



Instituto Universitário de Lisboa

Escola de Ciências Sociais e Humanas

Departamento de Economia Política

**Innovating in the Healthcare Sector:
The Case of Malo Clinic**

Sílvia de Almeida Baptista

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Orientador:

Professor Doutor Sandro Mendonça, Professor Auxiliar, ISCTE Business School,
Departamento de Economia

Co-orientadora:

Professora Doutora Cátia Miriam Costa, Investigadora Integrada no Centro de Estudos
Internacionais ISCTE-IUL

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"If people feel they understand the world around them, or, probably, even if they have the conviction that they could understand it if they wanted to, then and only then are they also able to feel that they can make a difference through their decisions and activities."

Frank Oppenheimer

*To my greatest treasure,
My parents.
Maria da Conceição Baptista and José Baptista*

*To my love,
André.*

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Disclaimer: The work leading to this dissertation was not affected by news of late 2019 referring to organizational turmoil at Malo Clinic concerning financial and corporate governance issues. The topic of the present research has been solely on know-how and technical capabilities at Malo Clinic.

Resumo

A economia mundial inclui empresas de vários setores que necessitam ter o conhecimento das estratégias que devem seguir para se tornarem competitivas. Com a crescente interconexão entre tecnologia e ciência, as empresas aumentam o seu investimento na criação e produção de conhecimento. A globalização também permitiu que as empresas pudessem estabelecer parcerias que permitam a partilha de conhecimento e a transação de bens e serviços. O resultado é uma combinação de resultados tangíveis, como produto ou serviço; e resultados intangíveis, como aumento da competência de novas patentes e marcas comerciais. O objetivo deste trabalho é demonstrar o sucesso da Clínica Malo, uma empresa portuguesa do ramo da medicina dentária, através da sua capacidade de criar conhecimento e investir em inovação. A questão que se pretende responder é como a empresa conseguiu articular conhecimentos e informações de forma a moldar estratégias para melhorar a inovação; e tentar avaliar esses resultados por meio de indicadores de inovação, como patentes científicas e marcas através da revisão sistemática da literatura e entrevista.

Palavras-chave:

Inovação, serviços, manual de Oslo, Investimento, Clínica Malo.

Código JEL:

O30 (Inovação; pesquisa e desenvolvimento; mudança tecnológica; direito da propriedade intelectual).

Abstract

The world economy includes companies from various industries that need to know the strategies they must follow to become competitive. With the growing interconnection between technology and science, companies are continuously investing more in knowledge creation and production. Globalization has also enabled companies to establish partnerships that enable knowledge sharing and the transaction of goods and services. The results are both tangible as products and services; and intangible with increased competency of new patents and trademarks.

The purpose of this dissertation is to demonstrate the success of the Malo Clinic, a Portuguese oral-care company, through its investment in the creation of knowledge and innovation. The question to be answered is how the company was able to articulate knowledge and information in order to shape strategies to improve innovation; and try to evaluate these results through innovation indicators such as scientific patents and trademarks, through systematic literature review and interview.

Keywords:

Innovation, Services, Oslo Manual, Investment, Malo Clinic.

JEL Classification:

I19 (Health); O30 (Innovation; Research and Development; Technological Change; Intellectual Property Rights)

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Nomenclature

AI - Artificial Intelligence

CIS - Community Innovation Survey

EC - European Community

ICT - Information and communication technology

IP - Intellectual Property

IPRs - Intellectual property rights

IT - Information Technology

KIBS - Knowledge-Intensive Business Services

KICS – Knowledge-intensive consumer services

NESTI - member states national experts

R&D – Research and development

SLR - systematic literature review

SNA - System of National Accounts

TPM - Technology-To-Product-To-Market

1. Introduction

In the evolution of the Portuguese economy, the growth of services stands out as a key feature. Companies are more dependent on factors such as knowledge and know-how, which bring out a new economic dynamic where innovation and internationalization come up with a leading role for competitiveness and the creation of value for them. The increase in global competitiveness, as well as the heterogeneity of preferences and needs of consumers, is emerging and companies are encouraged to implement strategic actions of vertical and horizontal differentiation to allow them to give quality and attributes to their offer (Castellaci et al., 2005). The appearance of the company gains new importance and its construction of image and reputation may be affected by itself or by third parties.

Innovation is determined by the capacity to realize connections, to add openings and to take benefit and advantage of them and is of the utmost importance in companies because it is through this that companies develop strategies and products or services to meet customer needs and have a competitive advantage (Caraça et al, 2009). Once knowledge (which can be measured by patents or trademarks; see Mendonça et al., 2004) has been produced, companies have the power to decide whether they wish to disclose it by making it public knowledge. As a company, there are several benefits for opting to make its findings public. Among them is showcasing their expertise, building a credible image and reputation in the public eye. This can also attract highly qualified collaborators and researchers in the recruitment process. Communication through scientific and technical publications is a way to explain and avoid possible uncertainties that could exist regarding their capabilities.

Innovation commitments have been increasingly recognized as a significant factor in the economy. The need to manage and measure such strategic impetus has been recognized by policy-makers in OECD countries. The Oslo Manual is an important tool used by policymakers to evaluate innovation and guides the collection of innovation data using common vocabulary and well-defined standards and practices to support the comparability of statistics (OECD, 2005). The first edition was published in 1992 and the research in which it was applied, notably the Community Innovation Survey (CIS)

organized by the European Community (EC), showed that it is possible to develop and collect data on complex and differentiated innovation processes. Written by and for the OECD member states national experts (NESTI), the Oslo Manual has been revised several times since. The most recent edition was revised in 2018 and was fully implemented (OECD, 2005; OECD, 2018).

The Oslo manual allows for understanding the role played by innovation in economic development and to abridge worldwide comparison on innovation by providing a research platform for innovation assessment. The definitions are internationally accepted and serve as a common language for discussions of innovation assessment (OECD, 2018). The Manual is widely used by various organizations associated with the United Nations and European Union.

The Malo Clinic is an oral-care company dedicated to creating treatments for patients with complex situations (maxillofacial surgery), investing in R&D and innovation developing and producing their own products and services. The question that needs an answer is: “How Malo Clinic has managed to gain competitive advantage and distinguish itself in its competencies and how they are designed globally?”; and “What capabilities and strategies have built to continually innovate?”.

In this study, Chapter 2 presents the theoretical framework used in this work. Chapter 3 explains the approach to the used methodology, making a theoretical framework of the methodology and discriminating indicators and types of analysis used for the study development. Chapter 4 presents the case study, with a brief Malo Clinic presentation; a systematic literature review, patent and trademark number; innovation measure using Oslo manual; and interview. Chapter 5 presents the main conclusions of the study.

2. Theoretical framework

2.1. Introduction

This chapter provides a brief contextualization of the different themes addressed throughout the dissertation, in order to understand the phenomenon of innovation and its competitive advantages in an organization. It begins by presenting the main concepts along with the respective theoretical perspectives that will be used. Namely, the relevant treatment in the literature on innovation in company services and how the Oslo Manual is applied to determine and study the innovation in a large oral-care firm of Portuguese origin.

2.2. Innovation

Although the widespread emergence of complex human culture is typically ascribed to the later developments of the European Upper Paleolithic (the third and last subdivision of the Stone Age), there is little doubt that humanity's creative revolution sparked some tens of thousands of years ago as technological and behavioral innovations suggestive of modern human capacities began to appear even 70,000–80,000 years ago in the African Middle Stone Age (Carr et al., 2016; Mellars, 2005; Nielsen, 2012; Shennan, 2001).

Innovation is at the center of changes in traditional practice and further responsible for humanity's remarkable success at colonizing the earth and diversifying the products, technologies, and systems within it. Surprisingly, very little is known of how this revolutionary component responsible for behavioral flexibility develops and the factors that are responsible for individual differences therein (Carr et al., 2016; Urabe, 1988). Innovation propelled by the ability to identify connections and opportunities and to take advantage of them (Tidd and Bessant, 2013).

Innovation is also a critical tool used by entrepreneurs, the means by which they identify and exploit change as an opportunity for a new or different business or service (Drucker, 2014). However, innovation is not concerned only with opening up new markets, but also with offering new ways of serving established and mature ones (Tidd

and Bessant, 2013). Innovation is able to be marketed as a discipline, able of being learned and put into practice. Successful entrepreneurs should purposefully procure opportunities for innovation, watching for changes and their symptoms that will bring forth a successful result. In order to do so, they need to know and to apply the principles of successful innovation (Drucker, 2014; Popadiuk and Choo, 2006).

Schumpeter defines innovation as something that arises from the combination of different elements already existing and is the original inspirer of innovation itself being an object of study (Castellacci et al., 2005; Ferreira, 2015; Salter and Alexy, 2014; Schumpeter, 1942). It propels economic development, in the sense that new discoveries and technologies replace previous ones, resulting in a phenomenon he labeled “creative destruction” (Schumpeter, 1942). Another definition of innovation is the application of new ideas to products, processes, activities that lead to increased *value*. This *value* may be added-value to that entity as well as benefits to consumers or other entities. (Greenhalgh and Rogers, 2010). Further classifications for innovation include product innovation, process innovation, position innovation, and paradigm innovation (Graham et al., 2006; Tidd and Bessant, 2013).

Product innovation can be defined as the introduction of a new product, or a significant qualitative change in an existing product, the product being tangible manufactured goods. Examples of recent tangible product innovations that have had a very significant impact on the way people live and work are personal computers, mobile phones, and microwave ovens (Graham et al., 2006; Tidd and Bessant, 2013).

Process innovation can be defined as the introduction of a new process for making or delivering goods and services, these being intangible services. Often, product innovation combines with process innovation and provides the tangible products with their intangible counterparts that complement these types of physical equipment including the various pieces of computer software needed to control flows of information through the personal computers, mobile phones, and microwave ovens, leading to the delivery of information, the supply of communication services, or the arrival of a correctly heated dinner. (Barney and Hesterly, 2012; Greenhalgh and Rogers, 2010; Tidd and Bessant, 2013).

2.2.1. Innovation, invention, discovery

Innovation is distinguished from invention or discovery in that the product or process is introduced into the marketplace so that consumers or other entities can benefit. (Greenhalgh and Rogers, 2010; Ferreira and Lisboa, 2018).

Innovation occurs in stages beginning the process with the invention. Invention or discovery enhances the stock of knowledge, but until it is available on the market, it is not a full-fledged novel product or process. Innovation marries prior, existing, and new knowledge to bring new products and processes to the commercial market. So, we see that innovation is encased in a complex process preceded by inventions and succeeded by the final stage, the widespread recognition and adoption of the new genre of products by customers, or the adoption of best-practice processes in the majority of like entities. This final stage is called *diffusion*, and until this has taken place, the benefits of innovation to the economy and its citizens are not fully realized (Greenhalgh and Rogers, 2010).

2.2.2. Knowledge and technology

Since the mid-seventies, it has been apparent that structural change is related to a transformation, within and across sectors, which can be referred to as the Third Industrial Revolution (Louçã and Mendonça, 2002). This has to do with information and communications technologies and has led to the rise of *informationalism* as a template for business models (Costa et al., 2019). Knowledge is embedded in technologies and socio-economic systems, but its impact on growth is not linear and is time-consuming (Neches et al., 1991). Many terms have been applied to the process of putting knowledge into action (Graham et al., 2006).

Formally, knowledge translation is defined by the Canadian Institutes of Health Research as a live, changing and continual process that includes the formation, distribution, exchange and ethically sound application of knowledge to improve health, provide more effective health services and products, and strengthen the health care system (Straus et al., 2009). Scientific evidence and human expertise as a whole are economically relevant knowledge if it is or could be useful in the production and supply

of commodities and in the invention and design of new products and processes. Knowledge can be arranged according to a plan or a system, such as a chemical formula or computing algorithm, or it can be implied without being stated (Geroski, 1995; Graham et al., 2006). Knowledge gained through experience, particularly practical knowledge, ought to count as knowledge, although it must also be acknowledged that it is a different type of knowledge from factual knowledge (Biggam, 2001).

Technology encompasses the current set of production techniques. It is the process by which humans use resources to expand their potential or change their environment. Technology is a sequence of actions, using certain tools, or a rational process, in order to achieve a predefined goal. Therefore, technology is the application of knowledge to production activity. In companies, the used technology is a determinant in its productive capability when combined with other inputs. Inventions and discoveries are added to the stock of knowledge to then be again applied to production (Graham et al., 2006; Hansen and Froelich, 1994).

2.2.3. Research and experimental development

“Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture, and society – and to devise new applications of available knowledge”. (OECD, 2015, pp. 44).

R&D activities may only be described as such if they satisfy five core criteria: novel, creative, uncertain, systematic, transferable and/or reproducible. R&D activities begin with an objective, whether specific or general. One objective of an R&D activity is always a new finding, based on original concepts. These concepts are interpreted and hypothesized. The final outcome is largely uncertain, generally unable to predict the quantity of time and resources required to achieve it. However, it is still planned for and budgeted, whether carried out by enterprises or individuals. The end goal is a result that could be either freely transferred or traded in a marketplace. (OECD, 2015).

The term R&D can be broken into three types of activity: basic research, applied research and experimental development. Basic research is experimental or theoretical

work with the primary purpose of acquiring new knowledge of the general workings of phenomena and observable facts, without any specific application or use in view. Applied research, on the other hand, is working towards a specific, practical aim or objective, though still an original investigation was undertaken in order to acquire new knowledge. Experimental development draws on knowledge gained through prior research and practical experience in a systematic way to produce additional knowledge, which is applied in the production of new products or processes or the improvement of existing products or processes (OECD, 2015; Miles, 2007).

2.2.4. Innovation process

It is also important to note that innovation opportunities change over time. As opposed to product innovation, more mature industries have a tendency to be more focused on process innovation or position innovation, looking for ways of delivering products in a more cost-effective or efficient way. They also focus on paradigm innovation, searching out new market segments into which to sell their products or services. In their pioneering work on this theme, Abernathy and Utterback developed a model describing the pattern in terms of three distinct phases (figure 1) (Tidd and Bessant, 2013).

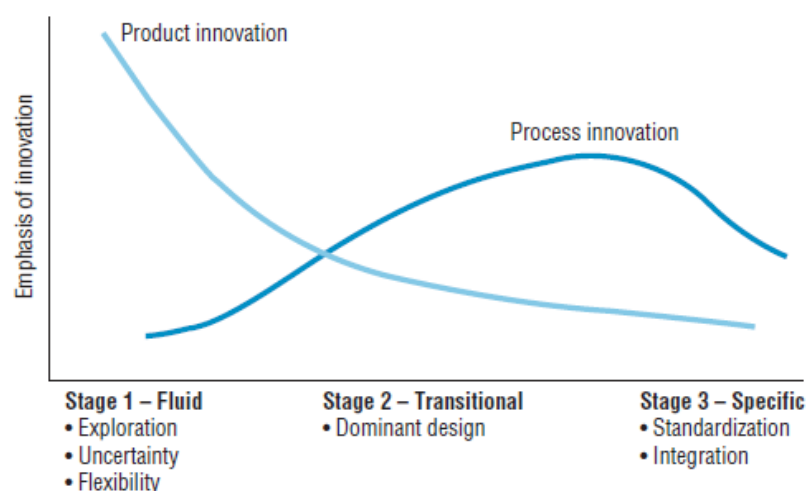


Figure 1- The innovation life cycle
Source: Tidd and Bessant (2013, pp. 43).

They describe the initial phase as *fluid*, having intervals or gaps, as completely new technology or markets emerge. The period in which the dominant design emerges and emphasis shifts to imitation and further development is termed *transitional*. As activities move from development to product differentiation, the product is customized to meet the needs of particular customized, thus named the *specific* phase. In this phase, the focus shifts to delivering products reliably, cheaply, with higher quality, and extended functionality (Dosi, 1982; Foster, 1986; Tidd and Bessant, 2013).

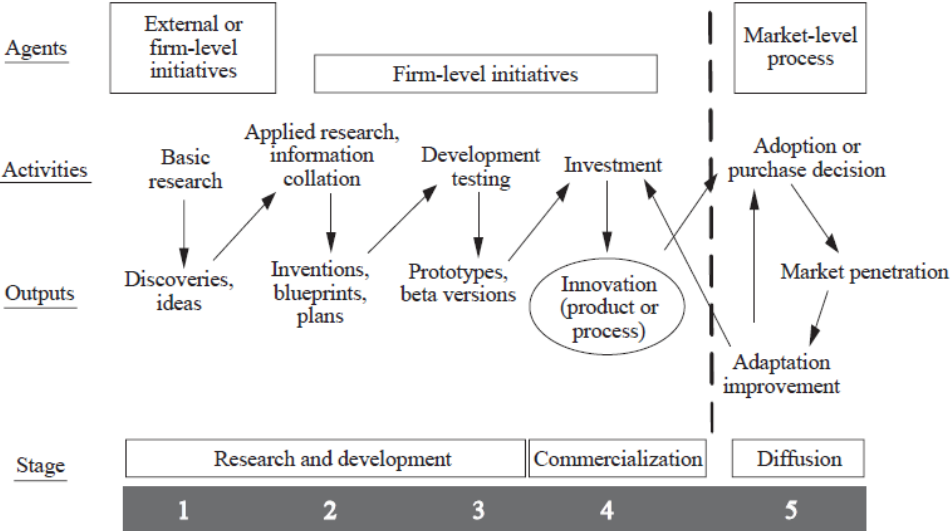


Figure 2- Innovation process stages
Source: Grenhalgh and Rogers (2010, pp. 7).

At each stage of the process, there are activities that require inputs of knowledge, by skilled personnel and specialized equipment, followed by the investment of time in using these resources (figure 2). The first three stages of the innovation process produce basic scientific knowledge, plans for new processes or blueprints, and initial prototypes of new products or processes. Stage 4 is reached when there is a marketable product or new process. It is only at this point that innovation is achieved. This phase, involving commercialization, begins stage 5, a start of another chain of events broadly characterized as diffusion. This assumes the widespread adoption of the new product or process by the market (Grenhalgh and Rogers, 2010).

It is also vitally important to recognize the inherent feedback between the various stages: innovation is rarely a linear progression through the stages shown. Likewise, there is also feedback between the diffusion and innovation stages. As consumers, or other like entities, start using the innovations, they often adapt or improve them, or communicate back to the innovating entity how to do so (Grenhalgh and Rogers, 2010; Hippel, 2005).

2.2.5. Innovation and company growth

Innovation matters and affects not only the individual enterprise but national economic growth as a whole (Tidd and Bessant, 2013). Success in developing and marketing new products results in changes in costs and rewards (Graham et al., 2006). Companies that do not invest in innovation put their futures at risk. Their business is unlikely to thrive, and they run the risk of falling out of competition if they do not seek innovative solutions to emerging problems (Graham et al., 2006; Tidd and Bessant, 2011).

The following statements can be made concerning successful small and medium-sized enterprises: Innovation is consistently found to be the most important characteristic associated with success; Innovative enterprises typically achieve more rapid growth or are more successful long-term than those not characterized by innovation; Enterprises that gain market share and increasing profitability are those that are innovative (Tidd and Bessant, 2013).

New products help capture and retain market shares, thereby increasing profitability within those markets. In the case of more mature and established products, competitive sales growth comes not simply from being able to offer low prices but also from offering a variety of options not associated with price. In a world of shortening product life cycles, being able to replace products frequently with better versions is increasingly important (Tidd and Bessant 2013; Stalk and Hout, 1990).

2.2.6. Innovation in services

Service innovation has been the subject of several academic research publications, being of interest to diverse research disciplines (Carlborg et al, 2014; Dotzel et al, 2013; Witell et al, 2015). Marketing, management, and operations are the main fields where research on service innovation is considered an important contributor (Witell et al, 2015). New or improved services emerge as an effective strategy used by companies in order to create sustained and competitive advantage. Growth maintenance in saturated markets and commoditization are two important problems that can be solved by organizations when they turn to or assume service strategies (Durst et al., 2015).

The topic of service innovation is of growing interest for both innovation researchers and policymakers (Miles, 2006). The global economic framework has been increasingly influenced by the services sector (Miles, 2004; Mattoo et al., 2008). While the services sectors of these economies play an important role in productivity, economic competitiveness, and quality of life, innovation in services is important beyond economic reasons, its reach affecting service beyond the services sector. Innovation processes throughout the economy can be sustained by some services as they act as transfer agents, backing innovation or serving as innovation sources for other sectors (Miles, 2004).

Innovation is widespread in services. Service firms and sectors are increasingly becoming the sites of deliberate attempts to innovate in order to improve the cost efficiency and quality of service production and products as well as to develop new service concepts. This also cast changes in the essence and arrangement of competition in several service markets (Hauknes, 1998).

With the emergence of knowledge markets and distributed knowledge generation, knowledge-intensive services appear as bridging institutions in national innovation systems. These service firms supplement and broaden the generative and distributive functions that have traditionally been the responsibility of public technological infrastructures, R&D institutions, advisory and extension services (Hauknes, 1998).

Richard Barras developed an innovation of services theory and observed a process contrary to the conventional pattern of innovation through the life cycle of an industry. Generally, innovation initially focuses on developing new products and improving

quality before a dominant design emerges. Then innovation focuses on processes, in order to seek out efficiencies to reduce costs. Improving cost efficiency first focuses on processes, then products. Applying Information and Communications Technology (ICT) improves the efficiency of back-office functions. Products are improved partially through learning but also through the increasing ability to customize products and features offered, again because of the flexibility afforded by Information Technology (IT) systems. Through Barras' model was clearly based on an attempt to adapt an existing understanding of innovation to services, it was highly influential, and marked the first step towards theorizing innovation in services (Salter and Tether, 2006). However, substantial criticism has been applied to this 'one-size-fits-all' model of innovation in services. In fact, Pavitt's taxonomy implied that there were various innovation patterns in manufacturing. Moreover, Miozzo and Soete's (2001) adaptation of Pavitt's taxonomy to embrace services was an evident attempt to incorporate services into innovation research using the known theories and mechanisms (figure 3) (Miozzo and Soete's, 2001; Salter and Tether, 2006).

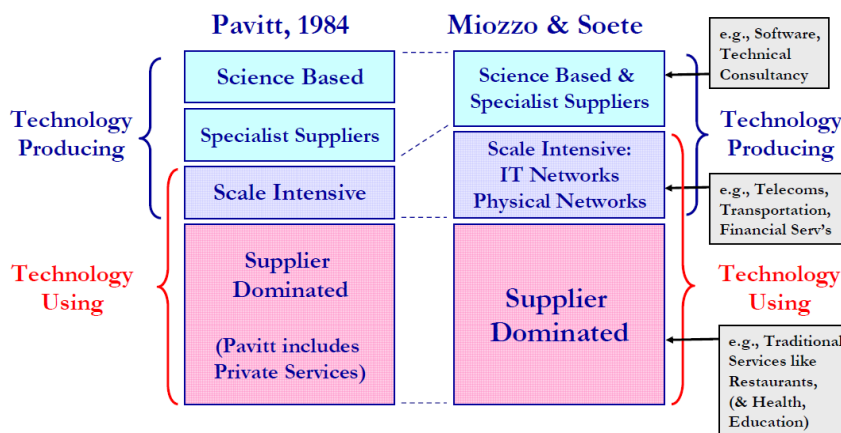


Figure 3- Pavitt's and Miozzo and Soete's taxonomy
Source: Salter and Tether (2006, pp. 7)

Den Hertog (2000) proposed a model that considers service innovation in a knowledge-based economy. This "four-dimensional model of service innovation" consists of: (1) Service concept (a new service in the market); (2) Client interface (client involvement in the service production); (3) Service delivery system (how services are delivered to

customers); (4) Technology (how services can be accurately provided) (Den Hertog, 2000; Durst et al., 2015)

Toivonen and Tuominen (2009) described five service innovation procedures related to collaboration and formality degrees. For instance, innovation can be internal procedures without a specific project (1), deriving from unplanned and cumulative innovations regarding existing services. Innovation can also derive from internal projects (2) when a project is focused on improving service production systems and content. Innovations are also driven by collaborations with costumers, being projects with pilot costumers (3) where new ideas and services are tested with a specific customer, or projects specifically tailored for a customer where the service provider solves specific problems. Externally funded innovation projects (5) where new service concepts and/or platforms are generated through research collaboration and teamwork (Durst et al., 2015; Toivonen and Tuominen, 2009).

Notwithstanding, some disparities still exist regarding economic theories for innovation: the service sector is regularly neglected, or it is often assumed that service innovations derive mainly from industry-developed innovations (Gadrey et al., 1995). With the appearance of knowledge markets and distributed knowledge generation, knowledge-intensive services can act as linking agents in national innovation systems, adding a key contribution as creative and disseminative functions, a traditional responsibility of public technological infrastructures, R&D institutions, advisory and extension services (Hauknes, 1998).

The existing open space regarding service innovations studies can be explained by the main focus of these studies on the analysis of technological innovation in industrial or manufacturing activities (Djellal et al., 2013). Additionally, the distinct characteristics of service activities should also be considered. Services are often from an intangible and interactive nature (Javalgi and Martin, 2007) and can serve a broad range of activities (Miles, 2004; Salter and Tether, 2006). The services industry is a rather heterogeneous group that comprises personal or traditional services (with a basic level of technology, small-scale organization, and weak power of innovation) and knowledge-intensive business services (KIBS) which use advanced information-intensive technology and have great innovation power (Ferreira, 2015).

KIBS is a type of sectoral pattern that comprises a variety of service companies that rely on the knowledge and experience of their labor pool (Salter and Tether, 2006; Tether and Howells). They can act as intermediaries of the knowledge and technology they have in the innovation system by developing innovations or providing services to their customers (other companies) so that they can innovate as well (Tether and Howells, 2007). KIBS are important agents of industrial competitiveness as they enhance a critical innovation policy challenge: *policy objectives* should be more *open-ended and framework enabling* instead of being oriented towards specific technological or economic objectives (Hauknes, 1998). Therefore, as Salter and Tether, 2006, pp.2 stated: “*Knowledge-intensive service firms are at the heart of a great many innovation activities*”.

Innovation can be defined as a change affecting vectorial elements of characteristics or competences. These changes can be achieved by several basic mechanisms: evolution or variation, depart or addition of elements, and association, dissociation or formatting of elements. Changes can be planned or intentional, as a result of R&D activities, or unintentional, rising from learning processes by the agents involved. Therefore, innovation is not a result, it is a process (Gallouj and Savona, 2009; Djellal et al., 2013).

The different types of innovation can be classified in several categories (Gallouj and Savona, 2009): Radical innovation (1), which is the creation of service with different technical characteristics and competencies; Improvement Innovation (2), which promotes quality improvement of certain features of the service without changing the system structure; Incremental Innovation (3), which eliminates or replaces a particular feature in the service, aiming to offer customers different package options, improving the final service, reducing costs or ensuring deadlines; Ad Hoc Innovation (4), which aims to obtain a new solution to a particular problem encountered by a customer, be it legal, strategic, organizational or technical. Recombination Innovation (5), which complies new combinations of service features; and Formalization Innovation (6), which is the specification of service characteristics, making them no longer vague and undefined, but rather formatted or standardized.

Recently, the role represented by services in technological innovation studies has been the subject of interest and advance. Specifically, knowledge-intensive consumer services (KICS) which include companies focused on end-use services using a learning-

productive approach (Costa and Mendonça, 2019). Usually, these companies unfold scientific, technological, social, and relational knowledge in order to innovate and improve. For this purpose, they may present advanced capital goods, such as innovative medical equipment, and also rely on using information and communications technology (ICT) in the same degree as other service sectors (telecommunications, finance, and professional services) known as KIBS. Significant attention has been given to KIBS research, viewed as productive territory for the utilization of neo-Schumpeterian visions and procedures. KIBS comprises companies that focus on high-tech business-to-business service operators that contribute to other dynamic forms of innovation systems by enabling intermediate inputs. This nomenclature was applied in order to rebut the long-established view that service companies did not contribute to innovation. KICS is fundamental for overcoming social challenges like aging, equality regarding health, self-image, and appearance (Costa and Mendonça, 2019).

Table 1 Knowledge-intensive consumer services (KICS) application to Malo Clinic
Source: Costa and Mendonça (2019, pp. 980)

	Relevant for final user	Relevant for producers
Hard innovation	New or improved products	New or improved process
Soft innovation	Marketing innovation	Organizational innovation

KICS and KIBS share the characteristic of depending on intellectual value-added operations to create tradable achievements, but KICS (table 1) is distinguished by both the specific industry it serves (which comprise beauty/care, travel/tourism, culture, among others) and also by the specific idiosyncrasy of the offered services. Resuming, while KIBS integrates manufacturing by contributing to refined data and knowledge, KICS can be considered as inherent importance to the general public (Costa and Mendonça, 2019).

2.2.7. Innovation and competitive edge

In the competitive capitalist market, the strategies and policies adopted by companies are becoming increasingly significant. Science and technology are a strategy with economic value that can lead to growth and increased competitiveness (Costa, 2015). However, the difficulty remains in having an economically adjusted measurement system that enables companies to identify and understand emerging challenges and could timely measure the strategies they must adopt. A company's ability to innovate enables it to gain competitive advantage, and companies gain competitive advantage through acts of innovation, and competitiveness depends on an industry's ability to innovate and update (Porter, 1990).

Innovative companies tend to have people dedicated to researching new solutions within the organization (Van de Ven, 1999), using their internal knowledge to face new challenges (Nonaka and Takeuchi, 1995). However, in a competitive economic environment, they realize their necessity to follow and know the activities of rival companies as well as the constant searching for new ideas to put into practice (Fagerberg, 2004). The more companies can learn from the outside, the greater the ability to innovate and become more competitive, which is important for small businesses that have less internal resources and have to be good at interacting with the outside, the so-called *absorption* (Cohen and Levinthal, 1990).

According to Marx and Schumpeter, it could be said that competition for innovation, often perceived as technological competition is the engine of economic development, and companies that cannot keep up with this same competition end up not resisting in the market. On the other hand, innovations resulting from a combination of existing knowledge and resources enable new business opportunities and innovations to be created leading to continuous change. Also, international relations centered on science, technology, and innovation allow the establishment of links between scientific knowledge and the ability of certain individuals from one country to influence others from other countries (Varela et al., 2016).

2.3. Oslo Manual and innovation mapping, measurement, and management

Innovation contributions to economic growth have been the subject of interest for many companies (Rueda and Cruysen, 2016) since it has the potential to promote sustainable development by reducing climate impact while encouraging social union. However, there is the need to measure innovation in order to properly advise, control and classify policy progress and implementation (Gault, 2018). Under this scope, Oslo Manual is an important tool used by policymakers to evaluate innovation, being a worldwide recognized method for innovation statistics developed by an OECD Committee dedicated to organizing innovation-related data (OECD, 2005). Within its framework are included concept definitions, guidelines for data compilation and classification for assembled statistics regarding innovation (OECD, 2018). The Oslo Manual was modeled from data gathered during the 1980s and 1990s which resulted in a Manual centralized on technological product and process (TPP) innovation in manufacturing (Bloch, 2007; Gault, 2018; OECD, 2018; Rueda and Cruysen, 2016).

Even though concern in innovation dates back to the 1960s, innovation surveys were only applied by OECD countries in the 1980s. During a decade, government departments collected data merely based on available patents and industrial research and development expenditures (Bloch, 2007; Godin, 2009). In the 1990s innovation assessment started to be standardized by Eurostat and OECD aiming to produce output indicators that quantify innovation in terms of products, processes, and services deriving from innovation activities (Godin, 2009).

By supplying directions for data collection and interpretation regarding innovation, the Oslo Manual aims to simplify worldwide comparison on innovation by providing a research platform for innovation assessment. These directions consolidate formal statistical standards by advising on best practices and offering recommendations to extend innovation assessment into different areas. Being mainly used by national statistical departments these guidelines offer direct value to users by meeting a wide scope of policy and research needs. Several countries and international organizations acknowledge the significance of innovation assessment, using this Manual to obtain accurate data and credible indicators in order to perform internationally comparable analysis (OECD, 2018).

To support the comparability of statistics, the Oslo Manual guides the collection of innovation data using common vocabulary and well-defined standards and practices, contributing to the improvement of a statistical database that can be used by researchers and policymakers interested in innovation information (OECD, 2018).

This Manual has been the subject of several updates in order to guarantee the durability, legitimacy, and comparability of the approach, held by a broad research range anchored in several validation protocols. Therefore, the Manual is directed for users of information giving directions regarding surveys in order to ensure suitable comparisons and analysis (Rueda and Cruysen, 2016).

Measuring innovation is the basis of the Oslo Manual, built on knowledge as the foundation for innovation, originality, and applicability leading to the creation of value as the focal point of innovation (OECD, 2018). The word ‘innovation’ can be applied for the activity itself and also for the outcome of that activity and the Manual describes both (OECD, 2018, pp. 20).

“An innovation is a new or improved product or process (or a combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)”.

This definition is the foundation of the Oslo Manual guidelines in the business sector because even though its subjective concept, innovation can produce objective and comparable applications, facilitating the comparison of innovation activities between different countries and organizations (in size and structure) (OECD, 2018). Innovation is defined by the development of processes (commercial and financial) within an organization that leads to an improvement in its operation, and business innovation is defined by a new methodology (that can be a combination of products and processes) applied by an organization in order to enhance profits or improve customer’s experience (OECD, 2018).

The Oslo Manual has been the subject of different revisions which resulted in several editions, and in the third edition, a distinction between types of innovation has been established. Referring to innovation as “the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new

organizational method in business practices, workplace organization or external relations”, this edition defined four innovation concepts (Bloch, 2007; Gault, 2016; OECD, 2005). Product innovation (1) contains all the improvements in the functional characteristics of a product/service: components, materials, incorporated software, and technical specifications; Process innovation (2) is defined as the application of a new method (techniques, types of equipment, and software) for production or delivery resulting in improved quality, decreased cost of production or new products altogether; Marketing innovation (3) is defined as the utilization of new product marketing methods (design/packaging, placement, promotion, and pricing) in order to satisfy customers and reinforce market position, resulting in increased sales and profits; Organizational innovation (4) relates to the employment of new methods regarding business practices, workplace organization, and/or external relations in order to reduce operational costs (administrative or transactional), improve workplace productivity and reducing supplies costs, among others.

An important note is taken from the definition of types of innovation presented in the Oslo Manual: the distinction between technological and non-technological innovation. Product and process innovation can be classified as technological innovation, while organizational and marketing innovations are among the non-technological category, which can be analyzed in almost all economic sectors (OECD/Eurostat, 1997; OECD, 2005).

Moreover, in order to perceive a sector’s dynamic, the distinction between the type of differentiation amongst products is also important, which can be either horizontal or vertical (Chamberlin, 1933). The former is applicable when there are differences in product features but there are no differences in product quality. The latter is applied when specific products/services have different qualities and can be chosen by customers (depending on their preferences) over this parameter (Chamberlin, 1933; João, 2004).

In the Oslo Manual’s new version (4th Edition), the previous list of four types of innovation has been reduced to only two categories: Product innovation (1) which comprehends significant improvements in products/services brought to the market and Business process innovation (2) which includes significant developments in business functions applied by an organization. Furthermore, the new version of the Oslo Manual

also reduced the existing ambiguity for “significant” by establishing comparison guidelines for innovation (OECD, 2018).

Innovations in business processes comprehend six different functions within an organization - Production of goods or services (1) and Distribution and Logistics (2) – both of which relate to the producing and delivering of products for sale; Marketing and Sales (3), Information and Communication Systems (4), Administration and Management (5), and Product and Business Process Development (6) – all of which relate to supporting operations (Brown, 2008; OECD, 2018). This version of the Oslo Manual draws onto the previous edition’s categories of innovation regarding the process, marketing, and organization (OECD, 2018).

Comprehensively, defining both innovation and innovation activity can characterize the nature of a company/organization. Therefore, an innovative company describes at least one innovation during the observation period and can be individually or jointly involved in innovation. On the other hand, an innovation-active company is involved, while the observation interval, in at least one activity, aimed to develop a new product or process (OECD, 2018).

Both innovative and non-innovative firms can be innovation-active during an observation period and in this Manual, the adjective “innovative” is applied to describe companies that report innovations during a specific period of time. This adjective has a restricted meaning to avoid misunderstanding, and special attention should be given to translations in order to replicate its precise definitions (which also applies to innovation indicators). On the contrary, a non-innovative company can be innovation-active if, during the scrutiny interval, it had at least one innovation activity that did not develop into innovation. This happens because several activities (experiments and co-creation exercises) can be concluded but not culminate in innovation within the period of observation (OECD, 2018).

2.4. Internationalization of services

Economic globalization is heavily dependent on the internationalization of services (Braga, 1996). Despite the expanding influence of the service sector in both national (AICEP, 2015) and global economic structure, the study of business is mainly aimed and advanced in the industrial sector (Lejpras, 2009), just as the innovation field.

Service industries contribute as a linking entity between geographically scattered economic activities, playing an indispensable role in the crescent interconnection of both production activities and markets across nations. Furthermore, formerly considered nontradable services are being traded actively nowadays, as progress in information technology (IT) broaden the periphery of tradability (Braga, 1996).

Services contain an extensive cluster of economic activities. The fast development of knowledge-based services, such as banking and insurance, modern health care and education, and professional/technical services, is one of the main contributors to the *services revolution* (Braga, 1996). This impulsion is also driven by the growing tradability of services. Investment in knowledge-based services is thriving globally, despite its very flexible generated income (Braga, 1996).

Internationalization can be perceived as the beginning of operation and market of products or services in a foreign market by a company, instead of being limited to a domestic market (Lejpras, 2009). Therefore, internationalization serves as a way to gain a competitive advantage for companies, which also applies to the services factor (Javalgi and Martin, 2007).

In international markets, all companies face several obstacles in order to access a new country, having associated risks and costs which can emerge interiorly or exteriorly (AICEP, 2013). These obstacles are classified either as tariff barriers if the internationalization is conditioned by the existence of a tariff or rate or as non-tariff barriers if the internationalization is conditioned by a separate non-monetary restriction (Coopeland and Mattoo, 2007). In services, internationalization is split into two groups: Hard services and Soft services. For the former, services consumption can be distinct from production and the service provider proximity at the consumption place is not imperative. On the latter, services consumption and production happen at the same time, requiring the presence of the service provider (Gröroons, 1999).

2.5. Business model

Even if founders/managers do not understand their companies' functions in these terms, it is critical for any organization to be supported by a solid business model (Magretta, 2002). There are several definitions for a business model (table 2) including managerial narrative (Magretta, 2002), innovation to value conversion processes (Chesbrough and Rosenbloom, 2002), bureaucratic outline and approach (Slywotzky, 1995; Slywotzky and Wise, 2003), knowledge and assets information flows (Timmers, 1998), and arrangement performance (Amit and Zott, 2001).

Value creation and value capture are paramount functions provided by a solid business model. In the first place, the business model establishes strategies for obtaining raw materials to satisfy final consumers, resulting in a new service/product that ultimately creates net value, an essential outcome in order to involve other companies during the process. Secondly, it is important to obtain value from, at least, a portion of the process so that the company's activities can be financially sustainable over time (Chesbrough, 2007; Kindström, 2010).

Deliverability and value creation for customers and value capture ability for itself (Osterwalder et al. 2005) explain how a firm does and stays in business – the definition of a business model (Magretta, 2002). In the last few years, the business model concept has induced exponential interest, being perceived as decisive for business success and representing a new analysis field for several companies (Teece, 2010). Companies can use either a single or several business models simultaneously for various product lines or markets. However, all the main products available to accomplish strategic objectives as well as all the production, logistical, marketing and co-operational steps need to be included in the business model. Therefore, a successful business model incorporates methods for better product delivery to customers (versus the market competitors) and profit formulas for income (Johnson et al., 2008).

Table 2 Business model Definitions (adapted from Slávic and Bednár 2014; Zott et al, 2011).

Author(s), Year	Definition
Slywotzky, 1995	“as the totality of how a company selects its customers, defines and differentiates its offerings, defines the tasks it will perform itself and those it will outsource, configures its resources, goes to market, creates utility for customers, and captures profit. It is the entire system for delivering utility to customers and earning a profit from that activity”
Timmers, 1998	“architecture of the product, service, and information flows, including a description of the various business actors and their roles; a description of the potential benefits for the various business actors; a description of the sources of revenues”
Amit and Zott, 2001; Zott and Amit, 2010	“the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities” “Based on the fact that transactions connect activities, the authors further evolved this definition to conceptualize a firm’s business model as a system of interdependent activities that transcends the focal firm and spans its boundaries”
Chesbrough and Rosenbloom, 2002	“the heuristic logic that connects technical potential with the realization of economic value”.
Magretta, 2002	“stories that explain how enterprises work”.
Teece, 2010	“A business model articulates the logic, the data and other evidence that support a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value”

Business model innovation can provide novel value proposals to customers, being a new or an improved activities system to generate a new value proposition. Therefore, during the definition of a business model, the value proposition and reference to customers are of crucial importance (Magretta, 2002; Teece, 2010). Additionally, business model innovation must be relevant (it must exclude simple adjustments without impact on the competitiveness) and must describe and establish networks between technology, innovation, and knowledge (specially industry-focused knowledge) (Souto, 2015). Thus, innovation results from combining several types of knowledge such as technical and non-technical knowledge, market knowledge, among others (Souto, 2015). Innovation also demands creativity, since a new idea results in innovation after implementation (the combination of several knowledge types) and market opportunity exploitation (Souto, 2015).

Hence, it is important to invest not only in new concepts and methodologies but also in business model innovation in order to successfully commercialize the resulting new technologies (Chesbrough, 2010).

The value of new technology is defined by the market upon commercialization using a defined business model. According to the applied business model during commercialization, the expected return yielded by the same technology will fluctuate. In some cases, innovation can rely on an already known business model and in other cases, the applied business model can only use technology through licensing. When the business model is not evident for new technology, technology managers have an important role in finding a suitable business model to obtain value from that technology (Chesbrough, 2010).

By specifying the total value created in transactions (the major limit of value capture potential), a business model works towards the global value creation for all the associates (Zott and Amit, 2010).

A business model has several functions such as value articulation proposition (1), or the created value for users; identification of a suitable market segment (2), meaning the definition of purpose and targets of the offering; value chain structure definition (3) in order to create and distribute the offering; revenue generation mechanisms specification (4) and estimation of cost structure and profit potential; company position within the ecosystem description (5), which includes competitors and associates identification; and competitive strategy formulation (6), which states the blueprint for gain/hold advantage over competitors (Chesbrough, 2007).

Table 3 resumes the aforementioned business model parameters, which function as a structuring and analytical framework that comprises internal and external elements, the actual offering or value proposition, and value creation/capture strategies (Chesbrough, 2007; Chesbrough and Rosenbloom, 2002; Kindstöm, 2010).

Table 3 Six Business model parameters and their focus (adapted from Kindstöm, 2010).

Business model parameter	Description
Value proposition	Products and services that are presented to the customer stating the value created
Revenue mechanisms	The tool that is used to fitting the value created
Value chain	The internal resources, processes, and activities of the supplier
Value network	The external network contributing to the creation and delivery of the offering
Competitive strategy	The company position on the marketplace and the offering relative competitors
Target market	The identified complete target market/segment for the offering

Being conceptualized either as a set of transactions or as an activity system, business models define value chain structure as an activity-based approach, creating value throughout the several actions that transform a raw material in a final consumer product (Zott and Amit, 2010). The design parameters illustrate the elements and themes present in the activity system, such as the content, structure, and governance, which surpass network structure assumptions. The content indicates the selection of performed activities, the structure characterizes the linking of activities, stating their importance on the business model, and governance establishes who executes the activities (Zott and Amit, 2010). Design elements can be configured in several ways resulting in designed themes known as novelty (1) if the core of the activity system design is to embrace original activities (content), or to incorporate different combination of activities (structure), or to integrate advanced strategies for activities governing (governance); lock-in (2) if the activity system is focused in attracting third parties to the business model using strategies like cost switching or network externalities; complementarities (3) which occur when coupling activities within a system is favorable over operating separate activities; efficiency (4) if the design is driven towards lowering transaction costs (Zott and Amit, 2010).

Business model innovations are difficult to accomplish, despite being of the utmost importance, functioning as a template of the company business strategy – strategies to deliver value to stakeholders and strategies to link ideas and product markets (Chesbrough, 2010; Zott and Amit, 2010). Business model changes are always challenging because changing organizational systems is an arduous task. Nevertheless, companies should experiment on several types of business model because new and

more better business approaches may arise, given that internal leaders can manage the outcomes of these processes (Chesbrough, 2010).

3. Methodology

This chapter aims to link the theoretical exposition of the previous chapter and the data analysis to the case study in the next chapter. Presenting the methodology adopted in this dissertation and the guidelines to be considered. As a methodology for used as data collection techniques: systematic literature review and interview.

3.1. Introduction

The medicine is one area very extensive, but oral health is a little-explored niche. We made an exploratory approach with Oslo manual application for proposed guidelines for Innovation interpretation in Malo Clinic. The principal questions that will be studied in this thesis are: (1) How Malo Clinic gain competitive advantage and distinguish itself in its competencies and how they are designed globally; (2) What capabilities and strategies have built to continually innovate”.

Demand and supply notably influence the technology change in medicine (Coccia, 2012) and technological breakthroughs are essential for the improvement of clinical dentistry science. Whilst some innovations lack support, others are progressively adopted and supplant existant materials, techniques (Parashos and Messer, 2006). As a matter of fact, the history of dentistry is plentiful of contributions for both knowledge and technical bases (Parashos and Messer, 2006). The research methodology is a selection process approach that establishes a suitable data compilation procedure in order to achieve the proposed objectives (Sousa and Baptista, 2011).

The catalyst for an investigation is the search for one of two realities (Oliveira, 2011). On one hand, research can be driven by fundamental studies in order to understand a set of specific phenomena, which may not result in short-term benefits. On the other hand, applied research is inspired by the foreseeable profit of its application. Pure research aims to broaden knowledge in several areas, such as corporate processes or management principles, highlighting common principles and disclosing a value for society (Saunders et al., 2007). Research is an ethics-based process, aimed to achieve an understating of relevant phenomena, making it a creative and productive activity (Oliveira, 2011).

During this process, research objectives are accomplished by obtaining relevant information from the studies performed.

3.2. Qualitative Research method

Qualitative research is an analysis performed to describe the human experience (Polkinghorne, 2005) based on the congregation of data in order to produce detailed descriptions and conclusions. The data is collected mainly in language form (spoken or written) via interviews, observations, and documents. Participants selection for an interview usually demand calculated and repetitive strategies. The production of data resulting from interviews requires attention for the intricacy of self-reports and the connection between experience and language expression. Therefore, to generate relevant data from interviews involves practiced skill and time (Polkinghorne, 2005).

There are several qualitative approaches, determined by the type of research questions and analytical tools used to answer those questions. Thus, according to the researcher's own science philosophy, language data collection can vary in both type and method (Creswell, 1998; Polkinghorne, 2005).

Contrary to quantitative research, qualitative research is not perturbed by sample size or generalization of results, neither with validity and instrument purposes. Instead, the focus is on problem understanding and analyzing behaviors, attitudes, and values (Sousa and Baptista, 2011).

3.3. Innovation indicators

The economic growth field has always been immersed in the quest to measure innovation, and how to do it properly given the fact that innovation-seeking activities may or may not result in the appearance of something new (Grupp, 1998; Smith, 2004).

After establishing concepts for innovation and explaining the relationship it holds with the economy (mainly for innovation policies), it is essential to address the existing indicators to measure innovation and their shortcomings (Dziallas and Blind, 2018).

Measuring and quantifying something are useful tools to better understand and bring knowledge forward, and as William Thomson, 1st Baron Kelvin stated: “when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind” (Nagaoka et al., 2010). In fact, even though innovation is the driving force for economic growth, knowledge of innovation is still insufficient (Nagaoka et al., 2010). Therefore, reflection on what can be measured and its limits is substantial since measurement requires proportionality meaning that entities need to be qualitatively similar in order to be compared quantitatively (Smith, 2005). In this sense, measuring innovation using only the final product can be misleading because it overlooks the process of learning and researching to achieve knowledge that can lead to innovation (Smith, 2004). Since there are several variables present during an innovation process, it is impossible to measure innovation using a single indicator, meaning that innovation repercussions and effects remain uncertain (Grupp, 1998).

Frascati Manual’s first edition published the original comparable statistics on Science and Technology because specific metrics and indicators were applied to quantify the innovation process (Henriques and Larédo, 2013). Several indicators were proposed, composing an extensive metrics portfolio including patents and R&D (Smith, 2004). More recently, brands were added to the portfolio (Mendonça et al., 2004; Schmoch, 2003) since trademarks (and commercial signs for entities and products) are industrial property rights that derive from marketing endeavors. In order to engage customers, products (tangible or intangible) pursue differentiation by specifying its attributes and benefits, which have been used to measure innovation of non-technological nature (Godinho, 2007).

Despite the fact that perfect indicators do not exist, these innovation indicators grant crucial analysis serving as a model for public policy (Godinho, 2007). Innovation is characterized by dynamic strategies applied by companies and innovation indicators fall short when analyzing this multidimensional context, therefore the chosen indicator should be appropriate given the context of the study (Godinho et al., 2008; Kleinknecht et al., 2002). Moreover, it is important to define new indicators suitable to the quantification needs observed nowadays in order to achieve higher and better analysis results (Godinho, 2007).

3.3.1. Intellectual property rights (IPRs)

Research-focused companies have been focusing on new strategies to obtain superiority over competitors by commercializing innovations because they need to take dividends after investing money in research (Kasch and Dowling, 2008; Alam and Newaz, 2016). However, if a certain innovation has a high market value or attractiveness, competitors may start to replicate the innovation bringing the innovating company to an uncertain position. In this sense, the application of Intellectual Property Rights (IPRs) is imperative in order to protect their innovation from copying, manufacturing, and selling without express permission (Fitzgerald and Fitzgerald, 2004). Intellectual Property (IP) concerns all legal rights regarding intellect developments in the industrial, scientific, literary, and artistic areas (WIPO, 2004) enabling companies and businesses to invest in creativity by legally protecting their investment (Alam and Newaz, 2016).

In economic terms, IPRs are described as the rights to use and sell (Alam and Newaz, 2016) "*creations of the mind: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce*" (OECD, 2018, p. 113). There are several kinds of IPRs like patents, trademarks, copyrights, and industrial designs, all of them protecting different aspects of innovation. Normally, an innovative product is protected by various IPRs (Alam and Newaz, 2016; Othman, 2011). Hence, IPRs serve as a policy tool to coordinate an innovative activity's private and social returns, meaning that innovation is required to benefit society in order to happen a social incentive for innovative activities (Othman, 2011).

Usually, companies need to invest in research and development (R&D) activities to create innovations (new or improved products/processes), which entail high risks, costs, and time. After the arrival of a new product or process to the market, competitors often attempt to resemble the successful innovation. Therefore, is very important for a company to protect its innovations and one of the most effective tools is by keeping secret of the critical elements of its products. In fact, business managers use confidentiality agreements before formal IPRs in order to assure the protection of their investment. Formal IPRs protect companies from competitors long enough to enable them to profit from an innovative product (recovering their investment) and encourage innovators to further develop their own products (Othman, 2011).

3.3.1.1. Patents

As previously referred, quantification of innovation varies significantly due to the applied method for this purpose, with patent numbers being the most used indicator because it gives information on output innovation (Kleinknecht et al., 2002; Godinho, 2007).

A patent is a privileged right granted over a time period (20 years) which protects an invention from making, using or selling without permission in the countries where the patent is granted, dividing worldwide markets into several protected trade areas. Inventors and innovators with issued patents have exactly 12 months to apply for a patent application abroad and assert first concern for their product (Alstadsæter et al., 2015; Greenhalgh and Rogers, 2010; WIPO, 2004).

The first step in obtaining a patent is the demonstration of an advance in state-of-the-art terms in a determined innovation field. Thereafter, detailed information is disclosed by the innovator in order to obtain legal protection during a period of time and in a determined geographical area. Consequently, the patent system is considered to be a mechanism that encourages the creation of value and knowledge (Smith, 2005).

Ultimately, a patent represents an invention proof of novelty, which resulted from a company's effort (in terms of dedicated time and resources) in developing a product or idea that can be used and marketable. However, regarding the quantification of innovation, patent data does not comprehend companies that solely employ pre-existing technologies in their operation. Moreover, companies do not apply patent protection for all inventions and even though not every R&D development result in patentable invention it still can be considered innovation (Zvi, 1990; OECD, 2018). On the other hand, patents have several advantages measuring innovation because can be directly correlated to inventiveness in the sense that, usually, the number of patents shows a company's interest in innovation. In addition, patents result in technological advancements that feed the company competitiveness. Last but not least, by awarding property rights, a patent promotes a company's asset value. Therefore, a company with several cited patents can be quantified in its innovativeness (Hsu et al., 2015).

The Schumpeterian theory defends that new knowledge is transformed into technology, which then becomes an innovation that can be commercialized. This is the same logic

applied to the industrial property because patents can be transacted by transfer (assigning the right to exploit to third parties) or license (maintaining the property but a third party has right to use). Therefore, the concept of patents as marketable products can help the company to have a profit or at least the return of investment (Andrez, 2008).

Even if the financial return is not verified, patents can serve as indicators of R&D investments because the resulting technological development may not be commercialized and still be considered innovation, leading to more inventions and more R&D. Resuming, R&D investments may not result in innovation and even if they result in patents, they may not be applied or marketed (Evangelista et al., 1998).

3.3.1.2. Trademarks

Analyzing trademarks is a feasible answer to surmount the shortcomings of innovation scrutiny and quantification. In fact, former empirical investigations demonstrated that trademark analysis is related to the innovation activity of companies and can be used as an alternate way to quantify innovation (Gotsch and Hipp, 2014; Mendonça et al., 2004).

Companies assure their brand name capital (investments in products and reputation of brands) by adopting trademarks, using them for differentiation from the competition. For instance, in the services sector, trademarks have been linked with high productivity levels (Othman, 2011). Moreover, trademarks are considered very important for companies because they represent their own reputation within the market and for the general public. Therefore, trademarks are crucial for companies' activity and financial success (Milot, 2009).

Trademarks result from a noticeable establishment of a company's identity, designation, and symbols, playing a vital part in marketing innovation due to the differentiation they create in the market (Mendonça et al., 2004).

A registered trademark allows exclusive rights in using the trademark and its associated products within the countries where it is registered. In this sense, a trademark provides a

monopoly since similar signs for products are legally forbidden in the countries where the trademark is registered (Mendonça et al., 2004).

Indicators based on trademark analysis can be used in research studies interested in the product innovation statistics in distinct industrial sectors, the patterns of specialization observed internationally, the existing bridges between technology and marketing, and the global progress of economic organizations. However, a brand might be simultaneously secured by a combination of words, symbols, and 3D designs and trademark analysis can be affected by obstacles consolidating this kind of data. Moreover, proneness in international and sectoral comparability also affect trademark analysis. In order to overcome these problems, in-depth case studies including econometric analysis should be applied to successfully assess the use of trademarks as indicators for innovation quantification (Mendonça et al., 2004).

Recent developments in international regulation of trademarks and the growing availability of digital databases have strengthened the use of trademark statistics in innovation research (Mendonça et al., 2004).

By conferring an exclusive legal right to a company, a trademark enhances the company's capacity to explore economic benefits on products. Moreover, trademarks represent a far-reaching feature of worldwide modern society and establish a quantitative and qualitative supply of information on socio-economic activities. For the aforementioned reasons, trademarks comprise an important interest in social science research studies (Mendonça et al., 2004; Mendonça, 2014).

3.4. Systematic literature review

A literature review is the selection of documents with ideas, data, and evidence regarding a certain topic, and should be written from an objective point-of-view in order to integrate readers with enough information to understand the following investigation. For this purpose, it is commonly applied to one of two approaches. The traditional approach does not require guidelines on data collection and analysis for researchers whereas the systematic approach relies on a scientific process to analyze published research (Hart, 1998; Tranfield et al., 2003). A systematic literature review (SLR) is

characterized by the identification, selection, and analysis of available research in order to solve an undoubtedly composed question and to justify future research (Dewey and Drahota, 2016; Torres-Carrion, 2018; Swartz, 2011).

Being based on various premises, SLR is a fundamental scientific activity. In the first place, since there is a lot of available information, an SLR is decisive to refine this information. Secondly, after assimilation and consolidation of information, the review is used by researchers to establish, defend, and clarify their hypotheses (Mulrow, 1994).

SLR requires following a protocol distinctly delineated in order to guide the search in a comprehensive and transparent way that may be repeated and recreated by other researchers. Logically, planning a search strategy in order to answer a determined question involves identifying and reviewing the search information, including search terms, database names, platforms, dates of search, and limits (Gough et al., 2012).

Detailing documentation regarding the search method and article collection is decisive to make a reproducible SLR, which grants the methodological quality of the research. In fact, there seven major conventions in SLR: Transparency, Clarity, Integration, Focus, Equality, Accessibility and Coverage (Ferrerias-Fernández et al., 2016; Pittway, 2008).

Indeed, reviewing literature is a hard task due to the quantity of information available nowadays. Therefore, the researcher needs to possess a set of capabilities to search, evaluate, and synthesize information, all of which while critically evaluating the information. Moreover, paraphrasing and citation skills are required. For this purpose, Pautasso proposed ten rules for literature review: (1) Define a topic and audience (2) Search and re-search the Literature (3) Take notes while reading (4) Choose the type of review you wish to write (5) Keep the review focused, but make it of broad interest (6) Be critical and consistent (7) Find a logical structure (8) Make use of feedback reviews (9) Include your own relevant research, but be objective (10) Be Up-to-Date, but do not forget older studies (Pautasso, 2013).

In this study, the systematic review process was used is described in five stages (adapted by Ferrerias-Fernández, 2016; Torres-Carrión, 2018): (1) Planing the review (scoping); (2) Identifying and evaluating studies; (3) Extraction and synthesizing data; (4) Reporting, analyzing and presenting data; and (5) Utilizing the finding and correlate with the Oslo Manual (4^o Edition). Thus, it was possible to conduct the collection and

discussion of information more efficiently and effectively in order to answer the questions proposed in this study.

3.5. Interviews

Data collection can be obtained by several methods such as Surveys, Interviews, Focus groups, Observation, and Extraction from secondary data sources (Harrell and Bradley, 2009).

Information can be gathered by interview, which is an individual oral conversation where the interviewee has importance, legitimacy, and accuracy regarding the thesis proposed objectives (Ketele and Roegiers, 1999). An interview is meant to analyze practices and responses to events in terms of value systems, reference readings in adverse situations, and interpretations of own experiences (Quivy and Campenhoudt, 2008).

Interviews, which can be operated personally or over the phone and diverge from surveys due to the existing structure level for the interaction (Harrel and Bradley, 2009), are often based on open questions resulting in data collected from the interviewee. The interviewer's opinions and views about the topic in question should be ignored by the researcher (Koskei and Simiyu, 2015; Kajornboon, 2004). Therefore, interviewing is a suitable and acceptable form of data collection and knowledge from individuals (Kajorboon, 2004).

Interviews should be used for data collection as a research mechanism if there is a need to obtain personalized data, or if there are favorable circumstances for probing, or if a favorable return rate is imperative, or if the interviewees are not fluent in the native language (oral and written) (Gray, 2004).

In order to perform an effective interview, the researchers should possess several skills such as a good listening ability, the ability to be objective, a good memory, and quick thinking. It is also important to avoid personal questions. Moreover, an interview guide is indispensable for the researcher. This guide should contain the questions, topics, and issues to be addressed during the interview, in order to be clear and avoid ambiguity (Koskei and Simiyu, 2015).

Interviews can be unstructured, semi-structured or structured (Sousa and Baptista, 2011). Semi-structured interviews are often used in qualitative analysis. This non-standardized interview has a script, with a set of key topics to focus on during the interview. However, the interviewer has the possibility to change the order of the questions. Moreover, the interviewee has the freedom to develop their answers but under some rigor (David and Sutton, 2004). Since the scope of the present thesis is extensive, choosing a semi-structured interview allows the interviewer to expand on several topics within the interview framework.

Interviews can have open and closed questions, depending on if the interviewee's opinion can be justified (in the former), or if the interviewee is not allowed to state their answer (in the latter) (Sousa and Baptista, 2011). Once again, since this thesis covers several extensions, it was decided to perform open questioning interviews, in order to obtain more detailed information (Quivy and Campenhoudt, 2008).

Additional questions can also be performed, even if the questions were not foreseen in the interview starting point. This type of interview also allows the researcher to explore new paths, i.e. probe, in order to obtain views and opinions from the interviewee. Taking notes and recording the interview are important tools to help the researcher during the analysis and data collection (Gray, 2004; Koskei and Simiyu, 2015).

Opting for a semi-structured interview allows the adjustment of the interview script according to the interviewee's answers and opinions (Bardin, 2004) without pre-determining the interviewer's interventions (Bisquerra, 1989). Moreover, interviewees can freely express their statements on the subject under analysis. Additionally, the content of the script final version should be validated (Valadas and Gonçalves, 2013).

There were several attempts to conduct interviews about the topic at hand. Initially, contact was made directly with the Malo clinic that was readily available to contribute to this study. However, the interview was not possible due to recent company restructuring. This was an obstacle to what was initially proposed for this study and the aspects it was intended to assess. Afterward, contact was made with Doctor Orlando Monteiro da Silva (President of the Portuguese Dental Association); Doctor Luís Miguel Pires Lopes (Director of the Faculdade de Medicina Dentária da Universidade de Lisboa); and Doctor João Caramês (Director of the Implantology Institute). From

Doctor Orlando Monteiro da Silva we did not receive any reply; other contacts rejected because they considered not having the knowledge to answer the questions about the subject. Interviews were conducted with two dentists, with a master's degree and experience in oral surgery, pediatric dentistry, orthodontics, and occlusion. In order to complement the findings for this study, as well as to provide a perspective on the dental area, getting a perspective perceived by peers.

The interview (appendix 1) was made with questions that approach the dynamics, the context and the innovative impact of Malo Clinic in order to increase knowledge about the subject under study, improvement knowledge and explore the opinion of professionals who deal daily with the procedures developed by Malo Clinic. The interview was done using email and was performed on October 28th.

4. Case study: Malo Clinic

4.1. Introduction

In order to understand the importance of innovation and the knowledge creation process and to measure them, we sought to apply, on the one hand, a study based on innovation indicators and on the other hand to know the vision and behavior that prevails within the organization through a systematic literature review.

During this Chapter, the result of the interview will also be presented in an informative and confirming way, as well as an assessment and definition of the company's innovation through the Oslo Manual.

First, a brief presentation of the company and some innovative performance indicators will be made, then subsequently, updated indicators from external sources of empirical evidence, such as *Espacenet*, *TMView* and *Scopus*, and discussion of the findings from the literature, such as scientific articles and theses.

4.2. Malo clinic

Malo Clinic is a Portuguese company created in 1995 with its headquarters being located in Lisbon (figure 4). The Malo Clinic provides services in the area of dentistry. Today, it is considered the largest Center of Implantology and Aesthetic Dentistry in the world (Malo clinic official site).



Figure 4 - Malo clinic headquarters
Source: <http://medical.maloclinics.com>

Paulo Malo was the founder of the clinic named after him. He was born in Angola in 1961 into an enterprising family. From a very young age, he was taught a strong work ethic (Costa and Mendonça 2015; Ferreira, 2015; Malo Clinic official site).

Malo enrolled in the College of Dental Medicine at the University of Lisbon and graduated in 1989. After graduation, he followed the typical next step for a young practitioner – opening his own office. (Costa and Mendonça 2015; Malo Clinic official site). The Clinic maintains and continually develops a focus on advanced oral fixed rehabilitation. It has a reputation for successfully handling delicate and challenging situations, including patients that have had severe defacing accidents or those who suffer from jaw cancer. Malo's specialty is in difficult cases the unique knowledge and experience that Paulo and his team have concerns the treatment and rehabilitation of edentulous or nearly edentulous individuals (Costa and Mendonça, 2019; Costa and Mendonça, 2015).

In the early 1990s, Malo created and developed an All-On-4 surgical technique, a passageway for removable prostheses and the techniques of dental implants, considered the greatest advancement in the area of implantology to date (Costa e Mendonça, 2019; Malo Clinic official site).

Malo Clinic has an international presence in 15 countries - Portugal, Poland, Spain, Israel, Germany, Lithuania, Switzerland, USA, Canada, Colombia, Angola, Morocco, Japan, China, and Australia. Its presence in different continents of the world is thanks to its growth in factors that allowed it to differentiate itself, such as innovation. It is internationally recognized for its development of innovative surgical techniques and patented products, has received national and international awards. It began with the provision of services focused in the area of dentistry and expanded later to other health specialties (Ferreira, 2015; Malo Clinic official site).

Malo Clinic has a lasting and fully organized R&D system in place, a tooth, and implant laboratory in constant renewal, and a team of surgeons and clinicians with expertise on new treatments. Continual development in technique and technology is the norm. Malo Clinic's early success can be attributed to innovation, which is also responsible for its thrust into a global status (Costa and Mendonça, 2015).

The innovative performance of the company has invested in the area of R&D. Together with its medical team, it has been developing new surgical techniques and fixed dental prosthesis solutions, achieving significant advances in the rehabilitation of totally edentulous patients. They have implemented a strategy of differentiation by focusing on developing the most important area of business for which it is most widely recognized - dental medicine. Following the innovation, performance resulted in 4 patents, 1 utility model and 52 papers (Costa and Mendonça, 2015; Ferreira, 2015; Malo clinic official site).

4.3. Malo clinic Innovation performance

In order to successfully innovate consumer-related services, this oral-care firm exemplifies a “double differentiation” trajectory (functional and psycho-social value) and a combination of technically deepening interventions and non-technological strategies. Thus, Malo Clinic meets the needs of patients and achieve their goals as a company.

This company has persistently innovated, grown and internationalized over two decades, placing it at the forefront of an industry that is proceeding innovation and

internationalization solutions (Costa and Mendonça, 2019). The six differentiating factors are Innovation, Excellence, Confidence, Generosity, Leadership, and Safety.

Both Malo Clinic and Paulo Malo (founder) have often been distinguished for innovation and entrepreneurship, having won several national and international awards (Table 4).

The founder Paulo Malo said, “*It was the innovation of technique and products that made us known*” (Costa and Mendonça, 2019, pp. 971). The innovative performance of the company is based on R&D, with a medical team (surgeons and clinicians) that has been developing new surgical techniques and fixed dental prosthesis solutions, achieving significant advances in the rehabilitation of completely toothless patients, becoming a specialized clinic in prosthodontics and maxillofacial rehabilitation. (Costa and Mendonça, 2019; Ferreira, 2015).

Paulo Malo exhibits a firm conviction that their business model may be constructed from his techniques and devices. Of these techniques and devices, the most prominent and acknowledged worldwide are All-on-4, NobelSpeedy and Malo Clinic Bridge (Table 5).

The business model key concept was the All-on-4. In 1990, Paulo Malo introduced it with a real patient in a pilot experiment. More than two decades later, this concept remains an innovation that defines the oral-care firm’s success. It consists of rapid treatment with low indecision which replaces painful, expensive and risky bone transplants in just one visit without such invasive procedures. According to interviewee 2 (appendix 3), this technique and its adaptations were the most prevalent at a national level for total implant rehabilitation. Interviewee 1 claims that the implementation of this technique was an innovation that proved effective in treating toothless patients.

Paulo Malo said in his interview that it was the techniques and product innovation that allowed him to obtain the knowledge and ability to bring about a resolution to cases with higher quality and success rate and at a lower cost than his competitors. All these innovative advantages made his company competitive, opening windows of opportunity and developing new products.

Table 4 Malo Clinic and its founder national and international awards since 2001 in different countries.

Year	Awards
2014	<i>Best Luxury Medical SPA 2014 – World Luxury SPA Awards™</i> <i>Mercury Award 2014 – Services Category</i> <i>European Business Award 2013/14</i>
2013	<i>Best Luxury Medical/Wellness SPA 2013 – Global Winner – World Luxury SPA Awards™</i> <i>Most Reliable Dental Group” – Hong Kong’s Most Valuable Companies Services Award 2013</i> <i>Oral Health Awards 2013</i> <i>Malo Clinic Ceramic Bridge</i>
2012	<i>Best Luxury Medical/Wellness Spa 2012 – Country Winner – World Luxury SPA Awards™</i>
2011	<i>Best Luxury Medical/Wellness Spa 2011 – Global Winner</i> Paulo Malo was recognized by the title “ <i>Innovator of the Year 2011</i> ” in the publication <i>Hong Kong’s Most Valuable Companies</i> The name Paulo Malo was assigned to the dental medicine course at the Universidad Tecnológica de San Antonio de Machala.
2010	<i>Produto Inovação COTEC-UNICER 2010</i> <i>Top-Ten Medi-Spa 2010</i>
2009	the Malo Clinic was considered as part of the group <i>China’s Top Ten Spas</i> by <i>Travel+Leisure</i> Third prize <i>Hospital of the Future Awards 2008/09</i> in the biotechnology category
2008	Paulo Malo received the prize: <i>Professor Armando Simões dos Santos</i> for Best Research Paper of the Year <i>Santiago 2008 – Homenagem pelo relevante percurso e contributo para a Reabilitação Oral Medalha Tiradentes</i>
2007	Paulo Malo received the prize: <i>INSEAD</i> de Empreendedorismo Líder 2020 in the project “Os líderes 2020 e o caso Portugal”
2006	Paulo Malo received the prize: <i>Professor Armando Simões dos Santos</i> for Best Research Paper
2001	Paulo Malo received the prize: <i>III Prémio Ibérico de Implantologia Clínica 2001</i>

Due to the difficulty of patenting medical procedures, the Malo Clinic has established a partnership with Nobel Biocare, allowing the All-on-4 to be industrialized in collaboration with Nobel Biocare, naming Malo clinic as a consultant of specialist knowledge. KULZER is another Malo Clinic partner and is a world leader in providing dental materials and digital solutions.

The partnership between the Malo Clinic and Nobel Biocare provided a crucial competitive advantage in the market.

Table 5 Techniques and devices developed by Malo Clinic.

Technique/device	Description
All-on-4	Allows the rehabilitation of totally edentulous patients with the placement of only four titanium implants in each jaw; It allows patients with maxillary atrophy to have a fixed prosthesis without bone transplantation.
NobelSpeedy	Implant with an original design and is used in the All-on-4 TM treatment because it is more efficient and has higher stability; Used in complex cases with low bone density.
Malo Clinic Bridge	A fixed teeth prosthesis (set of teeth) that works as a solution for the rehabilitation of totally edentulous patients, supported by the All-on-4 TM technique by NobelSpeedy TM implants.

Malo Clinic is active in innovative steps, namely in the early stages of knowledge discovery and the majority of its knowledge comes from real practice trials. The innovative performance of the company has invested in the area of R&D and their publication performance displays the innovate character of the company.

The following innovation, indicators resulted in four patents and one utility model (table 6). Patents are effective evidence that Malo medical/clinical team is an inventor, providing clear evidence of its technological development. Besides patents, at least forty trademarks were applied, including thirty-five by Malo Clinic and five by Paulo Malo.

Trademarks increase Malo Clinic internationalization and their position on the global markets: nine countries in which trademarks were protected. Most of it refers to sophisticated medical and education services (table 7).

Costa and Mendonça (2019) observed the general view of the company image projected by the media through news analysis concerning the innovation phenomenon, products, and service, internationalization, markets, trademarks, and patents; the patents, products, and services all being major factors influencing the image of the clinic. The

presence of team members in training and congresses with presentations of techniques and clinical cases is also prevalent (interviewee 2, appendix 3).

Table 6 Malo clinical patents and utility model.

Patent/Utility model	Inventor (s)	Publication Date
Dental Prosthesis	António Silva; João Legatheaux; Miguel Nobre de Araújo; Carlos Moura Guedes; Carlos Almeida; Paulo Malo; Nuno Serreno	10 January 2019
Prótese fixa Metallo-cerâmica suportada sobre implantes dentários para reabilitação protética de pacientes desdentados totais	Paulo Sérgio Maló de Carvalho	12 December 2012
Device for transferring the position of an angled abutment from a model to an implant	Paulo Malo	27 March 2010
Medical implant and method of implantation	Paulo Maló Carvalho; Lars Jörneus; Henrik Petersson	14 January 2010
Fixture for anchoring in jaw bone	Paulo Maló Carvalho	28 October 2004

Malo Clinic has a competitive advantage with both soft (social and relational knowledge) and hard innovation (scientific and technological knowledge) (table 8). In addition to the indicators that were mentioned above, there are other indicators of differentiation, creativity, and recognition. The Malo Clinic bet on marketing innovation for customer management; besides routine appointments, the clinics offer psychological support, complementary beauty, and shopping services. According to interviewee 2 (appendix 3), the Malo Clinic pioneered the development of a marketing strategy, featuring a strong presence in the media with television presence, which allowed visibility to grow into what it is today. The good presentation and care for patient treatment are also important and differentiating aspects.

Table 7 Trademark designations (Adapted by Costa and Mendonça, 2019).

Type	Description
Services	Medical services and beauty care Education and training provision Business management services, consultancy, and communication
Goods	Surgical, medical, dental apparatus, instruments, Pharmaceuticals and sanitary preparations and substances for medical Cleaning preparations, perfumery, essential oils, dentifrices and cosmetics Coffee, tea and other foodstuffs of plant origin prepared for consumption Industrial oils and greases, fuels and illuminants

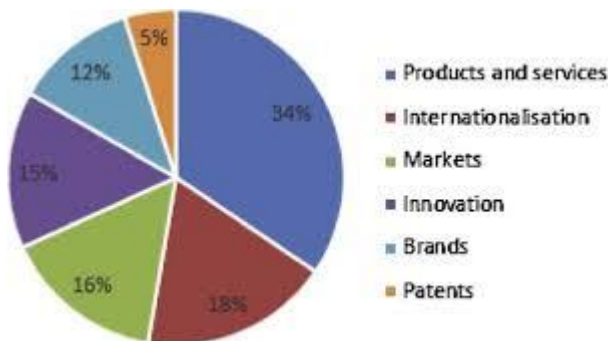


Figure 5 - Content analysis of news on Malo Clinic – Products and services; Internationalization; Markets; Innovation; Brands (Trademarks) and Patents
Source: Costa and Mendonça, 2019, pp.979.

Malo Clinic began to develop technical knowledge in the early 90s, investing in hard expertise. This was the differentiation strategy that began by giving the company a prominent position in relation to others, and its insertion in the global market. In order to maintain a competitive advantage, the company began by developing processes that allowed for the improvement of previously developed products. 24 years later this technique is currently integrated into a unique and innovative protocol: the Malo Clinic Protocol. With the increasing demand for services provided at the beginning of the new century, the Malo Clinic started by investing in soft skills. The proximity, patient well-being, and company-patient relationship become another form of differentiation, marking its presence in world markets.

Table 8 Knowledge-intensive consumer services (KICS) application to Malo Clinic according to Costa and Mendonça (2019).

	Relevant for final user	Relevant for producers
Hard innovation	Instruments, drills, implants, bridges, Abutments (Tangible resources); faster treatment, more reliable and enduring (Intangible resources).	Malo Clinic protocol; Cad/Cam prototyping; 3D artificial tooth printing; Big data patient case processing; Dental lab protocol.
Soft innovation	Costumer protocols; Clinic design and amenities; Media management routines; Wellness and psychology features; Content curation for follower communities in social media.	WeChat study clubs; Training provision while performing actual treatments to patients.

The interviews allowed the evaluation, from an expert's point of view, the impact of Malo Clinic innovation in the dental medicine, because it has distinguished itself from others by implementing a technique never before used in implantology and installing specialist consultations to better meet the needs of patients. In addition, the importance of the marketing strategy and close relationship with the client carried out by the Malo clinic was also verified. In organizational terms, the importance of using information technology was emphasized. According to interviewee 1, the development of technological information synchronization strategies had high importance, because it allowed different specialists to be informed about the patient's clinical condition, as well as their clinical files and diagnostic. A cross-sectional database may be crucial. If the patient was relocated from their area of residence, it is very advantageous for the team to already know their clinical situation. These aspects are very important and can make a difference.

4.4. Malo Clinic and Oslo Manual approach

Malo Clinic has followed, over the last 20 years, several guidelines for innovation according to the Oslo Manual (table 9).

Oslo Manual refers to innovation as “the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations” (OECD, 2018).

Table 9 Oslo Manual (4th edition) approach for Malo Clinic.

Concept	Malo Clinic
Knowledge	Yes
Novelty with respect to potential uses	Yes
Value creation	Yes
Research and experimental development activities	Yes
Marketing and brand equity activities	Yes
Intellectual property-related activities	Yes
Business strategy	Yes
Diffusion of innovation	Yes

Malo Clinic has been focusing on improvements in products/services brought to the market and has invested in significant developments in business functions using knowledge as the foundation for innovation, originality, and applicability leading to the creation of value. An important note is Malo Clinic presents both technological and non-technological innovations described in the Oslo Manual. Malo Clinic innovations derive from knowledge-based activities and involve practical experience. It has a fully organized R&D system that allows constant updates on the methods and techniques applied as well as a medical team (surgeons and clinicians) with expertise in novel treatments. Continued development in technique and technology is the norm.

The business model presented by the company is an integrated business model. The Malo Clinic innovation activity was successful as they were able to deploy a new technologically enhanced product and process. The business model was built through their techniques and devices. The key was the All-on-4, an innovative technique in implantology that allowed the replacement of missing teeth. This technique allowed the

rehabilitation of the total toothless with the placement of only four titanium dental implants in each jaw. This innovative, fast and effective treatment was the booster for the construction of the oral-care firm's image, name, and reputation to recognition in the world. Posteriorly, Malo Clinic innovates in more products such as the creation of dental implants and surgical objects like the zygomatic dental implant or the speedy Nobel. Subsequently, a process innovation Malo clinic bridge emerged in which dental implants would function as a support foundation. This process allowed the placement of fixed teeth like natural teeth; stabilizing bone loss and contributing to the preservation of oral health. In order to provide all laboratory material necessary to support internally with high quality, technology, and quickness, the Malo clinic Ceramics was created, a laboratory specializing in fixed implants and natural teeth.

These technological products and process innovations introduced modifications to the Malo Clinic's working methods, the use of production factors and the types of outputs that improved its productivity and/or business performance. In addition to product innovation, it also presented a business innovation that involves the production of goods and services; marketing and aftercare services. Its presence in different continents of the world is due to its growth in factors that allowed it to differentiate itself, including heavily betting on a knowledge-based service such as oral care and extending its business to a new practice known as Medical Spa. The application of ICT services was also important with massive digitization of their patient and technical information as a resource to big data platforms. Customer management has also been an important focus for the Malo Clinic regarding marketing innovation, with the creation of several procedures for this purpose. These procedures include customer protocols, clinic design and amenities, media management routines and wellness and psychology features. Organizational innovations include a social media app (WeChat) and training while performing actual treatments to patients.

The Malo Clinic business model comprises knowledge, novelty, implementation, and value creation. Knowledge because it developed models, methods and prototypes; novelty because its product and process, compared to competitors, have advantages in patients treatment; implementation because it makes a systematic effort to make the price as competitive and affordable as possible (€ 8,000-10,000); and value creation because it involves profit.

By investing in the development of technologically products and processes improved, Malo Clinic has made its innovations known in the world market. Build a business strategy that includes competition in price and quality of service; market leadership; and degree of openness through collaborations with external partners. The partnerships were very important for the commercialization of the products, which would influence commercial growth and knowledge expansion. The company has strategic competencies: long-term vision, ability to identify and anticipate market trends, availability and the ability to collect, and process and assimilate technological and economic information.

In this way, we can argue that Malo Clinic unfolded its business processes described in a way that is enlightened by the new edition of the Oslo Manual.

5. Conclusion

This dissertation aimed to measure knowledge creation and innovation in a company that considers itself innovative. In this sense, this work was based on the analysis of a case study about Malo Clinic, where after observing its performance, was asked the question “How Malo Clinic gain competitive advantage and distinguish itself in its competencies and how they are designed globally?”; “What capabilities and strategies have been built to continually innovate?”.

To answer the above questions and study scientific and technological skills, was performed a systematic literature review, patent and trademark analysis, and the interview method were applied. Some innovation indicators were also considered in order to analyze the economic performance.

This dissertation is organized and developed in five chapters. The first chapter presents a brief presentation of the work. The second presents a scientific concept in order to allow understanding of knowledge creation and the innovation phenomenon. With the third chapter, it is known the approached methodology, with the definition of systematic literature review, the indicators that help the scientific production performance study and the interview. The following chapter presents the analytical interpretation resulting from the extracted information as well as the worked indicators.

The Malo Clinic is the world leader in oral care. Furthermore, surgical tools innovation, the clinic introduced the All-on-4. This protocol has been recognized in implantology and aesthetic dentistry and this technique remain the best on the market for edentulous patient rehabilitation.

Malo Clinic aims to achieve quality in their services with research and knowledge sharing, making this competence a distinctive factor. This company focuses on giving quality to the main focus of its business – dental medicine, investing in innovation through R&D. In this way, Malo Clinic marks its presence within the sector and allows its internationalization. Partnerships were fundamental for commercialization and internationalization.

The company also has a solidary character, offering treatment to patients without financial means. Showing a positive image and reputation, which passes on trust and internal resource capabilities attaching possible customers and business partners.

Hereafter, it would be important to evaluate the effects of ownership change and restructuring of the Malo Clinic as the organization steps onto a new phase of its existence. What exists in evolutionary terms and how it may or may not change in the light of the new scenario; what are the changes and what will be done about your innovative business model (products and processes).

Measuring innovation is a problem that continues in trying to find the best method for quantifying innovation. This is a dynamic occurrence that affects markets and the global economy. Although over the last few decades, work has focused on studies that address innovation and the problem of its understanding and measurement. The range of innovation indicators has been increasing and, in this sense, it is a peculiar interest for companies to be able and able to apply them to quantify their innovation effort and activity.

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6. Appendixes

Appendix 1 – Interviewee profile and Interview guide

Name:
Employer Institution:
Position:
Formation:
Area:
Time at the institution:
Main activities in which you are involved:

INNOVATIVE DYNAMICS

- 1) In your opinion, what were the factors that allowed the Malo Clinic to succeed since its inception?
- 2) What do you consider to be the critical factors for oral medicine innovation?
- 3) In your opinion, is the Malo Clinic's strategy of proximity to patients during and after treatments considered an innovative strategy? Why?
- 4) In your opinion, the development of technological information synchronization strategies is crucial for the satisfaction of both physician and patient; and for resource management of dental clinics?
- 5) What are the challenges, obstacles or conditioning factors in contemporary prosthodontics?

INNOVATIVE CONTEXT

- 6) Does the institution where you work interact with the Malo Clinic to obtain new knowledge? How?
- 7) What is the patient's role as a source of innovation in project development? Is the psychological factor of patients considered during treatments performed at the institution where they perform their duties?

IMPACT OF MALO

- 8) How important is Malo Clinic's innovation in providing dental services to other competing clinics?

FINAL COMMENTS

- 9) If you could define Malo Clinic in one word, what would it be? Why?
- 10) Comment the following sentence: “The Malo Clinic is concerned with demonstrating scientific knowledge through scientific publications, invention patents, and trademarks, which has contributed to its recognition both internally and externally.”

Appendix 2 – Interviewee 1

<p>Name: Employer Institution: Somardental Position: Dentist Formation: Master degree Area: Dentistry Time at the institution: 7 years Main activities in which you are involved: Dentistry with special focus on Pediatric Dentistry, Orthodontics, and Occlusion.</p>	<p>Answer</p>
<p>1) In your opinion, what were the factors that have allowed the Malo Clinic to succeed since its inception?</p>	<p>The implementation of the All on 4 technique by Dr. Paulo Maló was an innovation, as it had never been used before and proved effective. Being Paulo Malo, the reference and image of the clinic gave great credibility and confidence to the institution. In addition, the creation of specialist appointments within dentistry has enabled a better response to patients' needs.</p>
<p>2) What do you consider to be the critical factors for oral medicine innovation?</p>	<p>Personalized service, specialized and differentiated treatment, predictable, lasting and painless treatments.</p>
<p>3) In your opinion, the Malo Clinic's strategy of proximity to patients during and after treatments considered an innovative strategy? Why?</p>	<p>Increasingly, patients are informed, so it is important to provide them with detailed follow-up and clarification on the most appropriate treatment plan for them.</p>
<p>4) In your opinion, the development of technological information synchronization strategies is crucial for the satisfaction of both physician and patient; and resource management of dental clinics?</p>	<p>Yes, as treatments are becoming more specialized and patients go through various specialist physicians, it is important that everyone is informed about the patient's medical history as well as their medical records and diagnostic aids so that fluidity and the patient feels that everyone is aware of their situation. It is very unpleasant to always have to explain to all doctors the reason for the consultation, the signs, symptoms, goals, and expectations. A cross-sectional database may also be crucial. If the patient is relocated from their area of residence, has a problem, and travels to a branch of the clinic where they are seen, it is very advantageous for the team to already know their clinical situation. These aspects are very important and can make a difference.</p>
<p>5) What are the challenges, obstacles or conditioning factors in contemporary prosthodontics?</p>	<p>In my opinion, too many sources of information for patients, some of them unreliable. It is challenging to present treatment plans to patients who already come with their own outlined treatment plans. The frequent appeal to complaints by some entities does not create uncomfortable situations in clinical practice. On the other hand, patients are increasingly demanding innovative, fast, painless and inexpensive locks.</p>
<p>6) Does the institution where you work interact with the Malo Clinic to obtain new knowledge? How?</p>	<p>No.</p>
<p>7) What is the patient's role as a source of innovation in project development? Is the psychological factor of patients considered during treatments performed at the institution where they perform their duties?</p>	<p>In my clinical practice, I try to understand the patient and adapt my conduct to the type of patient and treatment I will perform. It is often important to involve the patient in the clinical decision by explaining the procedure and what care to take. This reduces anxiety and also co-responsibility for treatment.</p>
<p>8) How important is Malo Clinic's innovation in providing dental services to other competing clinics?</p>	<p>The Malo Clinic innovations and the impact it has made, mean that other clinics have to evolve and form to remain competitive.</p>
<p>9) If you could define Malo Clinic in one word, what would it be? Why?</p>	<p>Innovation because it has distinguished itself from others by implementing a technique never before used in implantology and installing specialist consultations to better meet the needs of patients.</p>
<p>10) Comment the following sentence: “The Malo Clinic is concerned with demonstrating scientific knowledge through scientific publications, invention patents, and trademarks, which has contributed to its recognition both internally and externally.”</p>	<p>I don't have the knowledge to comment on the sentence.</p>

Appendix 3 – Interviewee 2

<p>Name: Employer Institution: Position: Dentist Formation: Master degree Area: Dentistry Time at the institution: 7 years Main activities in which you are involved: Oral surgery</p>	<p>Answer</p>
<p>1) In your opinion, what were the factors that have allowed the Malo Clinic to succeed since its inception?</p>	<p>Marketing strategy, good presentation, and care for patient treatment.</p>
<p>2) What do you consider to be the critical factors for oral medicine innovation?</p>	<p>-----</p>
<p>3) In your opinion, is Malo Clinic's strategy of proximity to patients during and after treatments considered an innovative strategy? Why?</p>	<p>I do not consider it an innovative strategy, I think it is the reality in most clinics, however, it is an important feature to make the patient feel valued.</p>
<p>4) In your opinion, the development of technological information synchronization strategies is crucial for the satisfaction of both physician and patient; and resource management of dental clinics?</p>	<p>Yes, Computerizing Schedules, Stocks, and Clinical Records simplifies processes and minimizes errors that could lead to rescheduling, material shortages, or job delays.</p>
<p>5) What are the challenges, obstacles or conditioning factors in contemporary prosthodontics?</p>	<p>In Portugal, the two main problems are the lack of awareness on the part of the population about the need for basic oral care (there are still people who do not brush their teeth daily) which is partly reflected in the government because there is practically no oral health care in the national system of health. And the second problem is often aggressive and misleading marketing health and insurance plans promising free treatment without any co-payment from the “insurers” to clinics. This leads to much confusion and patients thinking that they are being misled when really explaining how health plans work.</p>
<p>6) Does the institution where you work interact with the Malo Clinic to obtain new knowledge? How?</p>	<p>No.</p>
<p>7) What is the patient's role as a source of innovation in project development? Is the psychological factor of patients considered during treatments performed at the institution where they perform their duties?</p>	<p>It is the patient who finances all projects and training in private health. The psychological component is taken into account, even when choosing the treatments to be done perhaps not by the institution as a whole but individually by each clinician, we know that there are treatments that do not result in a certain type of patient.</p>
<p>8) How important is Malo Clinic's innovation in providing dental services to other competing clinics?</p>	<p>The technique developed for full rehabilitation on “all on-4” implants and adaptations of it (“all on-6”) is still in my personal experience the most prevalent nationwide for full implant rehabilitations, so in that respect, it had a significant impact.</p>
<p>9) If you could define Malo Clinic in one word, what would it be? Why?</p>	<p>Marketing because it was one of the first clinics to have a strong presence in the media with presences on television, which allowed their visibility to grow to what it is today.</p>
<p>10) Comment the following sentence: “The Malo Clinic is concerned with demonstrating scientific knowledge through scientific publications, invention patents, and trademarks, which has contributed to its recognition both internally and externally.”</p>	<p>I consider the sentence true, and the presence of team members in training and congresses with presentations of techniques and clinical cases is also prevalent.</p>

