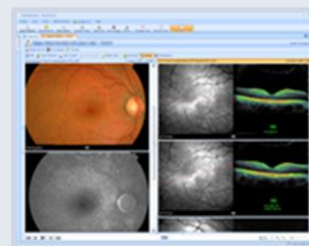
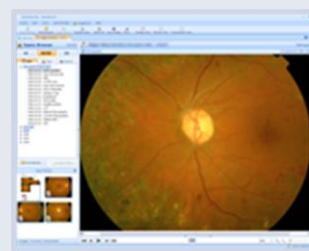
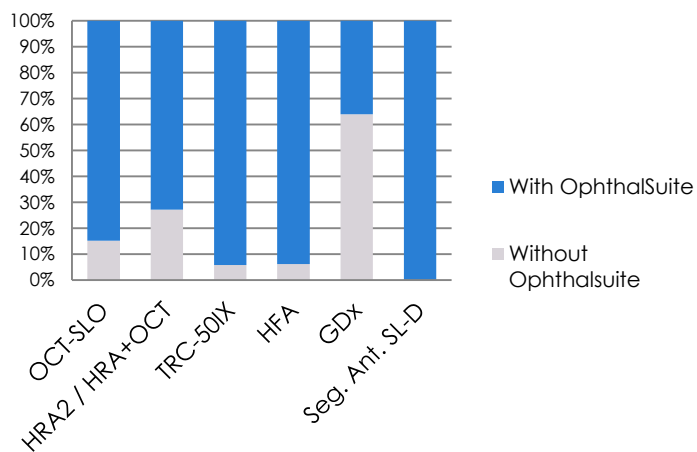
### Nº of times that image improves with OphthalSuite



\* Examinations whose content was not recorded before the OphthalSuite, so there is not a point of comparison.

Assuming that, with OphthalSuite we are acquiring 100% of the available data, we can obtain the following graphic, where the increase in image resolution is clearly stated:

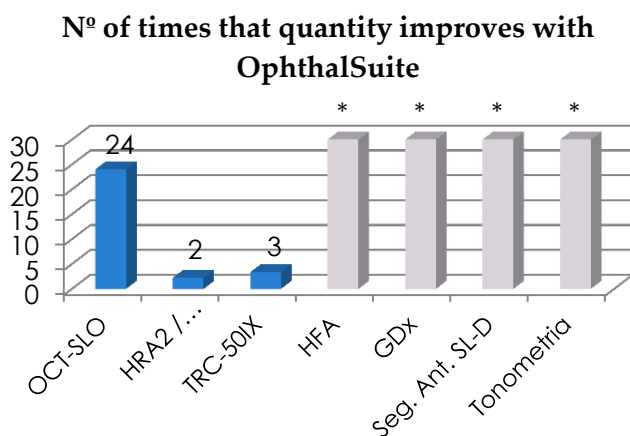
### Increase in image resolution



Regarding the quantity of images acquired before and after OphthalSuite, it is flagrant the increase, as is detailed in the following:

Type of examination	Quantity of images		Quantity of images increase
	Before	After	
OCT-SLO	2	48	2400%
HRA2 / HRA+OCT	9	20	222%
TRC-50IX	9	30	333%
HFA	0	4	*
GDx	0	2	*
Seg. Ant. SL-D	0	4	*
Tonometria	0	1	*

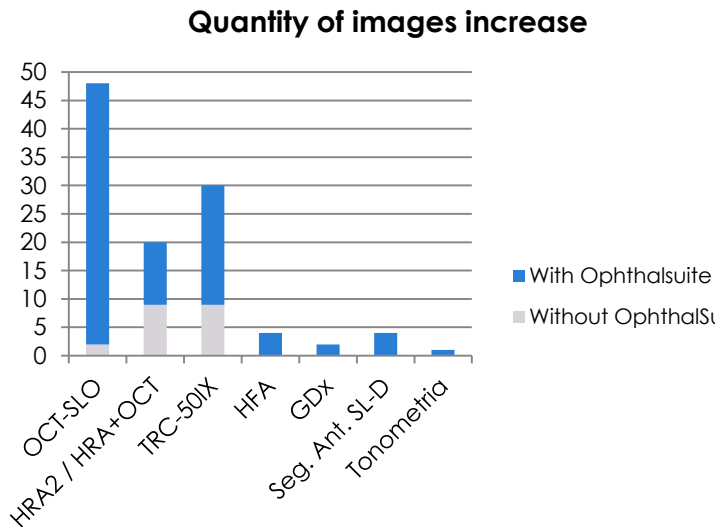
In the following graphic, it can be observed that the quantity of images recorded by the several equipment increases in every case. For the equipments depicted in the color orange, there were not previous recordings prior to OphthalSuite, so mathematically, the number of times that quantity of images improves is considered infinite.



\* Examinations whose content was not recorded before the OphthalSuite, so there is not a point of comparison.



The gains in terms of quantity of recorded data are patent in the following graphic:



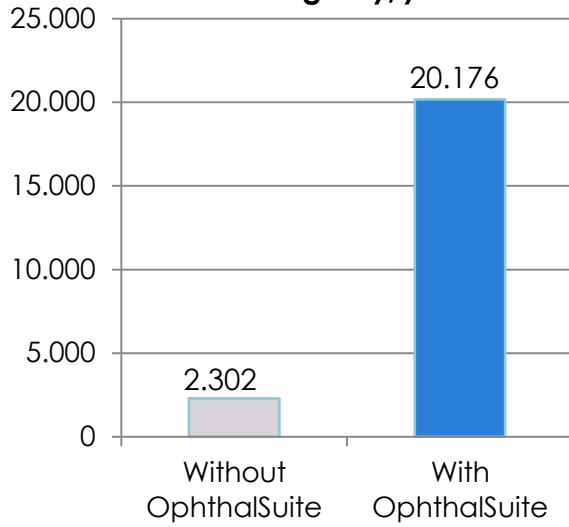
### 3. Fault Tolerance

- The automatic recovery of failures that can occur on the internal network and the ability to keep the system in operation during these precludes the need to suspend the examinations.
- Existence of backups to avoid data loss when a failure of equipment occurs.

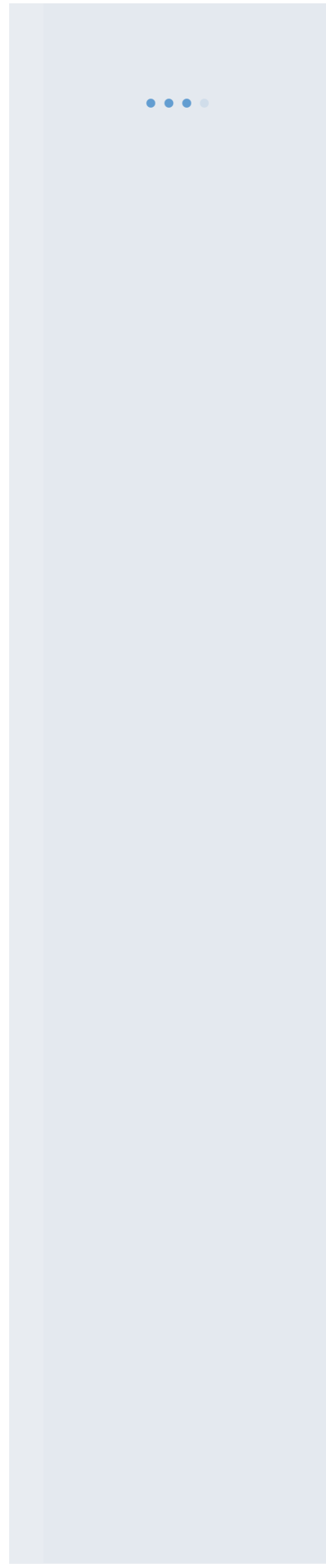
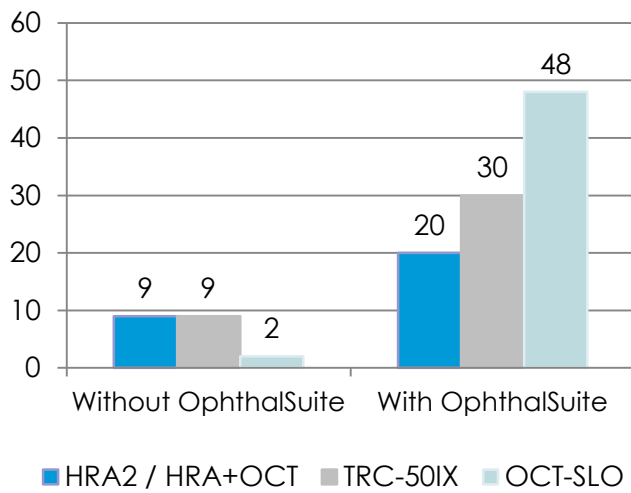
### 4. Business Intelligence - Research & Management Support

- Very easy to execute statistical studies, data collection and data mining (e.g., the mean ocular tension of all patients of the Glaucoma consultation).
- Possibility of extracting various reports, such as total number of exams grouped by equipment, pathology, physician and date.

**Average nr. of examinations saved digitally/year**



**Average number of images saved/examination**



## Why us

BlueWorks has a dedicated team and excellence partners, as is the case of ISA - *Intelligent Sensing Anywhere* - world leader in the telemetry area, with 20 years of experience in R & D innovative engineering concepts; the Surgical Center of Coimbra, where we are based - private health unit recognized by the high quality and differentiation of medical and surgical services rendered; and NeuroEye - another local start-up whose founder (Prof. Dr. Miguel Castelo Branco) was the 2008 winner of the BIAL prize.

It is through these partnerships that we have access to highly differentiated know-how in engineering, medicine and research areas, which are vital to the development of this project.

Although BlueWorks is a young company with just three years of existence, based on the experience of its founders has already developed significant work in the area of medical technology for ophthalmology, such as a medical device with patent subject to validation of medical compliance a system of pre-screening eye diseases in children using the computer "Magalhães", or a project which intends using interactive content to optimize the communication of clinical information between physicians and patients.

The development group of BlueWorks comprises elements with multidisciplinary backgrounds, in addition to the physicians and neuroscientists previously mentioned, incorporates Biomedical Engineers, an Electrotechnical Engineer and a Biochemist with previous experience in education.



BlueWorks main objective is the development of innovative systems to support the diagnosis and therapy in the area of Ophthalmology.

Improving the quality of health cares, optimizing processes and supporting health professionals in clinical practice is our mission.

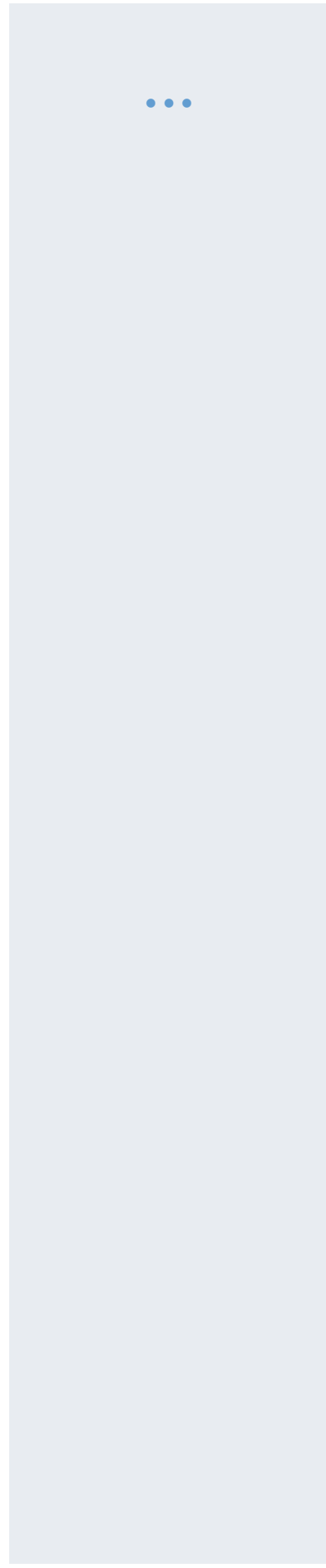
## Final Thoughts

If you deem that the interoperability precepts are met and effectively used in an Ophthalmology unit, then BlueWorks OphthalSuite is a very good option that can be made. The ratio between the investment and the returns is very appealing.

Being a solution that supports telemedicine, the greatest advantage inherent to its use is the capacity to generate and compile data in a way that facilitates the component of Business Intelligence. This is an advantage since it allows the use of all numerical data to realize studies involving several parameters that were not available before, or it was necessary a great effort to obtain them. This easiness in data manipulation may contribute indirectly but in great part to an increase in the published studies, and therefore to the status and reputation of the Clinic, Hospital or Physician in the medical scientific community.

OphthalSuite vastly improves the quality and quantity of the obtained data, whereas, at the same time improves the Hospital or the Clinic's public image – due to the use of high-end technology – and increases their competitiveness – allowing optimal resource allocation, workflow optimization and ultimately an increase in productivity –, requiring minimum effort by the end-user and also necessitates little time to train due to its intuitive and easy-to-use interface.

Over a short period of time, the advantages of using OphthalSuite become evident and translate in clear financial gains.



## References

- (1) . <http://en.wikipedia.org/wiki/Interoperability>
- (2) . [http://searchsoa.techtarget.com/sDefinition/0,,sid26\\_gci212372,00.html](http://searchsoa.techtarget.com/sDefinition/0,,sid26_gci212372,00.html)
- (3) . Gibbons, P., et al., "Coming to Terms: Scoping Interoperability for Health Care", February 7, 2007.

## B. Application to “Arrisca Coimbra 2009”

### i. Completed Form

				
<p>CONCURSO DE IDEIAS DE NEGÓCIO</p>				
<p>B o l e t i m d e C a n d i d a t u r a</p>				
Nº Candidatura		Data entrega		Ligação à Inst. Ens. Sup. de Coimbra

A preencher pela organização do concurso

Nome da Equipa	BlueWorks				
<b>1</b>	<b>Identificação dos promotores</b>				
Nome Promotor 1	BlueWorks – Medical Expert Diagnosis				
Morada	Rua Dr. Manuel Campos Pinheiro, 51				
Localidade	Espadaneira - S. Martinho do Bispo	Código postal	3045-089 Coimbra		
e-mail	blueworks@blueworks.pt	Telefone	239 802 700	Telemóvel	
Nome Promotor 2					
Nome Promotor 3					
Nome Promotor 4					
Nome Promotor 5					
<b>2</b>	<b>Descrição sucinta do conceito de negócio</b>				
	<p><i>Descrever num curto texto a ideia de negócio, qual(ais) o(s) problema(s) dos potenciais clientes que o conceito de negócio vem resolver e de que forma o(s) resolve.</i></p>				
	<p>Uma das maiores dificuldades dos médicos ao tratar e acompanhar um doente, é a garantia de que este cumpra correctamente o regime terapêutico indicado (doravante referida por “compliance”). Na especialidade de oftalmologia, esta garantia é ainda mais difícil devido ao facto de que habitualmente a terapia consiste em gotas para aplicação tópica (as conhecidas “gotas para os olhos”), e estas nem</p>				

sempre são de utilização simples. Esta dificuldade inerente pode prender-se com o incorrecto alinhamento do frasco com o olho, dificuldade no manuseamento do frasco – habituais a pessoas de idade – ou ainda ausência de uma correcta percepção do sucesso. Diversos estudos do problema revelaram que há uma enorme discrepância entre os níveis de compliance reais e os percebidos pelos próprios doentes e conseqüentemente os reportados e percebidos por oftalmologistas e/ou investigadores (*“ADHERENCE TO GLAUCOMA MEDICATIONS” by the American Academy of Ophthalmology*).

No caso específico de investigação de novos fármacos através de ensaios clínicos com voluntários – alguns pagos para participar –, existe a dificuldade adicional de alguns destes serem intencionalmente não-cooperantes.

As conseqüências da ausência de um mecanismo fiável para avaliar a complicação dos doentes podem ser:

- Aumento de perda de visão e conseqüente cegueira irreversível;
- Aumento de custos e riscos através da prescrição de uma quantidade de fármaco superior à necessária, fármacos mais agressivos (por exemplo os beta-bloqueantes utilizados no glaucoma podem influenciar o ritmo cardíaco) ou terapias mais invasivas (por exemplo cirurgia);
- No caso de se tratar de um ensaio clínico, os resultados obtidos são muitas vezes falaciosos ou inconclusivos, e as soluções utilizadas para aumentar a objectividade têm um custo elevado (deslocação diária dos voluntários ao centro onde se realiza o ensaio, aluguer de um local de permanência dos voluntários durante a duração do estudo, aumento do poder estatístico através do aumento da população envolvida, entre outros);

Com o objectivo de aumentar a objectividade e a qualidade da avaliação da compliance, a Blueworks está a desenvolver um projecto a que chamou “EyeDropper”. Este consiste num dispositivo portátil, dotado de uma câmara de alta definição, capaz de gravar rápidas seqüências de imagens cada vez que uma gota é expelida do frasco, retratando a trajectória da gota desde a ponta do frasco até que atinja ou falhe o olho.

Estes vídeos são transmitidos para o computador do médico/investigador, onde os dados são apresentados para visualização, com a opção de existir um passo adicional de processamento automático de imagem de modo a avaliar o sucesso da aplicação da gota, (localização da gota em cada frame, localização do contacto gota-olho e posição da pálpebra nesse instante) Caso seja necessária uma avaliação em tempo real, está prevista a possibilidade do envio dos dados remotamente através de uma ligação GSM ou UMTS.

O cruzamento da informação do sucesso da aplicação do fármaco com a hora e data da aplicação e com o calendário de prescrição permite, pela primeira vez no historial da oftalmologia, proceder a uma avaliação objectiva, remota e em tempo real da compliance dos doentes.

Adicionalmente, o dispositivo será dotado de alarmes sonoros e luminosos para lembrar o doente da hora de medicação, indicador sonoro do alinhamento olho-frasco e, na situação de ensaios clínicos, a eventual identificação da pessoa através da íris, bem como a aferição da lateralidade (olho direito ou esquerdo).

O conceito de negócio envolve a venda e/ou aluguer do dispositivo médico descrito, complementado pela prestação de serviços associados ao mesmo – processamento de imagem, validação manual de

resultados, *business intelligence* e assistência técnica – sendo que esta poderá ser feita directamente, através de distribuidores, ou através do licenciamento da Patente mundial já submetida.

### Descrição de vantagens competitivas da ideia de negócio

3

*Descrever de forma sucinta as condicionantes que conferem ao conceito de negócio apresentado uma vantagem competitiva, a médio ou longo prazo, comparativamente com outras soluções que já existem no mercado.*

A melhor solução actualmente no mercado para o permitir avaliar remotamente a compliance dos doentes de oftalmologia consiste num dispositivo electrónico que permite contar o número de vezes que um frasco é apertado, independentemente de ser ou não libertado fármaco e do destino do mesmo.

Existe em desenvolvimento um outro sistema que utiliza meios um pouco mais objectivos (dois feixes de infra-vermelho: um para detectar a queda da gota e outro para detectar uma variação brusca no cenário - caso seja um olho pode corresponder ao piscar do mesmo - e também um sensor de inclinação para avaliar o alinhamento do frasco-olho. Para além das limitações em avaliar o sucesso da instilação (os meios utilizados por este sistema são menos eficazes que uma avaliação vídeo da posição da gota e das pálpebras), e nenhum deles permite avaliar sequer algo tão importante como seja a lateralidade da aplicação (o olho esquerdo ou direito).

Relativamente à vantagem competitiva ao longo do tempo, uma vez que existe um pedido de patente a proteger o conceito (a utilização de imagens para validar a compliance em oftalmologia), esta manter-se-à pelo período de vigência da patente (20 anos – longo prazo).

Para o utilizador final, as vantagens do nosso sistema são fundamentalmente uma redução nos custos e uma enorme melhoria na qualidade dos dados recolhidos, o que por sua vez levará a uma melhoria na validação dos fármacos já existentes, ao aparecimento de novos fármacos, e sobretudo a uma melhoria da qualidade da saúde em geral.

### Análise preliminar da viabilidade económica da ideia

4

*Indicar uma estimativa dos principais custos e proveitos para a referida ideia (aproximando o preço unitário de venda e a dimensão do mercado) e o investimento inicial necessário ao arranque da ideia.*

Olhando para os dados de uma farmacêutica de referência, é visível um gasto médio de 384 M€/ano em investigação de novos fármacos de aplicação tópica na área de oftalmologia, sendo que uma parte significativa (embora não tenhamos documentação a prová-lo, estimamos que no mínimo será 50% da verba anual) destes gastos estará dedicada à execução de ensaios clínicos.



Nos últimos 3 anos houveram em média cerca de 7850 voluntários a integrar ensaios clínicos que envolveram a aplicação de gotas oftalmológicas, apenas para as 5 maiores farmacêuticas neste mercado, e no entanto, contactos com elementos da industria relevaram que, regra geral, até 90% do dados recolhidos acabam por não ser utilizados nos estudos, devido a não conformidades quer na execução da terapia, quer na execução da agenda de visitas de controlo.

Repetimos que as alternativas a estas elevadas taxas de desperdício têm um custo significativo, uma vez que a melhor avaliação possível da compliance utilizando os métodos actualmente existentes requer deslocações diárias dos voluntários à unidade de investigação, ou o alojamento dos mesmos em instalações alugadas. Deste modo, prevemos que a utilização do EyeDropper por parte da indústria farmacêutica permita uma redução de pelo menos 1/3 dos gastos associados a esta problemática.

Em termos de investimento necessário ao desenvolvimento do EyeDropper, prevemos as seguintes despesas (valores aproximados):

- Despesas suportadas até à data: 60.000€
- Investigação e desenvolvimento: 60,000€
- Barreiras comerciais (FDA, Infarmed e CE): 45,000€
- Protecção da PI (Patente): 300,000€
- Preparação para produção em massa: 150,000€
- Exploração de mercado: 50,000€/ano
- Custo de produção de cada dispositivo: 350€
- Custo de *helpdesk*: 30€/mês/dispositivo

O que dará um total de 665 k€ de investimento inicial.

Assumindo um preço de comercialização mínimo de 500€ por dispositivo, acrescido de uma subscrição mensal de 60€ (ou em alternativa um modelo de aluguer temporário, por exemplo a 100€ por 15 dias de utilização), atingindo uma quota de mercado de 10% (785 dispositivos vendidos, e activos pelo menos metade do ano), isto traduzir-se-à numa facturação de 675 k€, acrescida de 280k€/ano pela manutenção dos mesmos.

Contabilizando os custos previstos (310 k€ no primeiro ano mais 50 k€ nos seguintes) é possível determinar que o produto atingirá o *break-even* no prazo de 3 anos após o inicio da sua comercialização.

Nestes cálculos não foram tidas em conta as vantagens não dimensionáveis de decorrentes da maior qualidade dos dados obtidos.

<b>Análise SWOT da ideia</b>	
<b>5</b>	<i>Listar as forças, fraquezas, oportunidades e ameaças associadas à exploração do conceito de negócio.</i>
<b>Forças</b>	<b>Fraquezas</b>
<ul style="list-style-type: none"> <li>• Qualidade e inovação do conceito do dispositivo.</li> <li>• Protecção da propriedade intelectual (PI) através da existencia de um pedido de patente WIPO submetido.</li> <li>• Experiência da equipa e dos parceiros associados no desenvolvimento de sistemas de engenharia.</li> <li>• Autonomia para desenvolvimento interno da maioria do produto.</li> </ul>	<ul style="list-style-type: none"> <li>• Falta de experiência no mercado específico de dispositivos médicos.</li> <li>• Impossibilidade de realizar todo o desenvolvimento e produção dentro das instalações da empresa.</li> <li>• Falta de recursos (financeiros/tecnológicos) para diminuir o time-to-market.</li> </ul>
<b>Oportunidades</b>	<b>Ameaças</b>
<ul style="list-style-type: none"> <li>• Grande dimensão do mercado</li> <li>• Mais-valias muito significativas para o <i>end-user</i>.</li> <li>• Necessidade permanente deste tipo de produtos/serviços.</li> <li>• Mercado emergente (compliance).</li> <li>• Enquadramento político nacional e global (com apostas na tecnologia para a saúde que permita reduzir desperdícios e otimizar recursos e qualidade).</li> <li>• Para o mercado de clinical trials existe um pequeno grupo de “decision-makers” (logo serão necessários relativamente poucos contactos para conseguir a comercialização de muitas unidades).</li> </ul>	<ul style="list-style-type: none"> <li>• Deslocação dos ensaios clínicos para países do 3º Mundo.</li> <li>• Métodos alternativos de administração de fármacos no olho (nebulizadores).</li> <li>• Barreiras comerciais (FDA, Infarmed,...) e o custo de as ultrapassar.</li> <li>• Protecção da PI ainda não emitida.</li> <li>• Pequeno grupo de “decision-makers” (logo se a ideia for rejeitada há poucas alternativas).</li> </ul>
<b>6 Motivação dos promotores e seu envolvimento na concretização da ideia</b>	
<i>Indicar quais as mais valias da equipa de promotores para a concretização desta ideia de negócio: competências, experiência profissional, empenho e entusiasmo, complementaridade dos membros da equipa, investimento inicial que poderão realizar, entre outros.</i>	
A BlueWorks tem como objectivo tornar-se no prazo de 5 anos o líder mundial na validação remota da	

*compliance* em oftalmologia.

Para tal contamos com uma equipa dedicada e parceiros de excelência, como é o caso da ISA – Intelligent Sensing Anywhere - líder mundial na área de telemetria, com 20 anos de experiência em I&DT de sistemas de engenharia inovadores; o Centro Cirúrgico de Coimbra, onde nos encontramos sediados - unidade privada de saúde reconhecida pela elevada qualidade e diferenciação dos serviços medico-cirúrgicos prestados; e a NeuroEye - outra start-up local cujo fundador (Prof. Dr. Miguel Castelo Branco) foi o vencedor do Prémio BIAL 2008. É através destas parcerias que temos acesso a *know-how* altamente diferenciado nas áreas de engenharia, medicina e investigação, fundamental para o desenvolvimento deste projecto.

Sendo a BlueWorks uma empresa com apenas 2 anos e meio, a experiência dos seus fundadores neste novo mercado de tecnologia médica é ainda diminuta. Contudo, a vontade de singrar no mundo dos *medical devices* é muita e, para isso, todas as competências adquiridas durante os anos de formação académica, as características intrínsecas de cada um dos elementos que a constituem e o contacto adquirido com o mundo empresarial e profissional fazem a diferença.

Desse modo, tentamos inculcar aos membros envolvidos no desenvolvimento deste projecto, todo o entusiasmo e gosto “pela corrida” necessários para ultrapassar os momentos menos bons e saborear os melhores momentos desta viagem que começou com uma simples ideia e, terminará com um produto totalmente desenvolvido e comercializado.

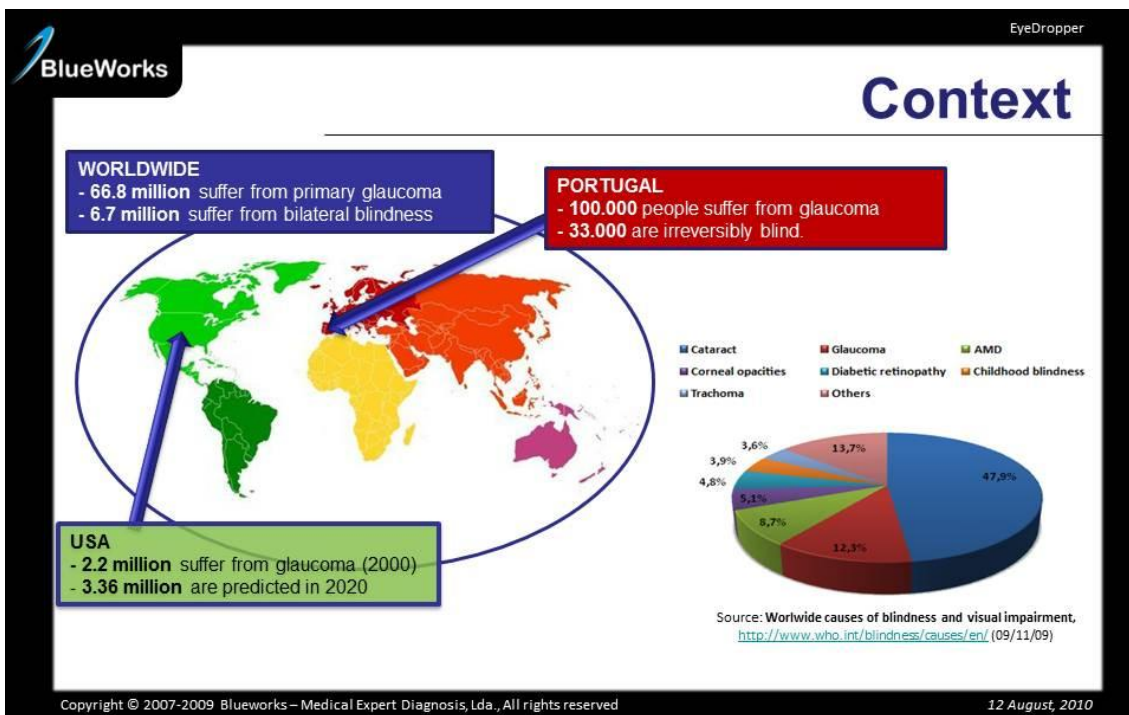
Para isso, a empresa conta com colaboradores provenientes do Mestrado Integrado em Engenharia Biomédica da Universidade de Coimbra, uma vez que estes possuem um conjunto de conhecimentos multidisciplinares adequados aos objectivos da empresa e à realização deste projecto.

De salientar que a BlueWorks tem recorrido a incentivos no âmbito do QREN e a autofinanciamento para o desenvolvimento dos seus projectos, e o projecto EyeDropper apresentado neste documento é apenas um dos vectores de acção da empresa. Paralelamente ao apoio à decisão através da recolha de informação objectiva relativa à *compliance* dos doentes, trabalhamos também nas áreas do rastreio precoce de problemas de visão, interoperabilidade de equipamentos médicos, e investigação de novas tecnologias de processamento de imagem médica e análise multidimensional de dados (*data-mining*).

Esta filosofia de inovação consubstanciada em diversos projectos de alta-tecnologia será a base de suporte ao crescimento da empresa, o que levará inevitavelmente ao reconhecimento da BlueWorks como marca de confiança, segurança e inovação na sua área de *expertise*.

Enviar o presente formulário, devidamente preenchido, até ao dia 16 de Outubro de 2009, para [gats@ci.uc.pt](mailto:gats@ci.uc.pt)

ii. Power Point Presentation



## Market Opportunity

### Ophthalmology Compliance Problem Statement:

- The most common way to decrease the progression is the topical application of eye drops, which must be taken in a regular basis.
- In ophthalmology, this is a bigger issue due to the **inherent difficulty of self-administrating eye-drops.**
- Even when someone tries to correctly apply it, he may fail.



3

## Market Opportunity

### Poor compliance consequences:

- Patients may become blind;
- Increase of the amount and type of prescribed drugs;
- Unnecessary surgeries;
- Research Centers have unreliable data to perform analysis of new therapeutical procedures or drugs.
- Increased population disability – decreased tax revenue, increased social support costs

The question remains:

*“How to accurately assess compliance with a minimum impact on patient’s daily life, and with costs below current ones?”*

4

## Current solutions

- Weight of drops flasks between visits.
- Asking patients to keep a compliance diary.
- In clinical trials:
  - Daily dislocation of volunteers to study center;
  - Rental of an hotel or private clinic to accommodate volunteers and staff.
- Use of electronic devices to get data regarding compliance.
  - Indirect measures
  - Unreliable data



5


## Our solution

*The world's most technologically advanced medical device to evaluate patients' compliance in ophthalmology.*



**EyeDropper**

6



EyeDropper

## Our solution

**Technical features:**

- Autonomous portable device;
- Built-in video camera;
- Internal clock, speaker, and LEDs for alarms;
- Lever to ease the pressure of the bottle;
- Battery & charger (similar to one from a mobile phone);
- Scene illumination LED;
- Inclination sensor and sound warnings to aid the alignment of the device.


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EyeDropper

## Our solution

**How it works:**

- Video-recording of each drop application
- Device inclination sensors assessing optimal angle of usage
- Sound cues guide user to optimal angle of usage
- Drop-use and recording synchronization mechanisms



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EyeDropper

## Our solution

**How it works:**

- Local data upload to study center via *Bluetooth* or *USB* (for example)
- Remote data upload to study-center via UMTS or GMS data-transmission (for example)
- Drop-application success evaluation trough image analysis
- Laterality assessment and subject identification through iris pattern

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EyeDropper

## Added Value

Pharmaceuticals

- Better research process of new drugs;
- Stratification of volunteers - cause-effect relationship is not compromised by the performance of voluntary;

Ophthalmology Units

- Increased effectiveness of drug therapies;
- Optimization of resource allocation, reducing the number of potentially unnecessary surgeries.

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EyeDropper – Compliance Validation System for Ophthalmology

## Deliverables

**Sales**

**Compliance Validation KIT**

N devices:

+

Review Software:

**Rental**

Device:

+

Review Software:

e.g. Per 15 days

**Rental**

**Compliance Validation Service**

Compliance Reports:

ID	Date	Hour	Eye	Success
001	01-01-2009	09:00	OD	1
001	01-01-2009	09:00	OS	1
001	01-01-2009	21:00	OD	1

Per patient/month

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EyeDropper

## Business Opportunity – Why BlueWorks?

Ophthalmology focused

- BlueWorks is headquartered in Coimbra (Health capital of Portugal), benefiting of very closed partnerships with a Private Health Clinic, with 10 years of history providing highly differentiated cares in the field of ophthalmology.

Excellence Partners

- BlueWorks benefits from the tech, clinical and research expertise of several founder companies:
- ISA** - M2M, wireless communication, embedded systems, engineering project management, international cooperation projects, etc.
- CCC** - Ophthalmology, clinical practice, surgical procedures
- NeuroEye** - Neurosciences, electrophysiology, psychophysiology

Attitude

- BlueWorks invests in new approaches to medicine, creating state-of-art technology and betting on young talents in order to achieve reliable healthcare solutions in a short time of development

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## Coimbra Surgical Center

- Private Healthcare Unit
- Aims to provide excellence medical services
- Specialized in Ophthalmology
- Provides services in other medical specialties such as:

- |                      |                  |
|----------------------|------------------|
| •Cardiology          | •Endocrinology   |
| •Neurosurgery        | •Orthopedy       |
| •Plastic Surgery     | •Nephrology      |
| •Otorhinolaryngology | •Pediatrics      |
| •Gynecology          | •General Surgery |



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## ISA – Intelligent Sensing Anywhere

- Engineering company specialized in Telemetry and M2M (Machine to Machine) Communications, with over 20 years of experience in those fields



- Among many awards received, ISA was distinguished in the course of Metering Europe 2006 in Copenhagen with the Innovation Award of the European Utility Awards

- ISA has telemetry solutions to:

- |                         |                |
|-------------------------|----------------|
| • Oil & Gas             | • Energy       |
| • Environment           | • Surveillance |
| • Industrial Automation | • HealthCare   |



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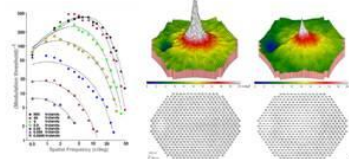
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## NeuroEye: Electromedicine & Psychophysics

- Start-up SME dedicated to the research and development of new psychophysical and electrophysiological tests for visual function assessment.
- These tests are aimed to early diagnosis of degenerative diseases
- Provides services in:
  - Validating therapeutic outcomes
  - Studying lens filtering influence
  - Contrast Sensitivity
  - Quantitative neuro-sensorial assessment

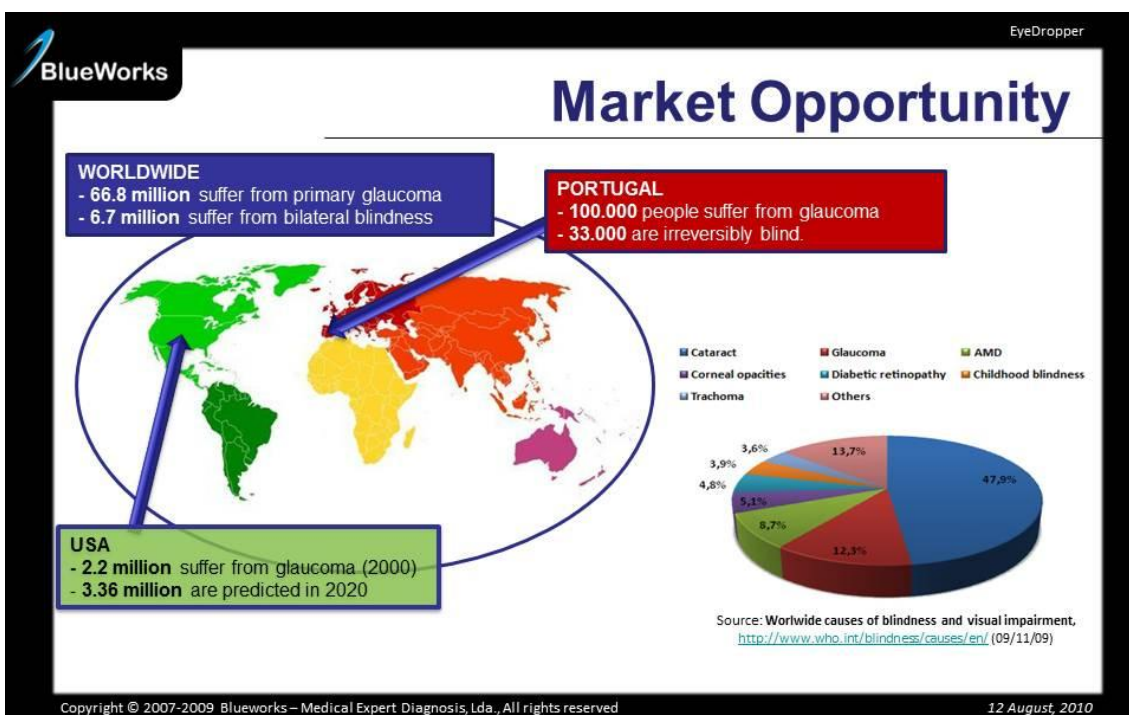
NEUROEYE



## Partners and support



### C. Presentation developed to FINICIA Platform



BlueWorks EyeDropper

## Market Opportunity

**Global Pharmaceutical Context:**

Over the last 10 years:

- ↑ 2.6x - Increase of Investment in new drugs & medical devices
- ↑ e<sup>x</sup> - Increase in existing fundamental scientific knowledge
- ↓ 60% - Drug discovery output

Possible reasons:

- Poor evaluation and manufacturing methods
- Lack of communication between entities
- + Weak basic infrastructures

= New drugs are only effective in 40% - 60% of the cases

↓

197.000 deaths per year in Europe ↔ 79 Billion Euros spent in Europe

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BlueWorks EyeDropper

## Market Opportunity

**Ophthalmology Compliance Problem Statement:**

- The most common way to decrease the progression is the topical application of eye drops, which must be taken in a regular basis
- In ophthalmology, this is a bigger issue due to the **inherent difficulty of self-administrating eye-drops.**
- In clinical trials, volunteers have poor compliance (~90% results are wasted)



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## Market Opportunity

### Poor compliance consequences:

- Patients may become blind;
- Increase of the amount and type of prescribed drugs;
- Unnecessary surgeries;
- Research Centers have unreliable data to perform analysis of new therapeutical procedures or drugs.

The question remains:

*"How to accurately assess compliance with a minimum impact on patient's daily life, and with costs below current ones?"*



## Current solutions

- Weight of drops flasks between visits.
- Asking patients to keep a compliance diary.
- In clinical trials:
  - Daily dislocation of volunteers to study center;
  - Rental of an hotel or private clinic to accommodate volunteers and staff.
- Use of electronic devices to get data regarding compliance.



## Our solution

*The world's most technologically advanced medical device to evaluate patients' compliance in ophthalmology.*



# EyeDropper

## Our solution

### The features:

- Autonomous portable device;
- Built-in HD video camera;
- Internal clock, speaker, and LEDs for alarms;
- Lever to ease the pressure of the bottle;
- Battery & charger (similar to one from a mobile phone);
- Scene illumination LED;
- Inclination sensor and sound warnings to aid the alignment of the device;


EyeDropper

## Our solution


How it works:

- Video-recording of each drop application
- Device inclination sensors assessing optimal angle of usage
- Sound cues guide user to optimal angle of usage
- Drop-use and recording synchronization mechanisms\*



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EyeDropper

## Our solution

How it works:

- Local data upload to study center via *Bluetooth* or *USB* (for example)
- Remote data upload to study-center via UMTS or GMS data-transmission (for example)\*
- Drop-application success evaluation trough image analysis\*
- Laterality assessment and subject identification through iris pattern



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BlueWorks

## Target Market

Pharmaceuticals

- Added Value:
- Better research process of new drugs;
- Stratification of volunteers - cause-effect relationship is not compromised by the performance of voluntary;

Ophthalmology Units

- Increased effectiveness of drug therapies;
- Optimization of resource allocation, reducing the number of potentially unnecessary surgeries.

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BlueWorks

## Market Size

	Population Size	Financial Size
Clinical Trials Use	In the last 3 years there was an average of 16,500 volunteers a year to include clinical trials of eye drops (drops) for ophthalmology. (source: analysis of existing data has <a href="http://www.clinicaltrials.gov">www.clinicaltrials.gov</a> )	Assuming that Alcon represents 1 / 5 of business research ( <u>pessimistic scenario</u> ):  Total pharmacological research: <b>1920 M€</b>  Total clinical trials (informed guess of 50%): <b>960 M€</b>
Clinical Use	Glaucoma only: 66.8 M patients worldwide	55% of all costs are non medical.  Cost per patient / year: <b>550€</b> Worldwide market: <b>36.7 B€</b>

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EyeDropper

## Business Opportunity – Why BlueWorks?

Ophthalmology focused

- BlueWorks is headquartered in Coimbra (Health capital of Portugal), benefiting of very closed partnerships with a Private Health Clinic, with 10 years of history providing highly differentiated cares in the field of ophthalmology.


Excellence Partners

- BlueWorks benefits from the tech, clinical and research expertise of several founder companies:
  - ISA - M2M, wireless communication, embedded systems, engineering project management, international cooperation projects, etc.
  - CCC - Ophthalmology, clinical practice, surgical procedures
  - NeuroEye - Neurosciences, electrophysiology, psychophysiology, etc.

Attitude

- BlueWorks invests in new approaches to medicine, creating state-of-art technology and betting on young talents in order to achieve reliable healthcare solutions in a short time of development

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EyeDropper

## Our Mission

**To innovate in the achievement of therapeutic strategies for ophthalmologic disease treatment**

- To ally human knowledge and computing power
- To use artificial intelligence's learning capabilities
- To achieve accurate Computer Assisted Diagnosis
- To accurately monitor and predict condition evolution
- To search for patterns in chosen therapeutic strategies

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## SWOT Analysis

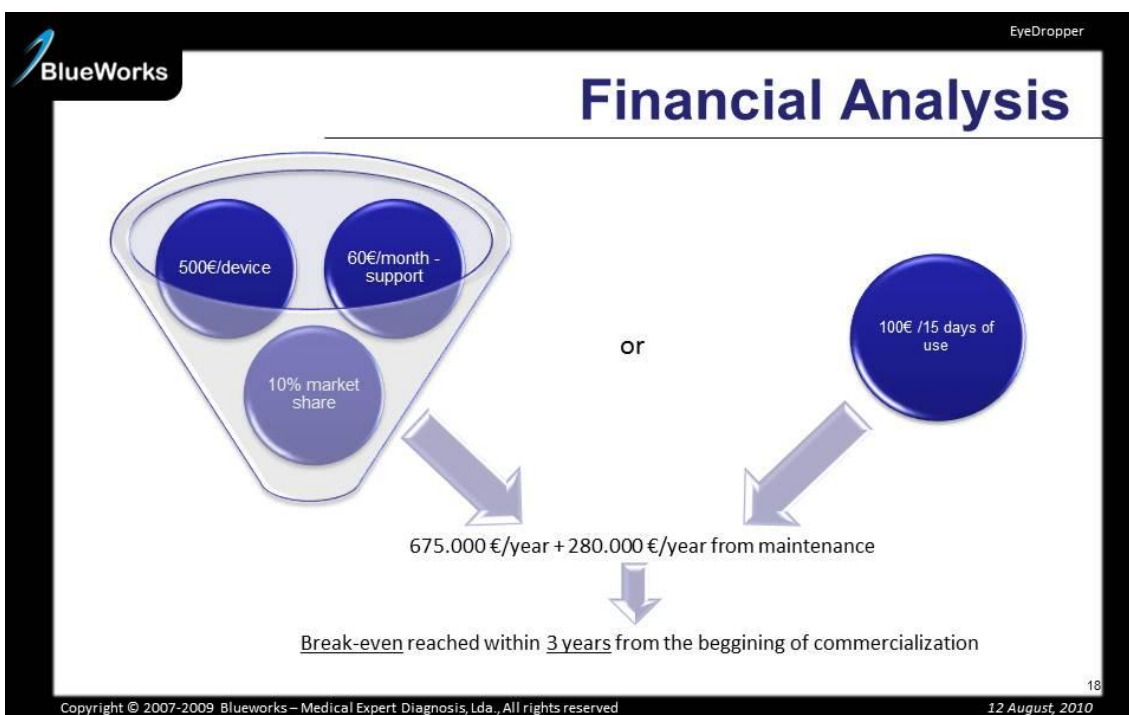
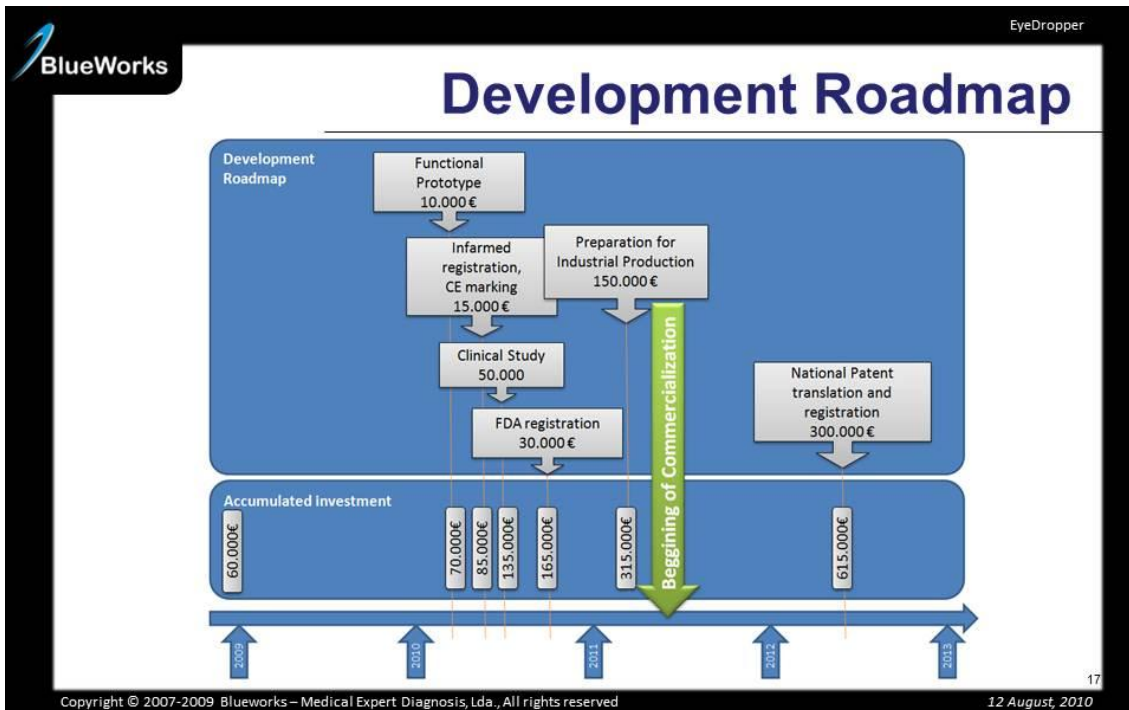
Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Quality and innovation of device concept</li> <li>• IP protection by a WIPO patent requested</li> <li>• Experience of associated enterprises in the development of engineering systems</li> <li>• Autonomy to develop internally the greater part of the product</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of experience in the specific market of medical devices</li> <li>• Inability to perform all development and production inside the company's facilities</li> <li>• Cost of Stand-Alone version development</li> <li>• Lack of resources (financial/technological) in order to diminish the time-to-market</li> </ul>

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## SWOT Analysis

Opportunities	Threats
<ul style="list-style-type: none"> <li>• Compliance is a huge and emerging market</li> <li>• High added value to the <i>end-user</i></li> <li>• Permanent need of such products/services</li> <li>• National and global political environment/framework</li> <li>• Small group of decision-makers (few contacts will be necessary in order to get to a great number of people)</li> </ul>	<ul style="list-style-type: none"> <li>• Clinical Trials dislocation to 3<sup>rd</sup> World Countries</li> <li>• Alternative methods for drug delivery to the eye</li> <li>• Commercial barriers and cost of overcoming them.</li> <li>• IP protection still undisclosed</li> <li>• Small group of decision-makers (which leaves few choices if the idea is rejected)</li> </ul>

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EyeDropper

## Product Offer

**Compliance Product**

- Hardware Sales
- Data management software licencing
- Equipment insurance fee

**Compliance Validation Service**

- Hardware rental
- Data management software licencing

**Associated Services**

- Data-mining report
- Data analysis services

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EyeDropper

## Other projects

**Ophthalsuite**

- Medical Equipments Integration
- Data Mining & Business Intelligence Support

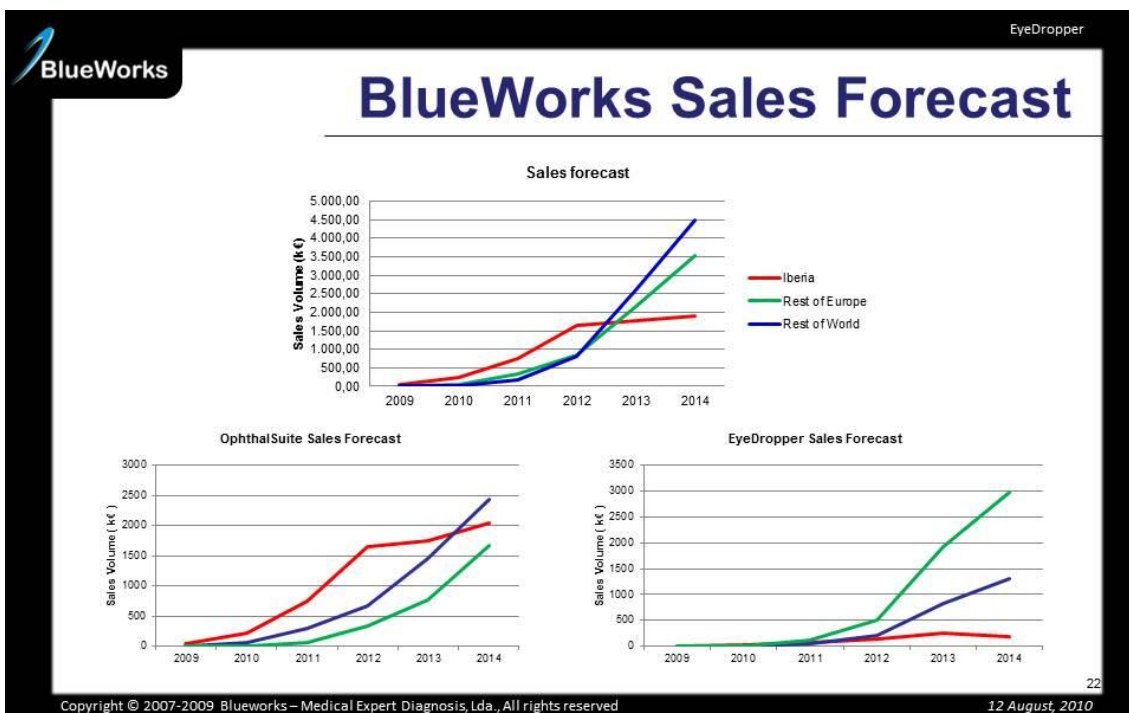
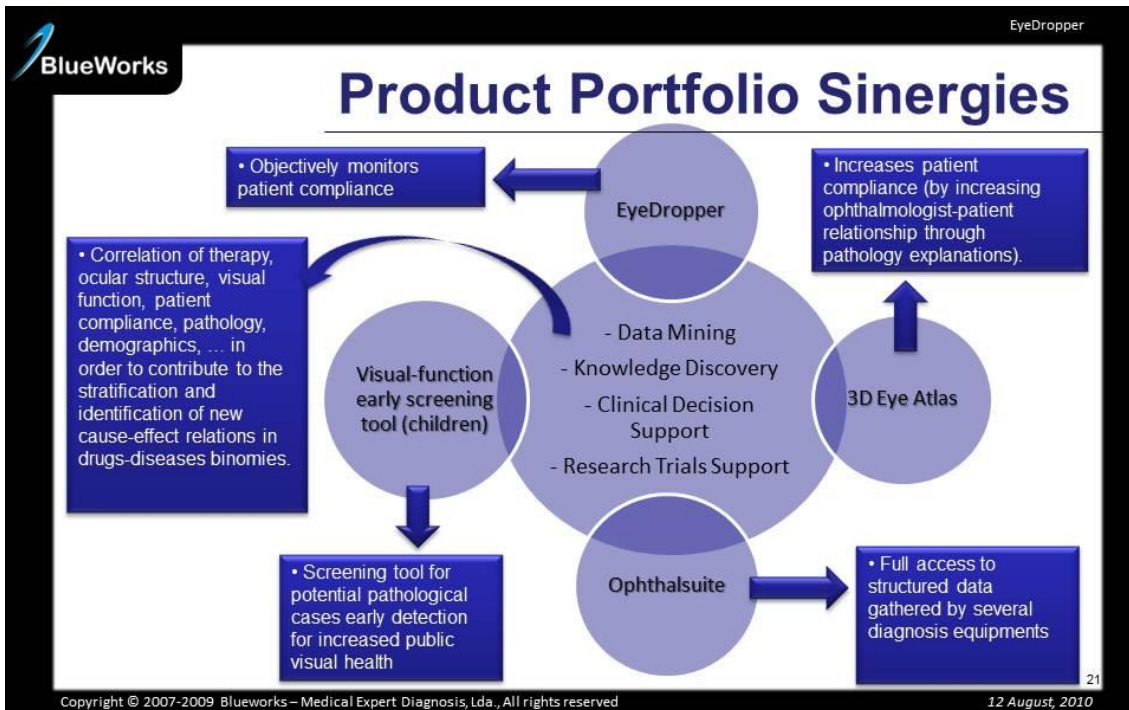
**Children eye-disease tracking system**

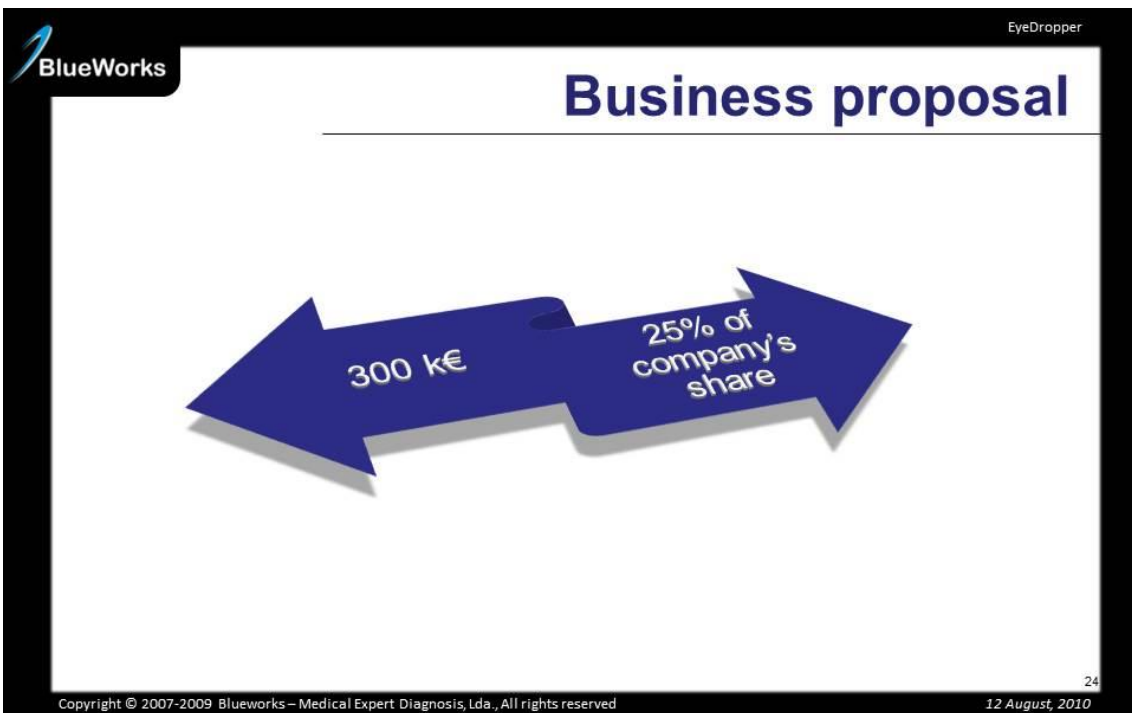
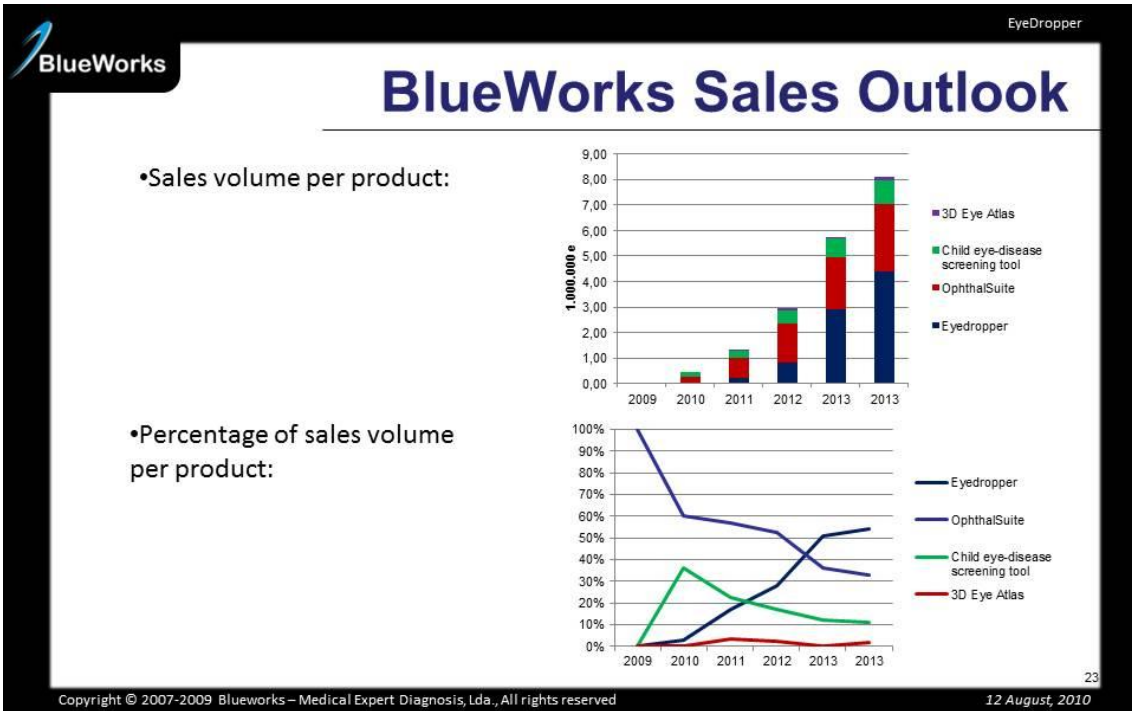
- Aimed for children aged 5 to 10
- Distributed for "Magalhães" Computer

**Advanced ophthalmology contents communication platform**

- 3D virtual reality environment
- Anatomy and Pathology dynamic illustrations

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BlueWorks EyeDropper

## Partners and support

CENTRO CIRURGICO LISBOA

ISA

NEUROEYE

CEI

QUADRO DE REFERÊNCIA ESTRATÉGICO NACIONAL  
PORTUGAL 2007-2013

FORMAÇÃO PME  
Faz das Pequenas, Grandes Empresas

Microsoft BizSpark

UNIÃO EUROPEIA  
Fundo Social Europeu

PROGRAMA OPERACIONAL POTENCIAL HUMANO

AEP  
CÂMARA DE COMÉRCIO E INDÚSTRIA

EMPOWER ISV  
Accelerating Success  
Microsoft

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BlueWorks

*Thank you!*

# BlueWorks

www.blueworks.pt

blueworks@blueworks.pt

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## D. Application to EEVC Semi Final in Lisbon '09

### i. Pitch used for online application

#### Project in short

The world's most technologically advanced medical device to evaluate patients' compliance in ophthalmology.

#### Project Description

The consequences of the absence of a reliable mechanism to assess the compliance of patients are:

- Increase of vision loss and consequent irreversible blindness;
- Increased costs and risks by prescribing a superior amount of drug than necessary, the use of more aggressive drugs (e.g. beta-blockers used in glaucoma can affect heart rhythm) or use of invasive therapies (e.g. surgery);
- In clinical trials, the results are often misleading or inconclusive and the solutions used to increase objectivity are very costly (daily dislocations of volunteers to the center where the test takes place, hiring a local unit to lodge them during the study period, increase of statistical power by increasing the population involved, etc.)

In order to increase the objectivity and quality of compliance evaluation, BlueWorks is developing a project called EyeDropper. It consists in a portable device equipped with a HD camera that records fast sequential images each time a drop is expelled from the bottle depicting its trajectory from the tip of the bottle until it reaches or misses the eye. These videos are then transmitted to the computer of the researcher, where data is presented, with the option of an additional step of automatic image processing in order to evaluate the successful implementation of the drop (drop location in each frame, location of drop-eye contact and eyelid position). If assessment is required in real time, there's a possibility of sending data remotely via GSM or UMTS.

Crossing the information of the drugs' successful implementation with the time and date of application and calendar of the prescription allows for the first time in the history of ophthalmology, the elaboration of an objective assessment of the patients' compliance, remotely and in real-time.

Additionally, the device will be equipped with sound and light alarms in order to remind the medication time, audible indicator of eye-bottle alignment, and the measurement of laterality (right or left eye).

## Go to market strategy

Market exploitation will be made by three distinct approaches:

- Regular medical-device sales, with all associated services (helpdesk, insurance, etc...);
- Rental of the medical-device with a monthly fee;
- Licensing the technology through a worldwide patent;

In order to prepare the technology to arrive to the market, several steps must be performed. They are:

- Concept demonstration prototype – Already Concluded
- Portuguese National patent – Submitted at July 08
- Worldwide patent – Submitted at July 2009
- Final prototype – To be ready at the end of 2009
- Scientific paper publication – To be ready at the end of 2009
- Initial certification request by FDA and CE - To submit in the first quarter of 2010

After these steps are completed, the applied strategy will be as it follows:

1. Direct contact with pharmaceutical research departments in order to include the medical device in clinical trials.
2. Direct contact with the NHS in order to perform clinical trials regarding the assessment of a reduction in the number of unnecessary surgeries due to the use our technology.
3. Direct contact with physicians and/or private healthcare units using promotional activities and market approaches.

To summarize, the business concept of the technology involves the sale or rental of the device, complemented by services associated with it - image processing, manual validation of results, *business intelligence* and technical assistance - which can be done directly through distributors, or through licensing the worldwide patent which already has been submitted.

## Protection and Copyrights

Portuguese National Patent nº 104086 (patent pending)

International Patent nº TCT\PT2009\000032 (patent pending)

## Awards and milestones

Portuguese National patent – Submitted at July 08

Worldwide patent – Submitted at July 09

## E. Presentation developed to INOVPOINT Contest

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## The need of improving patient compliance

*“The number of people with primary glaucoma in the world by the year 2000 is estimated at nearly 66.8 million, with 6.7 million suffering from bilateral blindness. In developed countries, fewer than 50% of those with glaucoma are aware of their disease. In the developing world, the rate of known disease is even lower.”*

Wilmer Institute  
Johns Hopkins University School of Medicine  
Baltimore USA

*“Glaucoma is the leading cause of irreversible blindness in the world. The Eye Disease Prevalence Research Group estimated that in the year 2000, glaucoma affected 2.22 million people in the United States. This number is projected to increase to 3.36 million by 2020. Overall, it is estimated that almost 10% of the visual loss from glaucoma is the result of non compliance with medications.”*

Health Benchmarks  
Blue Cross Shield of Illinois



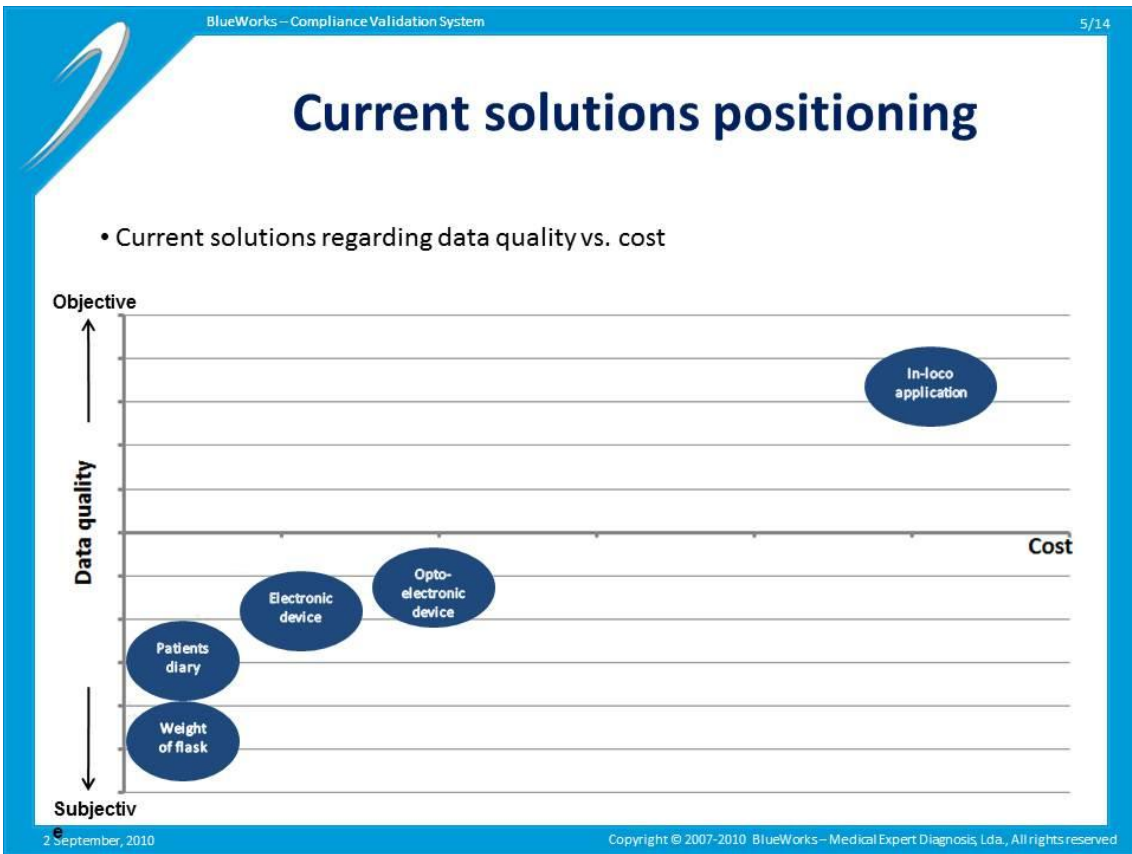
## Current solutions for compliance assessment

- Weight of drops flasks between visits.
- Asking patients to keep a compliance diary.
- In clinical trials:
  - Daily dislocation of volunteers to study center;
  - Rental of an hotel or private clinic to accommodate volunteers and staff.
- Use of electronic devices to get data regarding compliance.
  - Indirect measures
  - Unreliable data
    - Date
    - Time
    - Flask squeeze / Drop leaving flask



The question remains:

*“How to accurately assess compliance with a minimum impact on patient’s daily life, and with costs below current ones?”*



BlueWorks – Compliance Validation System 6/14

## Proposed Solution

- Small-sized autonomous device
- Portable Device able to contain a drop dispenser
- Schedule alarms
- Light and sound alarms
- Remotely programmable therapeutical schedule\*

**Current Prototype**

**This device has a Patent Pending** - Under development \*


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BlueWorks – Compliance Validation System 7/14

## Proposed Solution

- Video-recording of each drop application
- Device inclination sensors assess optimal angle of usage
- Sound cues guide user to optimal angle of drop
- Drop-use and recording synchronization mechanisms\*

**This device has a Patent Pending**      - Under development \*




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BlueWorks – Compliance Validation System 8/14

## Proposed Solution

- Local data upload to study center via *Bluetooth* or *USB*
- Remote data upload to study-center via UMTS data-transmission \*
- Drop-application success evaluation trough image analysis\*

**This device has a Patent Pending**      - Under development \*



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BlueWorks – Compliance Validation System 9/14

## Proposed Solution

- Subject identification through iris pattern
- Laterality assessment through iris pattern

+

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This device has a Patent Pending
- Under development \*

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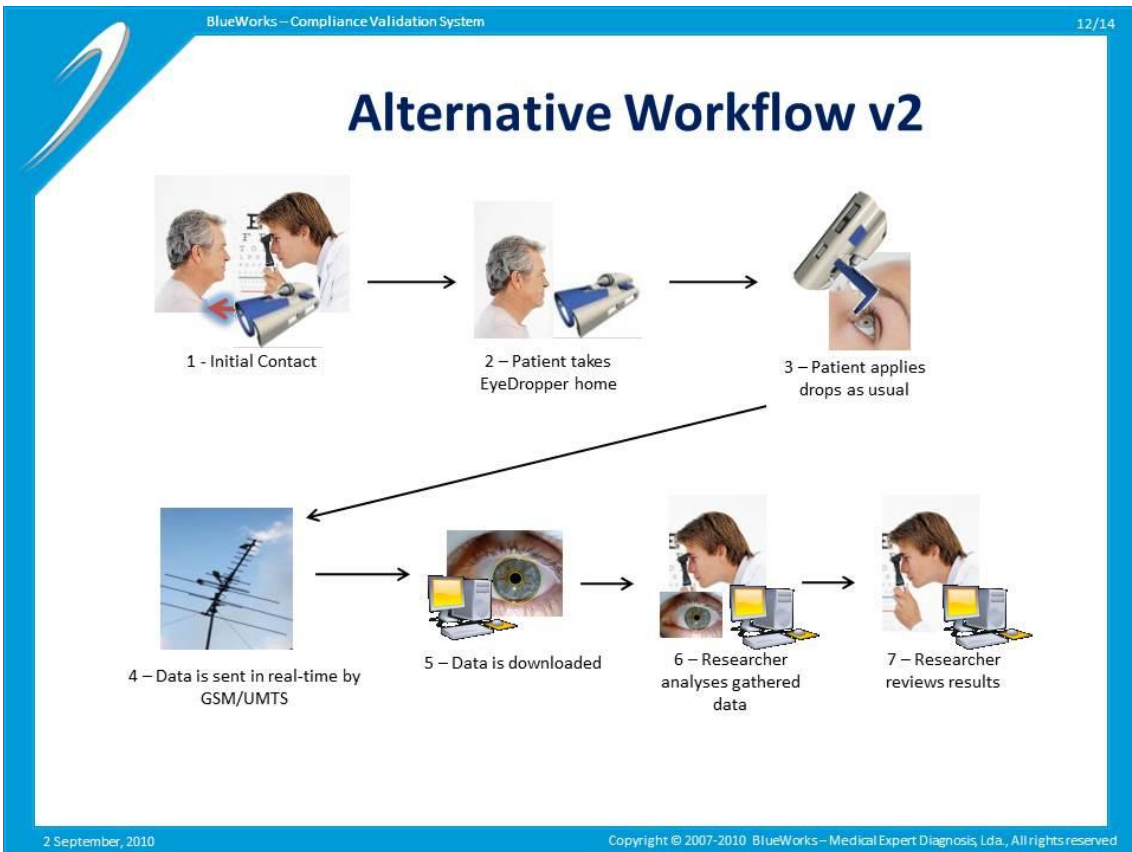
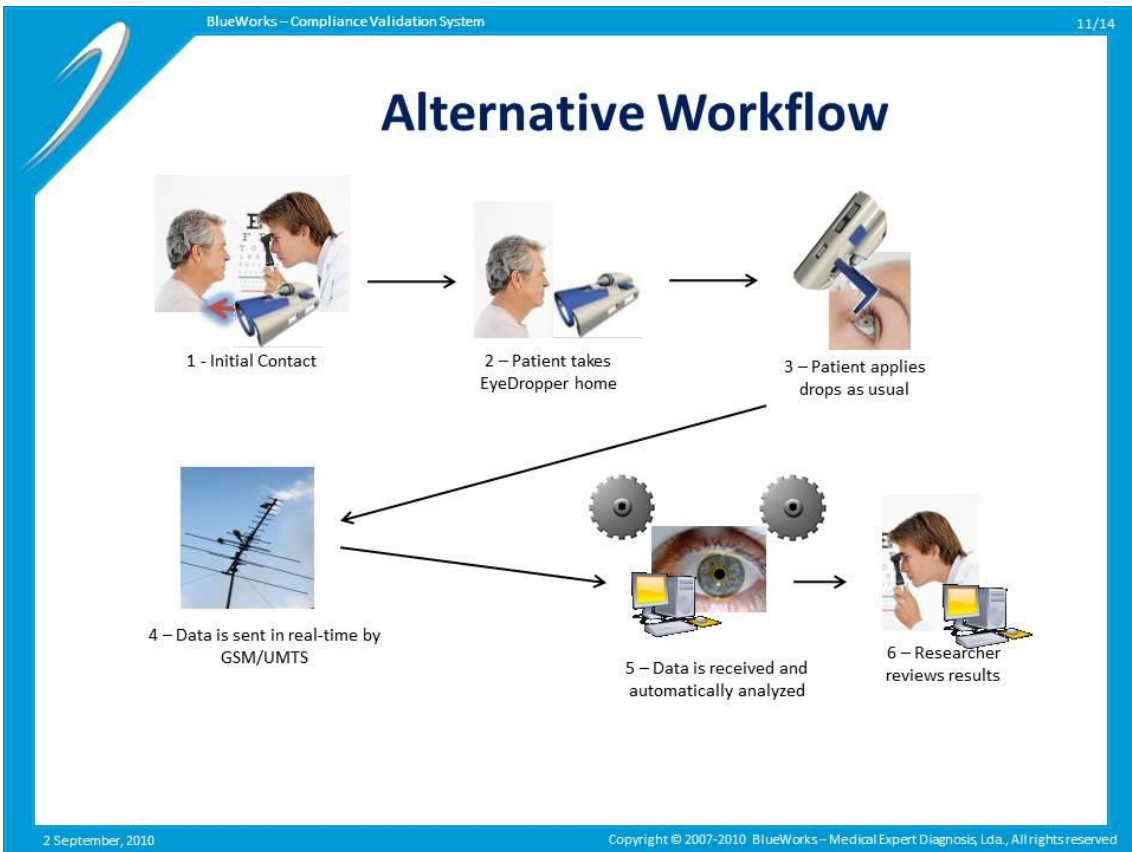
BlueWorks – Compliance Validation System 10/14

## System Workflow

- 1 - Initial Contact
- 2 - Patient takes EyeDropper home
- 3 - Patient applies drops as usual
- 4 - Patient Returns with EyeDropper
- 5 - Researcher plugs device to PC
- 6 - Data is downloaded and analyzed
- 7 - Researcher reviews results

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BlueWorks – Compliance Validation System 13/14

## Researcher Software

Register / Import Patient Data
Gather an Iris Sample

Step 1  
Initial Contact

Define Therapy Schedule

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BlueWorks – Compliance Validation System 14/14

## Researcher Software

View Gathered Videos
Use Algorithms

Step 2  
Analyze  
Gathered Data

Manually define instillation success

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## Researcher Software

Compliance  
Results  
Review

**Graphic Representation**

**Statistics**

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BlueWorks – Compliance Validation System 16/14

## Value Proposition

- Regarding the current solutions, EyeDropper provides greater type and data quality, with also several financial benefits:

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**Medical Expert Diagnosis**

# BlueWorks

[www.blueworks.pt](http://www.blueworks.pt)  
[blueworks@blueworks.pt](mailto:blueworks@blueworks.pt)

**Compliance Validation System**

blueworks

## F. Application to “Arrisca Coimbra 2010”



# CONCURSO DE IDEIAS DE NEGÓCIO ARRISCA COIMBRA 2010

## B o l e t i m d e C a n d i d a t u r a

Nº Candidatura		Data de entrega		Ligação à Inst. Ens. Sup. de Coimbra	
----------------	--	-----------------	--	--------------------------------------	--

A preencher pela organização do concurso

Nome da Equipa	BlueWorks
----------------	-----------

### 1 Identificação dos promotores

Nome Promotor 1	BlueWorks – Medical Expert Diagnosis
-----------------	--------------------------------------

Morada	Rua Dr. Manuel Campos Pinheiro, 51
--------	------------------------------------

Localidade	Espadaneira - S. Martinho do Bispo	Código postal	3045-089 Coimbra
------------	------------------------------------	---------------	------------------

e-mail	blueworks@blueworks.pt	Telefone	239 791 090	Telemóvel	
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Nome Promotor 2 - e-mail	
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Nome Promotor 3 - e-mail	
--------------------------	--

Nome Promotor 4 - e-mail	
--------------------------	--

Nome Promotor 5 - e-mail	
--------------------------	--

### 2 Descrição sucinta do conceito de negócio

2 *Descrever num curto texto a ideia de negócio, qual(ais) o(s) problema(s) dos potenciais clientes que o conceito de negócio vem resolver e de que forma o(s) resolve*

Os problemas relacionados com a visão em Portugal afectam cerca de 4.000.000 pessoas, sendo que cerca de 70 000 dos casos são impossíveis de ser corrigidos através da utilização de lentes. Destes últimos, 40,000 são cegos, metade dos quais com menos de 65 anos.

No que diz respeito a crianças com problemas oculares em Portugal, 20% das crianças sofrem de erros de refração, e 5% dos recém-nascidos em cada ano têm factores de risco para a ambliopia. Segundo a

Sociedade Portuguesa de Oftalmologia, em cada ano, cerca de 5.000 crianças podem ficar ambliopes devido à falta de rastreio.

Os sintomas que a criança apresenta podem variar dependendo da condição subjacente que afecta os seus olhos. Contudo, no caso específico da ambliopia, mesmo os pais mais atentos poderão ter dificuldades em se aperceber da perturbação ocular da criança, uma vez que esta é assintomática e não há da parte da criança afectada uma percepção do que é “ver bem”, sendo que nunca viu de outra forma, não possuindo portanto um termo de comparação.

Estes factores aliados ao facto que a maturação do sistema nervoso central ocorre até aos 6 anos de vida <sup>5</sup>, se algumas destas doenças visuais não forem corrigidas atempadamente, tentativas posteriores de tratamento e correcção poderão ser infrutíferas.

É principalmente devido às dificuldades anteriormente mencionadas que cerca de 65% dos pais portugueses nunca levaram os seus filhos ao oftalmologista com o intuito de avaliar uma possível deficiência ao nível da visão.

Desse modo, uma vez que são mais facilmente tratáveis nas fases iniciais, os problemas oculares em crianças devem ser identificados o mais cedo possível através do rastreio/exame ocular regular. Este consiste geralmente num exame padronizado, para avaliar e acompanhar a visão de uma criança e detectar potenciais doenças ou distúrbios que possam afectar os olhos.

Assim sendo, a BlueWorks pretende contribuir para a detecção precoce de doenças oculares em crianças em idade escolar, criando um programa de computador – semelhante a um jogo interactivo – que, sendo “jogado” pelas crianças (com a supervisão de um professor), enviará através da internet os resultados para uma central onde será avaliado o estado funcional global da sua função visual, permitindo rastrear precocemente eventuais problemas.

Essa ferramenta será de utilização simples – a fim de ser utilizado por usuários na faixa etária em questão, e será optimizado para trabalhar no computador “Magalhães” – uma vez que este é especialmente concebido para uso das crianças e fornece inerentemente uma standardização dos resultados.

Este programa será distribuído gratuitamente, e os clientes (por ex.: pais, escola, ARS, SNS, ...) pagarão para aceder aos resultados da informação processada.

### Descrição de vantagens competitivas da ideia de negócio

3

*Descrever num curto texto de que modo o conceito de negócio é melhor a longo prazo comparativamente com outras soluções que já existem no mercado*

Quando o Serviço Nacional de Saúde pretende avaliar a saúde global das crianças, geralmente recorre a unidades móveis, que são equipadas com médicos, enfermeiros, e máquinas diversas para ajudar ao diagnóstico de problemas nos olhos, ouvidos e problemas dentários, uma vez que estes são os mais

<sup>5</sup> <http://www.conhecersaude.com/adultos/3133-Ambliopia.html>

comuns entre as crianças.

Apesar da diluição do custo da deslocação pelos diversos exames realizados, além do tempo gasto e da logística envolvida, este sistema tem outras duas desvantagens: o custo por rastreio e a incapacidade de chegar a todas as crianças dentro do tempo útil.

Quanto aos testes de visão por computador, existem vários disponíveis na internet, mas têm como principais desvantagens a falta de calibração do *hardware* específico onde estes serão executados (dimensão do monitor, resolução, dimensão de cada pixel, etc.), traduzindo-se fundamentalmente numa falta de fiabilidade dos resultados.

As vantagens da solução da BlueWorks são:

- **Fiabilidade:** Está calibrado especificamente para o *hardware* do computador “Magalhães”, e os testes serão sempre supervisionados por um professor;
- **Baixo custo:** Apesar do preço por exame assentar numa economia de escala, prevemos que possa ser tão pequeno como 10% dos custos actuais (que estimamos que actualmente esteja em 10€ por criança rastreada);
- **Abrangência:** Colaborando com o ministério da educação, poderão ser analisadas TODAS as crianças do ensino primário nacional (100.000 alunos);
- **Rapidez:** Sendo no início do ano lectivo, será possível garantir que todos os alunos têm acesso a rastreio atempado.

A informação recolhida será utilizada primordialmente para contactar directamente a escola/pais no sentido de os reencaminhar para uma consulta de especialidade, mas em alternativa poderá servir como pré-avaliação que permita otimizar o planeamento da alocação das carrinhas móveis (identificar quais os alunos que deverão analisar mais exaustivamente ou não).

Em termos de negócio, para além do retorno com baixos custos de estrutura (manutenção servidor), o potencial de internacionalização é extremamente elevado, assim como a expansão deste conceito para outras áreas médicas (por exemplo, pré-avaliação de audição com *headphones* calibrados; fotografia bucal através de adaptador óptico acoplável à webcam do Magalhães, etc..)

#### Análise preliminar da viabilidade económica da ideia de negócio

4

*Indicar uma estimativa dos principais custos e proveitos estimados para a referida ideia (estimando o preço unitário de venda, e a dimensão do mercado) e o investimento inicial necessário ao arranque da ideia*

Os principais custos desta tecnologia serão de desenvolvimento ( a estimativa preliminar aponta para 80.000€), e depois de manutenção do Webservice/Servidor e Base de Dados (estimada em 30.000€ / ano).

O panorama actual deste mercado a nível nacional é o seguinte: 100.000 novos alunos todos os anos, traduzindo-se numa dimensão total de cerca de 400.000 alunos actualmente a frequentar o ensino

primário.

Deste modo, assumindo apenas o mercado nacional a 2€ por criança rastreada, o retorno anual será entre 200.000€ a 800.000€ por ano.

Para países em processo de adopção de programas semelhantes ao *e-escolas* (França, Alemanha, Reino Unido, Venezuela, etc..), a dimensão do mercado é muito superior, sendo o aumento de custos de manutenção do sistema residual comparando com o mercado nacional.

<b>5</b>	<p><b>Análise SWOT da ideia de negócio</b></p> <p><i>Listar as forças, fraquezas, oportunidades e ameaças associadas à exploração do conceito de negócio previsto</i></p>	
<b>Forças</b>	<b>Fraquezas</b>	
<ul style="list-style-type: none"> <li>• Autonomia para desenvolvimento interno do produto na totalidade;</li> <li>• Possibilidade de expansão do projecto para outras áreas médicas;</li> <li>• Elevado valor acrescentado para sociedade (VS baixo custo de aquisição do serviço);</li> <li>• ROI do projecto nos primeiros 12 meses (assumindo contrato com SNS);</li> </ul>	<ul style="list-style-type: none"> <li>• Limitado - uma utilização por aluno / ano;</li> <li>• Específico – apenas área de oftalmologia na fase inicial;</li> </ul>	
<b>Oportunidades</b>	<b>Ameaças</b>	
<ul style="list-style-type: none"> <li>• Tendência de investimento na informatização na área da Saúde;</li> <li>• Saúde visual como área prioritária</li> </ul>	<ul style="list-style-type: none"> <li>• Pequeno grupo de <i>decision makers</i> (ministério da saúde)</li> </ul>	
<b>6</b>	<p><b>Motivação dos promotores e seu envolvimento na concretização da ideia de negócio</b></p> <p><i>Indicar quais as mais valias da equipa de promotores para a concretização desta ideia de negócio: competências, experiência profissional, empenho e entusiasmo, complementaridade dos membros da equipa, investimento inicial que poderão realizar, etc.</i></p>	



A BlueWorks conta com uma equipa dedicada e parceiros de excelência, como é o caso da ISA – *Intelligent Sensing Anywhere* - líder mundial na área de telemetria, com 20 anos de experiência em I&DT de sistemas de engenharia inovadores; o Centro Cirúrgico de Coimbra, onde nos encontramos sediados - unidade privada de saúde reconhecida pela elevada qualidade e diferenciação dos serviços medico-cirúrgicos prestados; e a NeuroEye - outra *start-up* local cujo fundador (Prof. Dr. Miguel Castelo Branco) foi o vencedor do Prémio BIAL 2008. É através destas parcerias que temos acesso a *know-how* altamente diferenciado nas áreas de engenharia, medicina e investigação, fundamental para o desenvolvimento deste projecto.

Apesar de a BlueWorks ser uma empresa com apenas 3 anos, apoiada na experiência dos seus fundadores tem desenvolvido trabalho significativo na área de tecnologia médica para Oftalmologia, como sejam um dispositivo médico com patente submetida para validação da *compliance* médica, um sistema de interoperabilidade para suporte a apoio à decisão de diagnóstico oftalmológico, ou ainda um projecto de conteúdos interactivos para optimização da comunicação de informação clínica entre médicos e pacientes.

Este projecto específico, pela relevância social que encerra – potencial de prevenção de cegueiras monoculares irreversíveis, como todas as dificuldades de aprendizagem e limitações de trabalho associadas – e pelo público-alvo com que temos de interagir (a geração que será o futuro do país) motiva-nos de especial modo.

O grupo de desenvolvimento do projecto conta com elementos de backgrounds multidisciplinares, e para além de médicos e neurocientistas mencionados anteriormente, incorpora Engenheiros Biomédicos, um Engenheiro Electrotécnico e uma Bioquímica com experiência prévia em ensino.

Este é um projecto vital para a BlueWorks, sendo que o seu desenvolvimento foi já iniciado, e apesar de não estar ainda garantido, prevemos ter capacidade para autofinanciar o projecto.

Esta filosofia de inovação consubstanciada em diversos projectos de alta-tecnologia será a base de suporte ao crescimento da empresa, o que levará inevitavelmente ao reconhecimento da BlueWorks como marca de confiança, segurança e inovação na sua área de *expertise*.

## 7 Resumo da ideia de negócio para divulgação

*Descrever o conceito de negócio num curto texto, que os promotores autorizam que a organização do Concurso use para divulgação. O texto deverá salvaguardar eventuais aspectos confidenciais das ideias de negócio apresentadas*

Com o aparecimento dos computadores patrocinados pelo governo para as crianças (em Portugal existe o "Magalhães", um *notebook* padrão que é distribuído a todas as crianças logo que entram no ensino primário, aos 6 anos de idade), a existência de uma plataforma com um *hardware* homogéneo e disponível com todas as crianças, apresenta-se como uma grande oportunidade para a chamada medicina 2.0.

Neste projecto, a BlueWorks, juntamente com vários parceiros, pretende desenvolver um conceito idealizado pelo actual presidente da Sociedade de Oftalmologia Português: Criar um jogo de computador instalado nestes computadores padrão, que, quando "jogado" pelas crianças (desde que

supervisionadas por um professor), pode recolher informações relativas à sua função visual, permitindo rastrear precocemente problemas oculares, alguns destes (5%) correspondendo a potenciais ambliopias, que no caso de não serem tratados terminam em cegueiras monoculares irreversíveis.