



Business Models in Healthcare

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Master in Business Administration

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Abstract

Healthcare industry is changing worldwide, due to an increase in demand, both qualitative and quantitative. Business models in healthcare are struggling to give an answer to such changes.

Different societies manage their healthcare systems according to their politics and possibilities, this way different business models fit each society needs. Technology is promoting an evolution in business models in healthcare, increasing efficiency and effectiveness.

Among the most common technologies and business models' enablers applied in healthcare field are Digitalization, Big Data, Internet-of-things and Project financing.

This work intends to understand how these new technologies are impacting healthcare sector in Portugal. How they are being applied, which are the main barriers their implementation is facing and what is expected to improve by incorporating them in healthcare industry.

Data was collected through semi-structured interviews performed to an expert panel composed by C-level managers from public and private healthcare organizations.

The results achieved portrayed a strong correlation with what is found in literature. Showing that most organizations are applying these resources, understanding that they may bring better outcomes for all stakeholders in healthcare field.

Keywords: Business models, Healthcare, Technology, Big Data, Digitalization, Internet-of-Things, Project financing

Journal of Economic Literature (JEL) Codes: M1 Business Administration; I13 Health Insurance, Public and Private; I18 Government Policy, Regulation, Public Health; O33 Technological Change: Choices and Consequences, Diffusion Processes

Resumo

A indústria da saúde está a mudar em todo o mundo, devido ao aumento da procura, tanto qualitativa quanto quantitativa. Os modelos de negócios na área da saúde estão a lutar para dar uma resposta a essa mudança.

Diferentes sociedades gerem os seus sistemas de saúde de acordo com as suas políticas e possibilidades, desta forma diferentes modelos de negócios adaptam-se às necessidades de cada sociedade. A tecnologia tem vindo a promover uma evolução nos modelos de negócios na área da saúde, aumentando a sua eficiência e eficácia.

Entre as tecnologias e “promotores” dos modelos de negócios mais comumente aplicados na área da saúde estão os programas de Digitalização, “Big Data”, Internet das Coisas e Financiamento de projetos

Este trabalho pretende perceber como estas novas tecnologias estão a impactar o setor da saúde em Portugal. Como estão a ser aplicadas, quais são as principais barreiras que a sua implementação enfrenta e o que se espera melhorar ao incorporá-las neste setor.

Os dados foram adquiridos por meio de entrevistas semiestruturadas realizadas a um painel de especialistas composto por gerentes de nível C de organizações de saúde públicas e privadas.

Os resultados obtidos retrataram uma forte correlação com o que se encontra descrito na literatura. Mostrando que a maioria das organizações aplica estes recursos, entendendo que os mesmos podem trazer melhores resultados para todos os “stakeholders” da área da saúde.

Palavras-chave: Modelos de negócios, Saúde, Tecnologia, “Big Data”, Digitalização, Internet das Coisas, Financiamento de projetos

Códigos do Jornal de Literatura Económica (JEL): M1 Administração de Empresas; I13 Seguros de Saúde, Público e Privado; I18 Política Governamental, Regulação, Saúde Pública; O33 Mudança Tecnológica: Escolhas e Consequências, Processos de Difusão

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1. Introduction

Healthcare industry is struggling against many obstacles, being the most recent COVID-19 pandemic. However, this disease only came to portray even better the problems already existent in different societies around the world. Many countries are facing budget deficits and growing government debt (Villani et al., 2017). This matters the most, since healthcare is a resource-intensive system (Guzzo et al., 2020). Besides public budget constraints, growing expenses in healthcare industry, mainly due to aging population trends, shows how incapable public healthcare sectors are being, while trying to deliver an adequate care to citizens around the world (Archena & Anita, 2015). According to Cicellin et al (2019), the increase of life expectancy is driving to “new care needs”, this phenomenon associated with the lack of sustainable efficiency delivered by the model of public “government-controlled” healthcare are behind the increase in private healthcare expenditure. On the other hand, the private healthcare sector, does not present itself as an affordable and available option to the poor (George et al., 2015; Johnson et al., 2008, as cited in Cicellin et al., 2019). Also, this sector starts to struggle to provide efficient, high quality and accessible healthcare, due to the increase in demand (Cicellin et al., 2019). While facing this problematic, some authors defend that healthcare industry is shifting towards a growing interest on technical and economic performance, mainly due to an increased rationalization of resources. These changes are presenting repercussions on the ethical-value dimension as well as on healthcare management (Barile, 2012, as cited in Saviano et al., 2018). On a broader line of sight, Saviano et al. (2018) defended that focusing on sustainability, would lead to higher performance levels without the need of cost cutting. This approach provides an alternative to the pure spending logic, into a resource optimization logic, focusing on production.

Healthcare industry requires an innovation plan, to respond to the new needs, it is facing. In the most recent years, new business models are being developed and assessed to enable a sustainable and efficient healthcare to every citizen. Currently, improving patient empowerment and quality of life is becoming a growing concern (European Commission, 2018).

Zott & Amit (2008) defined business model as “a structural template of how a focal firm transacts with customers, partners, and suppliers, that is how it chooses to connect with the factor and product markets”. Other authors, described business model as the way an organization creates, delivers, and captures value (Osterwalder and Pigneur, 2010, as cited

in Cicellin et al., 2019). Business models in healthcare present the way to create value for all stakeholders, from government to private entities, to professionals and to patients.

Technology is a promotor of new business models by enabling new ways of interaction between all stakeholders. Actually, interactions are a pillar in healthcare industry. This means that technology allows innovative business models to provide and suit the main concerns of different societies, with different needs. Digitalization of healthcare organizations and services, project financing, internet of things and big data are some of the new resources and capabilities that are allowing innovative business models to arise.

The research problem relies on the need for new business models, that allow faster and more flexible responses by management systems, due to the change that healthcare industry is facing in the most recent decades (Brooks et al., 2015; Unger & Landis, 2016). Also, McKinsey Global Institute (2012) agreed that inefficient and unnecessary health administration practices resulted in an increase of wasteful costs in healthcare sector.

The literature review was preformed based on high relevance, English articles, published since 2017, on high quartile journals (Q1 and Q2).

The dissertation is organized as follows. After the introduction about healthcare industry and its status on current society, different business models in healthcare are presented and described. Lastly, different resources and capabilities are addressed, as well as the way they can enable or promote business models.

2. Literature review

2.1. Healthcare: A worldwide view

Healthcare industry is constantly growing, and it is nowadays facing more challenges than ever before, mainly due to the increase in demand of its services (Ramori et al., 2021). Actually, according to Cicellin et al (2019), the increase of life expectancy is driving to “new care needs”. Also, quality is an issue of growing importance for caregivers and patients. As Ramori et al. (2021) described in their work, most research on lean business models and healthcare was performed since 2016, this portrays an increased interest in healthcare innovation and in the look for better solutions. Torre Díez et al. (2016) reported that literature on this field is growing since even earlier, about 2011. Although most research was conducted on USA, an important number of countries around the world are contributing to the development of research in healthcare field (Ramori et al., 2021). In 2019, Cicellin et al. noticed how European countries are interacting and learning with developing economies, in order to achieve innovative business models. Besides the increase in literature and relevance, the money spent to fund projects and research in healthcare also increased (Moro Visconti & Morea, 2019).

In 2019, Cicellin et al. realized how hard it is to meet low-income population needs regarding healthcare issues, utilizing traditional business models. There are two main reasons that justify this inability to deliver proper care: long waiting lists and inadequate economic resources. Accordingly, Klein (2015) describes that the increased prevalence of chronic diseases is demanding higher and innovative quality services. However, healthcare expenditure is increasing, but limited by public budgets. In 2021, Ramori et al. explained that this increment on healthcare expenditure, in USA reality, can be explained by the investment in new technologies and in outpatient services. Actually, public budget constrains heavily impacts the inequity access to healthcare for people at the bottom of the social pyramid, even in developed European countries (Mladovsky et al., 2012). These inequities are even higher in developing countries. In Africa, more than 60 percent of the population does not have access to medical facilities. And nearly one-third of the developing world’s population does not receive medical care on a regular basis (WHO, 2016, as cited in Cicellin et al., 2019).

Public budget constrains is playing a major role on promoting private sector to grow. According with Deloitte (2016), most innovations in developing countries are expected to come from the private sector, rather than the public sector. This is leading to an even higher

inequity access to healthcare between the wealthier and the poorer (Mladovsky et al., 2012). Due to these discrepancies, new actors are arising. New service providers, located at the low cost segment of healthcare industry, are trying to fulfill the gaps left by both, public and private healthcare sectors. This new segment aims to provide care at competitive prices and operates mainly in the field of “light health” (Cicellin et al., 2019).

In most societies around the globe, including most developing economies, technology is an asset on which healthcare relies on. However, technology is a main cost driver, responsible for the increase in healthcare expenditure, since medical technology costs are rising (Callahan, 2018; Kumar, 2011). On the other hand, technology allows quality-of-life improvements, as well as cutting costs in other areas (Moro Visconti & Martiniello, 2019). Actually, Ancker et al. (2015) referred that unlike other healthcare investments, like diagnostic equipment or physical infrastructures, technology provides a shorter payback and is often cheaper.

Creating value for all stakeholders, within healthcare industry, is a must according with most authors. Ramori et al. (2021) described how necessary these researches are being to help improve patient care, as well as reducing wastes and costs, and improving the work environment for employees. In 2010, Yunus et al. also identified the importance of value proposition, assuming the value creation for every stakeholder as well as the product/service itself. Torre Díez et al. (2016) agreed about the need for innovation and productivity gains, and cost and risk reduction in both, private and public healthcare sectors. Behind all proposals lays a common sense of the need to grow humanization in healthcare (Saviano et al., 2018).

Within the stakeholders referred above, environment is playing a major role in most economic sectors. However, in healthcare the importance of this stakeholder is growing faster, due to the impact this industry can have. The social concern on this topic brought sustainability to an imperative state, where environmental risks are at the same level as health risks (Buys et al., 2014; Lopes et al., 2019).

Ultimately, if healthcare expenditure becomes affordable, it can lead to an economic growth that can provide financial support to new investments in this area, generating a cycle of additional growth (Visconti & Morea, 2020).

2.2. Business models in healthcare

Business models are transversal to several industries, and they do represent a way of explaining initial strategic planning and subsequent management (Villani et al., 2017). Business model is defined by Zott & Amit (2008) as a template of how a firm interacts with its stakeholders. However, most authors agree that business models are broadly focused on the way an organization creates value for itself and its stakeholders (Osterwalder and Pigneur, 2010, as cited in Cicellin et al., 2019; Schiavone et al., 2021). Similarly, Laya et al. (2018) describes it as a “creation of a common value proposition” and understands it as business opportunities that are exploited by the actors within the network.

In a narrower concept, slightly different definitions arise. For Zott & Amit (2010) business models are described as *activity systems*, exposing which activities are being performed, how they are being performed and who is performing them. On a more self-perspective point of view, business models can be seen as a profit creation driven, while positionally and organizationally managed (Chesbrough and Rosenbloom, 2002, as cited in Laya et al., 2018). In 2010, Baden-Fuller & Morgan described business models as artefacts that portray manners to profitably create and distribute value and that facilitate comparing, understanding and disseminating business structures. Lastly, other authors understands that a business model objective should be strictly value creation (Täuscher & Laudien, 2018). However, the definition of value differs between authors. Lepak et al. (2007) defined value in three different levels: individual, organizational and social.

Business models implementation aims, between other objectives, to promote a sustainable future for business. Being sustainable does not refer only to being economically stable, but also to being able to minimize negative environmental impacts, representing a responsible position towards future generations (Golinelli, 2012, as cited in Saviano et al., 2018). However, alongside environment, society and economy are being described as the “three pillars” of sustainability (Gibson, 2006).

Business models in healthcare organizations face a dual function when compared to other business. Like any other business, they present a need of sustainable monetary, financial, and economic future. On the other hand, healthcare organizations rely heavily on effective service, since health is a sector of high interest for the general population (Saviano et al., 2018). Alongside Saviano et al. (2018), other authors defend that management should

embrace a wider view of its context, what will promote that more stakeholders can achieve their expectations (Golinelli, 2000, as cited in Saviano et al., 2018).

In healthcare industry, innovation and business model concepts are commonly used together. Nowadays, cost and waste reduction are key elements for healthcare institutions strive and keep sustainable competitiveness (Guzzo et al., 2020). Also, patient and professionals' concerns play a major role for organizations to be able to provide the value demands required by customers and competitors (Ramori et al., 2021). Agreeing with the research of Ramori et al., Martin (2007) found in his study that organizations should determine which model will provide better improvement in quality experience for most stakeholders.

To assess and verify the implementation of business models in healthcare organizations, as well as in other organizations, there is a need for control systems. Integrated control systems were used as a tool to cover these needs, providing methodological approach that promotes viability and survivability to an organization (Bassano, 2004, as cited in Saviano et al., 2018). In 2018, Saviano et al. also addressed the necessity of control systems, mainly in organizations that seemed more complex, which will portray an opaquer appearance to the outside, becoming harder to control. Integrated control systems also pretend to support the preparation of plans, budgets, and rationalization of information and resources (Saviano et al., 2018).

In the following sections there will be discussed some business models that intend to fulfill the needs mentioned above.

2.2.1. Lean business model

Lean business models are already used in many industries and is for the most recent years being implemented in healthcare industry. The concept *Lean* refers to an operation management design that intends to focus on the elimination of waste, making processes more efficient. Lean thinking represents an alternative model to the capital-intense mass production (Hines et al., 2004). Within Lean business models there is another concept in straight relation *Six Sigma*. *Six Sigma*, similarly to *Lean* represents an operation management design, which intends to reduce process variation and defect rate in the most critical processes, aiming to generate savings in the bottom line of an organization. While

Lean focus on efficiency, *Six Sigma* focus on effectiveness (Ramori et al., 2021). However, some studies indicate that *Six Sigma* alone cannot drive innovation, but instead provides what is need for innovation to succeed (Lazarus, 2011, as cited in Ramori et al., 2021).

In 2012, Gowen et al. found that continuous quality improvement (CQI) and lean management initiatives (LMI) were essential on diminishing hospital error sources. It was also shown that CQI and *Six Sigma* initiatives promote organizational improvement. On another point of view, other authors presented some limitations to this model, mainly the difficulty to keep *Lean Six Sigma* strategies over long periods (Duarte et al., 2012).

In 2021, Ramori et al. proposed the implementation of *Lean Six Sigma* in healthcare industry being driven by customer satisfaction. However, there was no defined guide or idea of how to do it. This way, in their research, Ramori et al. (2021) presented different approaches already studied by other authors.

Integrated delivery systems (IDS) was one of the first business computing models used in healthcare sector, and it showed how much more accurate would decision making be, by providing an easier way to share data among partners and providers, on a larger population. With this model organizations should understand which activities are well performed and which ones are not, and consequently defining the activities that should be outsourced (Lang, 1997, as cited in Ramori et al., 2021).

In 2007, Nelson-Peterson and Leppa created a business strategy that would enable cost reduction and weakness elimination. This business strategy alongside rapid process improvement workshops (RIPW) allowed improve processes and as consequence nurses had more time to check on patients, what in last instance reduced errors along the process and resulted in positive feedbacks (Nelson-Peterson and Leppa, 2007, as cited in Ramori et al., 2021).

2.2.2. Circular business model

Circular business models are of an increased importance in healthcare industry because it is a resource-intensive system, and due to the emergence of disposable single-use devices (Guzzo et al., 2020). Circular economy is at the center of this business model, since it applies strategies that slow, close or narrow material and energy loops, aiming for a sustainable future (Geissdoerfer et al., 2017; Kirchherr et al., 2017). In a similar line of

thinking, Lewandowski (2016) defines circular business model as mindset that challenges practitioners to identify opportunities that enable and maintain resource cycles.

Circular business models, as well as every other business model relies on value proposition and capture, however, here it represents the promise of value that leads to long-term competitive advantage considering triple bottom line impacts. Also, value creation and delivery allow that established benefits keep being generated on circular flow of resources (Bocken et al., 2018). A major trend in circular business models is the identification of environment as a central stakeholder (Bocken et al., 2015).

Circular economy can be boosted by innovative business models, since the latter aim to implement cost-saving initiatives and circular economy may represent a significant economic potential by reprocessing medical devices and through sterilization of reusable sharps (Greenhealth Practice, 2018). According to Guzzo et al. (2020), circular business models rely on combinations of products and services that allow a more effective use of resources than usual business models.

In 2020, Guzzo et al. identified barriers to circular business models, being the most important one that the main stakeholders involved in the lifecycle of an equipment (manufacturers, reprocessors and hospitals) should all benefit from the reprocessing, making it a more appealing process. To answer this necessity, Bang et al. (2019) proposed that an equipment should have a limited number of cycles of reprocessing. Accordingly, Guzzo et al. (2020) defined that those products should be redesigned and developed in order to cope circular business models with healthcare inherent risks.

2.2.3. Low cost/Social business model

Low cost business models are allowing products and services to become more affordable and available to the poor, and are gaining increased importance in low and middle income countries (Angeli & Jaiswal, 2016; Bhattacharyya et al., 2010; George et al., 2015). Low cost business models in healthcare are commonly associated with social business models, since both aim to design strategies to the bottom of the pyramid (BoP) markets (Angeli & Jaiswal, 2016; Bhattacharyya et al., 2010). Accordingly, Cicellin et al. (2019) understood low cost business model as one of the most innovative, aiming to develop a more efficient and effective way to create social value for communities. Other authors mention that social business models have the potential to create value for society as well as organizations' stakeholders (Sabatier et al., 2017).

This model copes the simplified services with high volume/low unit costs paradigm, allowing significant cost savings for costumers. Also, cross-subsidization (ability to manage revenues from different categories of costumers) allow to maximize value and the number of patients served (Bhattacharyya et al., 2010).

In their work, Cicellin et al. (2019) addresses the importance of economies of scale, that can be reached when taking highest advantage of the investment done, this requires high performance levels. Also in their work, Cicellin et al. (2019) portrays how social sustainability is important in this business model, this relies on patients and suppliers' involvement and participation, to support some of the costs for patients that are not able to afford their treatments. In the same line of thinking, Yunus et al. (2010) connected the need to be profitable with the necessity of bringing value to the society, to achieve a long-term sustainable future. Other authors straightly linked the term efficiency with economic sustainability, while the term effectiveness is more related with social sustainability. Given the difference between both terms, 'systems viability' emerged as a concept that pretended to reconcile them (Barile et al., 2018; Saviano et al., 2018).

Lastly, the way an organization manages its profits plays a major role in the sustainability of this business model, since there is an increasing request of investment in new low cost healthcare projects and in the expansion of already existing ones (Cicellin et al., 2019).

Conceptually, social business models present the handicap of being hardly replicable in for-profit business models. Facing this problematic, Sabatier et al. (2017) suggested that social benefits and profits should be understood separately for each stakeholder, accepting the divergence of objectives, in order to realize the potential of the social business model. In a slightly different perspective, Richter (2004) portrays that a win-win situation is hardly achieved when aims and goals are different between stakeholders. These differences of expectations had brought the necessity of new definitions like central systems. Central systems had emerged from the need to satisfy the 'supra-systems', the latter can be addressed as the stakeholders that hold the most critical resources, being able to influence other stakeholders, including decision makers. However, the long-term survivability of a business does not only rely on 'supra-systems', but in all stakeholders of an organization (Golinelli & Spohrer, 2010).

Low cost business model is currently being applied into other areas, like dentistry, treatment of diabetes, blood tests, sight tests and psychology and psychotherapy (Cicellin et al., 2019). The fact is that low cost business model present a satisfactory range of services at lower prices, while betting in specialization and speed of access to health services (Hibbard et al., 2012; Roy et al., 2017).

2.2.4. Public-private partnerships

Public-private partnerships (PPP) are broadly known as a form of hybrid organization that can offer innovative solutions to complex problems, by combining diverse resources and capabilities, provided by different partners that complement the gap in skills, competencies, and resources, left by the other party. The collaboration among the different institutions or organizations is what allows them to create value, increase efficiency and flexibility (Villani et al., 2017). Also, Moro Visconti & Morea (2019) shows in his research that PPPs represent a common stakeholder framework of project financing (PF) investments, in which public and private partners exchange data.

In a more narrowly concept PPP are defined by some authors as an agreement in which government contracts a private organization to create or manage a public good for a period of time (Engel et al., 2014). In 2016, Eurostat published a document that referred that in a PPP, public players should be responsible for setting goals and necessities, while the private players should provide the technological expertise. In the same document, Eurostat (2016) recognizes that the public partner should be the source of most revenues.

PPP rely straightly on the value it creates for all stakeholders. According to Kivleniece & Quelin (2012), the survival and growth of this institutions depends on what their business models are able to provide to stakeholders and society as a whole. In 2018, Hellowell present three benefits that PPPs can generate: better investment decisions; increased efficiency of infrastructure delivery; and higher quality in healthcare services.

In their study, Villani et al. (2017) found that there were three main business models characteristics that may impact the future of a PPP: assets; processes; and governance.

In 2010, Casadesus-Masanell & Ricart and Zott & Amit defined *Assets* referring to goods or information exchanged, as well as the resources and capabilities need to exchange them. Within this theme there are four different codes:

- a) Complementary core skills: refers to the different skills or competences provided by the different partners;
- b) Long-term technology commitment: refers to technological capabilities needed as well as the need to keep them updated;
- c) Project financing: relies mainly on a risk avoidance for all partners (insurance package);
- d) Networking: consists in a pre-existent relationship between people and institutions. And it provides specific and support competences for the internal skills of the partners.

As a business model characteristic *Processes* are described as the way the previous exchanges take place, as well as the mechanisms adopted by each partner. It also comprehends how the activities are linked. *Processes* rely on:

- a) Co-operative bargaining: refers to the transactions and cost co-ordination among partners;
- b) Partnership loyalty: refers to the commitment of each party about long-term value creation;
- c) Knowledge sharing: refers to formal and informal communication among public and private partners (Casadesus-Masanell & Ricart, 2010; Zott & Amit, 2010).

Finally, *Governance* refers to the way information, resources and goods are controlled by the partners, the legal form of organization and the incentives to participants. The three codes that compose *Governance* are:

- a) Integrative leadership: refers to the establishment and exploitation of a co-operative decision-making framework;
- b) Government-led legal framework: refers to the impact and guidance that government has on the different phases of a project;
- c) Risk mitigation planning: refers to the strategy and planning implemented resulting in the identification and assessment of the most relevant risks (Casadesus-Masanell & Ricart, 2010; Zott & Amit, 2010).

PPP present some handicaps resulting from different logics between the different partners: government logic; business logic focused on making a profit; non-profit civil society logic, focused on public service provision (Villani et al., 2017). However, PPPs are gaining increased interest by Europe's governments, in order to develop, finance and provide public health infrastructures as well as healthcare services (Roehrich et al., 2014).

2.3. Healthcare business enablers

In this work business models enablers are understood as new resources or capabilities that promote innovative business models to arise. Among the most important ones it can be found: digitalization, big data, internet of things, and project financing.

2.3.1. Digitalization

In 2019, Deloitte referred that digital transformation should be at the top of the agenda. Since it drives innovation, growth, and competitiveness (Ancker et al., 2015). Besides that, it enables easier and faster information exchange, sharing data in real-time and instant access to digital health records (Kontio et al., 2014; Kruse et al., 2018). Additionally, digitalization allows to bring new technologies into healthcare industry, enabling quality-of-life improvements as well as cost-savings, since unlike other areas, medical technology costs are not declining (Kumar, 2011; Moro Visconti & Martiniello, 2019).

Digital investments frequently bring shorter payback, due to intrinsic lower costs and relative higher benefits (Ancker et al., 2015). This becomes specially interesting when the pace of change in healthcare technologies is increasing, since it will enable adaptability of the structures that support healthcare services (Barlow & Köberle-Gaiser, 2009).

In a final instance, digitalization will increase potential savings for the private actor, that should be shared with the public sector, enabling reinvestment in non-digital technology, and lastly with the patients, allowing reduced fees (Visconti & Morea, 2020).

2.3.2. Big Data

Healthcare industry is seen as strong candidate to the implementation of big data (Raghupathi & Raghupathi, 2014). Also, according to Torre Díez et al. (2016) the literature in this field is growing faster in the last decade.

Big data concept is based on an easier and less expensive way of gathering large-volume information sets from different sources, even in fast-changing and complex scenarios. These characteristics allows to produce large amounts of information in real time that enable effective planning and monitoring, which promotes continuous improvement for value chains in terms of quality, quantity and readiness. There are five strategic steps with

big data: Creation (data capture); Storage (warehousing); Processing (data mining); Consumption (sharing); and Monetization (Moro Visconti & Morea, 2019). In 2020, Visconti & Morea described big data as a nuclear factor for digitalization processes.

Project financing can be faster and easier, with big data providing readily available information. This is especially important to the formulation of the business plan and subsequent base for competitive auction among private players. In the management phase, purchases can be handled through digital platforms (Smith et al., 2012). Accordingly, Alotaibi & Mehmood (2018) addressed that big data can be a powerful tool to improve healthcare supply chains by enabling faster forecasting and decision-making processes.

Internet of things (IoT) can be a source for big data, through smart devices and sensors that are networked through healthcare digital platforms. New innovative business models can arise due to the digital connections between healthcare facilities and patients' homes or other healthcare services (Moro Visconti & Morea, 2019).

Most researches about big data agree that it may represent an alternative that can lead to an increase in revenues and reduction in costs. In 2016, Dubey et al. showed that big data can achieve an increase in return on investment (ROI), productivity and competitiveness of 15 to 20%, by analyzing operations management and supply chain activities. Other authors suggest that big data can provide a reduction on USA healthcare sector around 8% (McKinsey, 2019, as cited in Moro Visconti & Morea, 2019).

2.3.3. Internet of things

Internet of things (IoT) just like big data is receiving increased interest from different industries. These high technologies provide conditions to generate reduced service costs for healthcare organizations. However, the acceptance of new forms of health services is a major obstacle to a higher implementation of these technologies. On the other hand, it is easy to take advantage of the widespread number of devices that can be used, as well as the potential that mobile apps bring (Nguyen Dang Tuan et al., 2019; Wang et al., 2018).

IoT in healthcare rely mainly in four sectors: hardware platforms, wearables; networking technologies; and cloud platforms (Kwon et al., 2016). Wearable devices, like cellphones or wristwatches, enable patients to use health monitoring equipment on a daily basis. This plays a major role in patients with chronic diseases. These devices send the data

to the cloud that would be posteriorly examined by a physician. In the opposite direction, once the doctor prescribes, the information will immediately be available at the pharmacy. This system provides a faster and more effective way of access to healthcare, as well as a more effective treatment based on real-time information (Nguyen Dang Tuan et al., 2019).

IoT can reduce the gap between patients and doctors, but also between the supply chain and the healthcare organizations, promoting a better forecast of demand and faster response by the suppliers (Nguyen Dang Tuan et al., 2019).

In a wider point-of-view IoT can promote patient empowerment and lastly a more cost-effective healthcare system (Hajli & Featherman, 2018).

2.3.4. Project financing

Project financing (PF) is mainly associated with PPPs, under different financing mechanisms. The most common ones are pay-for-performance (P4P) and results-based financing (RBF) (Moro Visconti & Morea, 2019). These mechanisms provide financial payments or penalties based on predetermined goals or outputs (Mendelson et al., 2017; Renmans et al., 2017). P4P models can guarantee an adequate economic incentive for private players to collaborate with public players (Visconti et al., 2017). PF should rely on a feedback mechanism between both parties, that will allow a better management of scarce resources (Wyber et al., 2015).

In 2017, Josephson et al. showed through experimental P4P-based payment systems that healthcare access improved both, in quality as well as quantity.

Currently, fee-for-service (FfS) still plays a major role in hospitals' income, what can lead to a focus in quantity, rather than quality of their services (Mendelson et al., 2017). However, value-based healthcare framework is gaining increased interest, making hospitals to pay attention to new factors (Nejm, C., 2018, as cited in Visconti & Morea, 2020). Actually, patient's empowerment gains a new tool to restructure healthcare industry, which will ultimately drive to the previously mentioned humanization of the sector (Mohammed et al., 2016).

3. Research Methodology

3.1. Research Techniques and Procedure

The research of this study started with a review of existing literature about business models, healthcare systems and their management, new technologies employed in the field of healthcare as well as the theme of sustainability. The data was collected mainly from Q1 and Q2 Journals from ISCTE university databases. Besides giving an overview of the work developed in this field until now, this research also allowed to understand what can still be done to increase knowledge in the area of business models in healthcare.

A qualitative analysis was conducted to explore the impact of COVID-19 Pandemic in the business models and technologies, in healthcare industry.

The research objective relies on understanding how the upper mentioned healthcare business enablers can be implemented in healthcare industry in Portugal, which limitations can organizations face when implementing them, and what can they bring to this industry.

To gain more insight into the views of different management perspectives, about healthcare business models and healthcare business enablers, multiple semi structured interviews were performed to an expert panel, compounded of 7 C-level managers of different Portuguese healthcare organizations. Due to the exploratory nature of this research, the sampling was purposely non-probabilistic.

The utilization of a semi structured interview is an information-gathering tool that allows to join a big and varied amount of information, that allows the different participants to draw upon their own experiences to share their responses, with freedom of time and words, while following a script of topics and questions, that helps to keep the focus on the problem under study.

Research issues are central to the research strategy. As such, the exploratory research on literature review had arisen a few research questions, that later promoted the basilar stone for the different interview questions. Defining the research questions allowed to delimit the concepts and the objectives to be studied.

The selection of the participants relied on their position in the healthcare organization they work, but not in the nature of the organization. This means that were approached public and private organizations, with different sizes and different backgrounds. All interviews were conducted via zoom and took an average time of 30 minutes. Interviews took place between April and June 2022 and were recorded, in video support, for later translation and content analysis. They were transcribed chronologically, in Word document format, with fidelity to the speech and then translated with resource to “DeepL Translator” program.

3.2. Research Instrument and Objectives

Main Issues (Author, Year)	Research questions	Research objectives
<p>“Whereas diagnostic or other “physical” technologies often increase the cost of the investment, digital applications are cheaper and may allow for timely cost reduction. They may therefore fit with the needs of public authorities that face compelling budget pressures.”</p> <p>Visconti & Morea, 2020</p>	<p>Does healthcare industry in Portugal see digitalization as a cost saving mechanism? How is it being implemented?</p>	<p>Understand how far healthcare industry in Portugal is utilizing digitalization as an efficiency driver.</p>
<p>“At management level in many industries, demand forecasting is widely used in order to decision-making reinforcement and to promote other management tasks.”</p> <p>Alotaibi & Mehmood, 2018</p>	<p>Is healthcare industry in Portugal using Big data to promote improvements in efficiency, mainly regarding forecasting and decision-making processes?</p>	<p>Understand how Big data is being implemented in healthcare industry in Portugal and what it may improve.</p>

<p>“The integration of internet of thing (IoT) devices, the Ecomedic Social network allows to conduct personal Healthcare services in a more professional, real-time data manner for better decision making from both doctors, patients and other service providers.”</p> <p>Nguyen Dang Tuan et al., 2019</p>	<p>Is IoT viable in our current society? Which limitations have you found to apply these systems?</p>	<p>Understand if IoT is a system in which healthcare industry in Portugal can rely on.</p>
<p>“From the consumer perspective, empowering people to manage their own health via new technologies and receive some services via Internet content, can result in more cost-effective healthcare systems and even improve health outcomes.”</p> <p>Hajli & Featherman, 2018</p>	<p>Does IoT promote a cost-effectiveness driver? How can patient-empowerment improve healthcare services?</p>	<p>Understand what IoT can bring to improve service quality in healthcare industry in Portugal.</p>

<p>“Pay-for-performance (P4P) programs provide financial rewards or penalties to individual health care providers, groups of providers, or institutions according to their performance on measures of quality.”</p> <p>Mendelson et al., 2017</p>	<p>How often are P4P programs implemented in Portugal? Do they work properly? Is there any suggestion to improve them?</p>	<p>Understand how viable are P4P programs in Portugal.</p>
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Table 3.1 - Research questions and objectives

4. Data Analysis

4.1. Sample Characterization

The sample was composed by 2 male and 5 female. Regarding the years of experience in healthcare management 28.6% had more than 20 years of experience in healthcare management, 42.8% had between 10 and 20 years, and 28.6% had less than 10 years of experience. Regarding experience in public and private healthcare organizations, 14.3% had only experience in private organizations, 14.3% had experience in both, and 71.4% had experience only in public healthcare organizations. Academic backgrounds varied between management (42.8%), law (14.3%), civil engineering (14.3%), medicine (14.3%) and nursing (14.3%). However, 85.7% had specific training in healthcare management, 71.4% had a post-graduation in hospital administration and 14.3% in health management. Regarding the professional position, 57.1% were executive vowels in public healthcare organizations, 28.6% were presidents of the board of directors, and 14.3% were CEOs of private institutions.

4.2. Descriptive analysis

Our data analysis used text mining as a form of qualitative analysis, to obtain the most relevant information from the interviews previously performed.

In order to understand which words were most frequently used during the interviews, the first tool used was Word Frequency. The analysis was performed first with all answers, allowing an overview on the data collection. Then, each question was analyzed independently, using the same tool.

The second tool used was word Co-Occurrence Network of Words. This tool enables to understand which words are more commonly linked and how they connect with other clusters of words. This tool portrays which concepts are the most relevant to the interviewees.

The research main goal was to understand how healthcare business enablers can be implemented in healthcare industry in Portugal, their limitations, and the advantages that make them viable, through the experience of an expert panel composed by Portuguese professionals that got themselves in a top management position, in public or private healthcare organizations.

4.2.1. Text Mining

From the 7 conducted interviews, it was possible to collect relevant information that was analyzed using “KH Coder 3” program. Different tools were utilized to understand which were the most frequent words, also the way such words associate with each other, and lastly the correlation and mind-mapping of these words within the interviews

4.2.1.1. Word frequency

Word Frequency List was the first tool used to analyze the data provided by the interviews. This tool allowed to identify the most frequent words present in the interviews, and therefore highlight the main themes and concepts addressed during the interviews.

This analysis was firstly used to identify these words in the interviews as a whole, and then it was preformed attending the research questions independently.

4.2.1.2. Text correlation and Mind-Mapping

Text correlation allows to preserve specific patterns and relationships between words that enables to reach important conclusions. On the other hand, mapping makes possible to analyze information through the interpretation of figures and diagrams, allowing an easier and quicker understanding of the relationship between words. By separating different themes by colors, it is possible to depict the main themes addressed in a text, as well as the relationship between them. Illustrations provide a clearer way to understand association of words within a text.

4.2.1.3. Word association

Word association is a qualitative methodology used to understand which words are more often associated or linked with others. This tool allows to infer about the most relevant concepts within a text, as well as to understand which words play a role with each other.

To depict how strongly some words are associated with other the Word association tool presents how many times a word is present in a text without being related with the word in study, these results are portrayed in the column unconditional. Similarly, this tool shows how many times the same word is present in a text in relation with the word in study, this is present in the column conditional. The column Jaccard will not be used in this work.

5. Results

5.1. Main interview

The most frequent word present in our data was health, as shown in Table 5.1. Since the main topic of the interviews were business models in healthcare, this result was the expected outcome. Actually, all interviewees addressed the importance of health in this context, regardless of the sector they represented. This means that behind the business models, and its priorities, health represents a central role, as a core value for all stakeholders.

As illustrated in Figure 5.1, health is in the center of the interview, linked with the main issues discussed. On the other hand, health as a concept is mainly associated with the

Word	Frequency
health	137
think	112
sector	91
area	70
patient	67
people	61
hospital	56
work	54
year	54
time	51
private	50
model	44
issue	38
make	38
way	38
equipment	35
information	35
pay	34
business	32
professional	32
management	31

Table 5.1 - Word Frequency List for the Main interview

term business model. Figure 5.1 also portrays the five main themes discussed during the interviews: the hospital, the business models in health sector, the healthcare sector (public and private), the healthcare area as a whole, and finally the people.

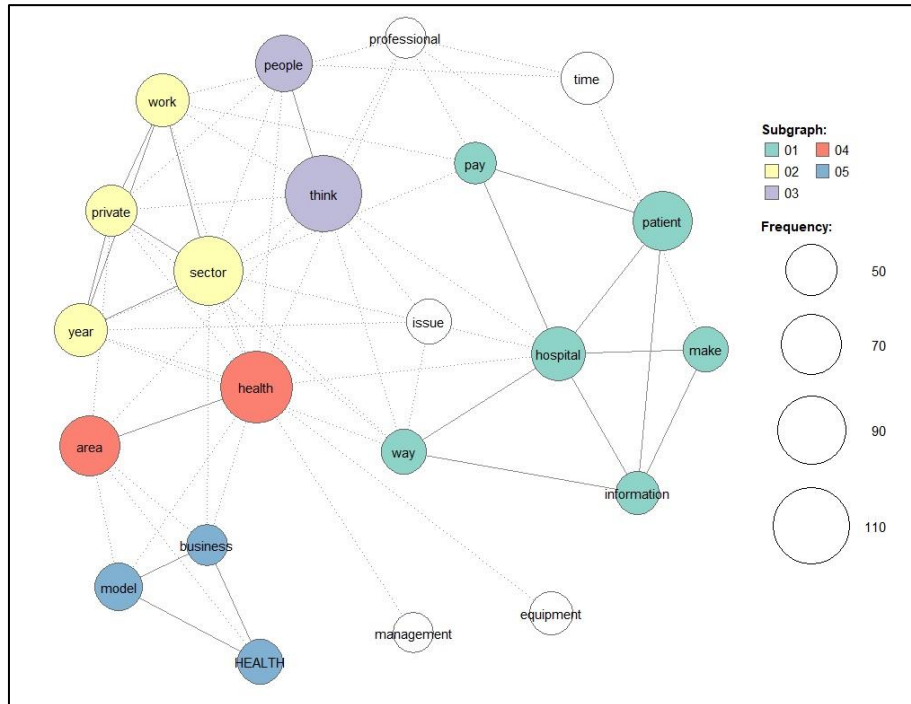


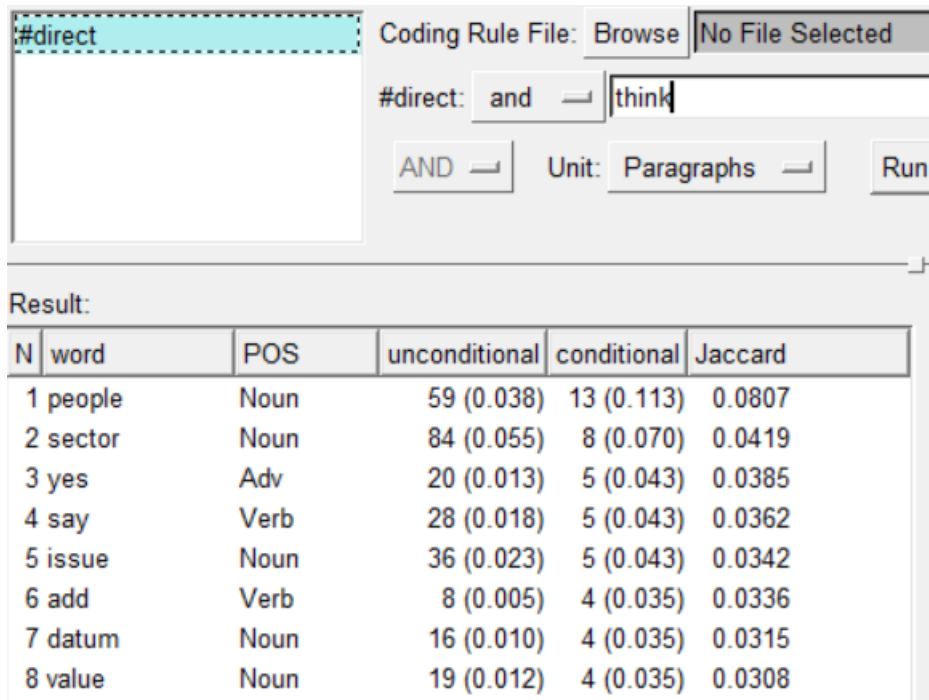
Figure 5.1 - Mind-Mapping for the Main interview

Lastly, in Table 5.2, it is portrayed how the word health is strongly associated with words like area, sector and the concept business model.

#direct		Coding Rule File: Browse		No File Selected	
		#direct: and	health		
		AND	Unit: Paragraphs	Run	
Result:					
N	word	POS	unconditional	conditional	Jaccard
1	area	Noun	67 (0.044)	22 (0.168)	0.1250
2	sector	Noun	84 (0.055)	21 (0.160)	0.1082
3	unit	Noun	20 (0.013)	12 (0.092)	0.0863
4	business	Noun	32 (0.021)	10 (0.076)	0.0654
5	model	Noun	42 (0.027)	10 (0.076)	0.0613
6	care	Noun	25 (0.016)	7 (0.053)	0.0470
7	public	Adj	27 (0.018)	6 (0.046)	0.0395
8	management	Noun	30 (0.020)	6 (0.046)	0.0387

Table 5.2 - Word association (Health)

The second most frequent word was think, as shown in Table 5.1. There are two main reasons that may explain this result, first the interviews were based on interviewees' opinion, where they portrayed their own thoughts about the different issues discussed. In the other hand, in the majority of the questions, people's opinions were discussed, focusing on what people think. This second reason is well portrayed by both, Figure 5.1 and Table 5.3.



N	word	POS	unconditional	conditional	Jaccard
1	people	Noun	59 (0.038)	13 (0.113)	0.0807
2	sector	Noun	84 (0.055)	8 (0.070)	0.0419
3	yes	Adv	20 (0.013)	5 (0.043)	0.0385
4	say	Verb	28 (0.018)	5 (0.043)	0.0362
5	issue	Noun	36 (0.023)	5 (0.043)	0.0342
6	add	Verb	8 (0.005)	4 (0.035)	0.0336
7	datum	Noun	16 (0.010)	4 (0.035)	0.0315
8	value	Noun	19 (0.012)	4 (0.035)	0.0308

Table 5.3 - Word association (Think)

Besides these two words, there are other words like people and patient, that are widely used by the interviewees. Similarly, to health, these words portray how important people are in every speech regarding healthcare.

Lastly, words like equipment, information, professional and management, link the interviews with a more technical core of ideas.

5.2. Business models in healthcare

Regarding the second question of the interview, the four most common words were no surprise: health, area, model and business. Since all four words were directly linked to the question itself. On the other hand, all the following words present in the Table 5.4, portray a faithful overview of the main ideas shared. Actually, all interviewees understood that to make a business model to work in healthcare area there is a need to conciliate a quality service, focusing on care and costs, similarly to what is expected from a hotel.

Word	Frequency
health	25
area	18
model	16
business	14
service	9
quality	8
provide	7
care	6
cost	6
focus	6
hotel	6
work	6

Table 2.4 - Word Frequency List for the theme Business models in healthcare

Figure 5.2, illustrates how the word health remains as a core word on the interviews, and again in strong association with the concept business model. Regarding this question a new theme arises, that focus on the service provided to patients. Although being a less frequent word used, Figure 5.2 portrays that care plays a central role on business models in healthcare, commonly linked to words like cost and quality.

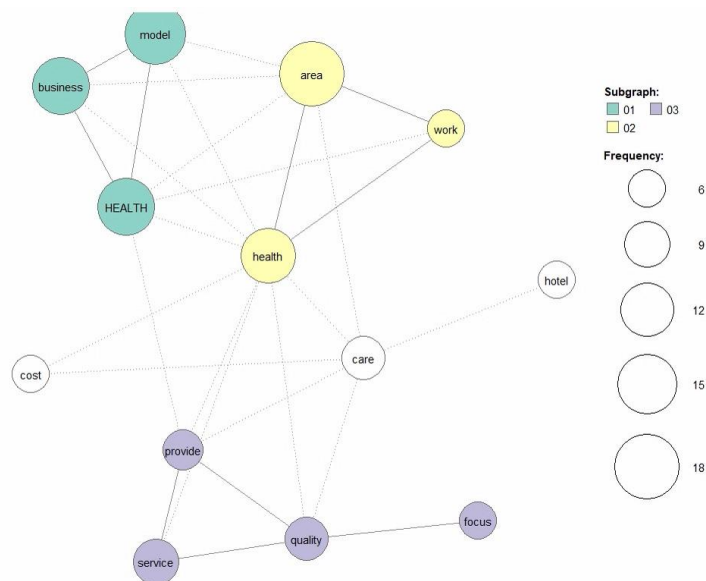


Figure 5.2 - Mind-Mapping for the theme Business models in healthcare

5.3. Environment

The third question aimed to give an overview of the role of the environment on a business model in healthcare industry. One of the main topics was the discussion about what people search on healthcare organizations regarding their environmental policies, as well as if it differs from what people say. There is a significant discrepancy between the frequency of the words think and say, what portrays the results achieved in the interview, where all interviewees identified this discrepancy. (Table 5.5)

Word	Frequency
people	21
health	18
think	18
environmental	14
area	13
issue	10
measure	9
policy	7
say	7
energy	6
environment	6

Table 5.5 - Word Frequency List for the theme Environment

Differently from the previous questions, the main issues discussed on this third question were the environment and people's opinions, what justifies the centrality of the words environmental and think, as portrayed in Figure 5.3.

Lastly, as shown in Figure 5.3, the word energy, portrays the focus of the healthcare organizations regarding environmental policies. Focusing on new sources of energy, mainly renewable energy sources, enables improved environmental gains as well as increased financial gains for the organization. Most interviewees addressed the importance of solar energy in their organizations as a cost saving mechanism.

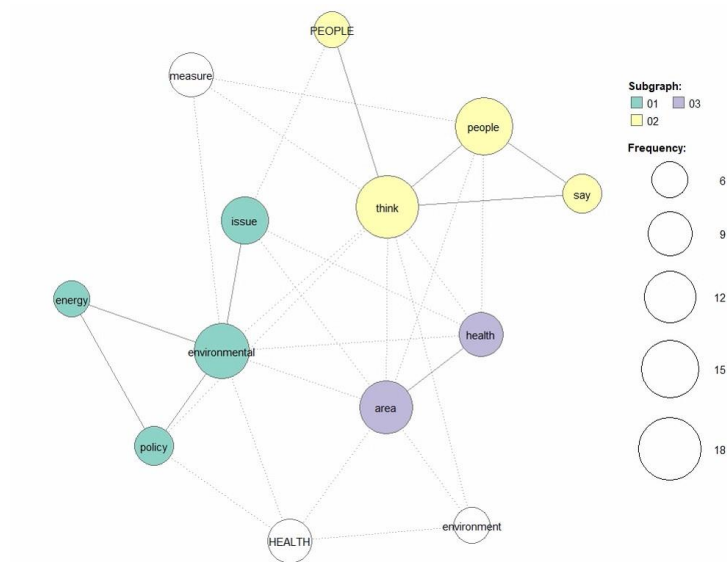


Figure 5.3 - Mind-Mapping for the theme Environment

5.4. Public vs Private healthcare organizations

The fourth question of the interview regarded on the differences between private and public sectors, and the reason behind private sector growth in healthcare field. Once again, the most frequent words relied on the main topic of the question, namely sector, private and public. (Table 5.6)

Word	Frequency
sector	46
private	35
public	30
people	21
think	18
work	14
professional	13
user	9
year	8
health	7

Table 5.6 - Word Frequency List for the theme Public vs Private healthcare organizations

Although all interviewees agreed on the main reasons for private sector growth, as well as the reasons behind professionals and people in general resort to private sector, the analysis performed were not able to identify them, but these reasons will be discussed later.

Figure 5.4 how wide the answers were, not allowing a clear outcome from its interpretation.

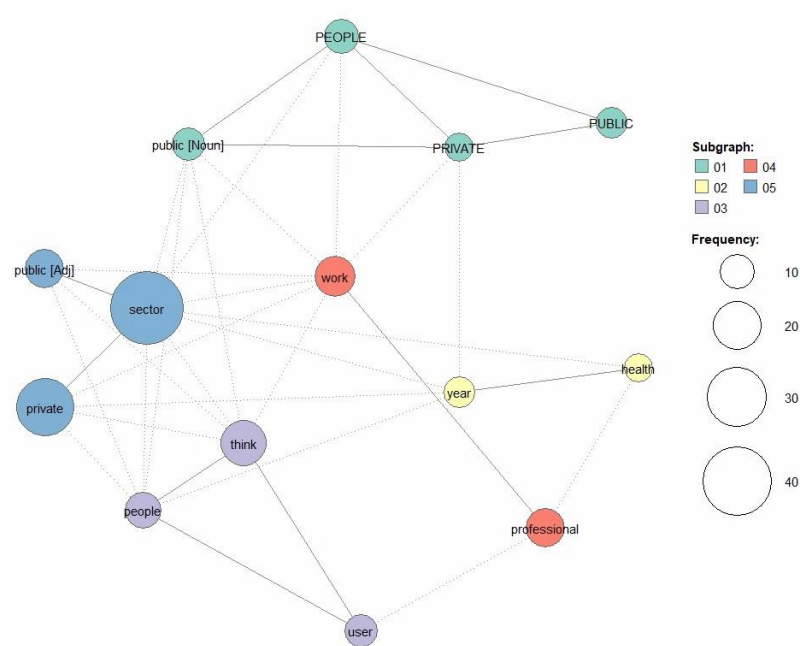


Figure 5.4 - Mind-Mapping for the theme Public vs Private healthcare organizations

5.5. Digitalization

The fifth and sixth questions addressed the process of digitalization in healthcare industry, as well as a comparison between digital and physical expenditure and return on investment for these two resources.

In Table 5.7 the most frequent word is equipment, which was expected since the main issue discussed relied on the differences in acquiring physical equipment or digital tools.

Actually, all interviewees identified a trend of increased investment in digital tools, what justifies the word investment as one of the most frequent ones.

Figure 5.5 illustrates that the word sector was a core word in this topic, however, only slight differences were identified between the investment in these resources between both, private and public sectors. These differences were based mainly on the purchasing power, instead of a difference in culture or priorities.

Word	Frequency
equipment	27
think	19
health	15
area	14
sector	12
physical	11
digitalization	10
invest	10
path	10
technology	10
way	10
year	10
DIGITAL	9
EQUIPMENT	9
hospital	8
investment	8
LOT	8
term	8
allow	7
digital	7
DIGITALIZATION	7
new	7
patient	7
cost	6
different	6
paper	6
question	6
SAY	6
yes	6

Table 5.7 - Word Frequency List for the theme Digitalization

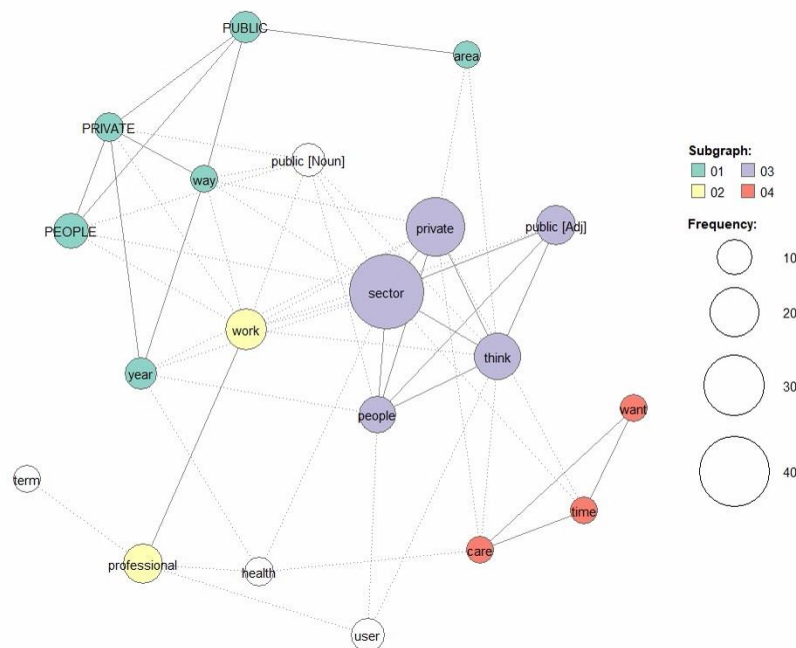


Figure 5.5 - Mind-Mapping for the theme Digitalization

5.6. Big Data

Seventh and eighth questions aimed to shown how Big Data is being implemented on healthcare industry, as well as what it may bring to this sector. Table 5.8 portrays faithfully the answers given by the interviewees regard this topic. The two most frequent words were data/datum and information, exactly what is in the core of Big Data. In fourth place is the word decision, the high rank of this word can be linked to one of the main objectives of Big Data, that is facilitate and provide a more accurate process of decision.

Interestingly, the word allow is in the center of the Figure 5.6, since Big Data is seen as an enabler, that truly allows new opportunities to be explored.

Word	Frequency
datum	36
information	28
Big	22
decision	19
make	17
think	17
health	16
way	11
sector	10
term	10
time	10
management	9
patient	9
lot	8
model	8
allow	7
clinical	7
issue	7

Table 5.8 - Word Frequency List for the theme Digitalization

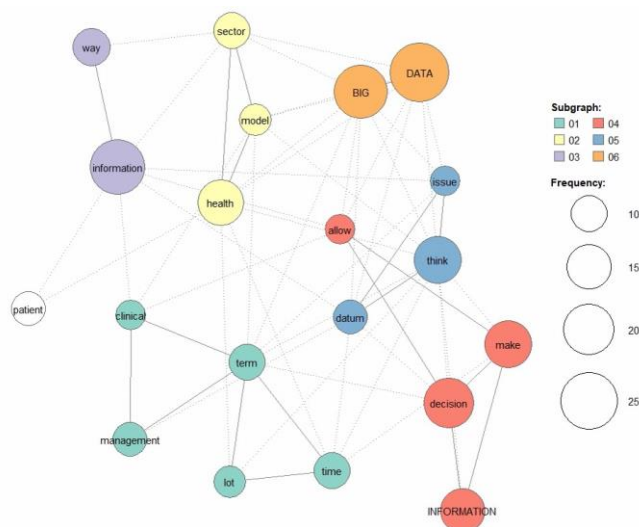


Figure 5.6 - Mind-Mapping for the theme Big Data

5.7. Internet of Things

The ninth question analyzed the advantages and liabilities in the introduction of Internet of Things in healthcare industry. According to Table 5.9, the four most frequent words, think, barrier, patient and doctor, describe perfectly the idea behind this resource. All interviewees agreed that IoT might decrease the barriers between doctors and patients.

Word	Frequency
think	14
barrier	10
patient	8
doctor	6
issue	6
lack	6
difficulty	5
health	5
make	5
people	5
population	5
project	5
technology	5
term	5

Figure 5.7 gives an overview of the four main themes discussed during the interviews: the project, where it was approached the ideas to implement IoT, the relation between the project and the current technology in healthcare field, the main barriers to this implementation and finally the feedback expected from patients and professionals.

Table 5.9 - Word Frequency List for the theme Internet of Things

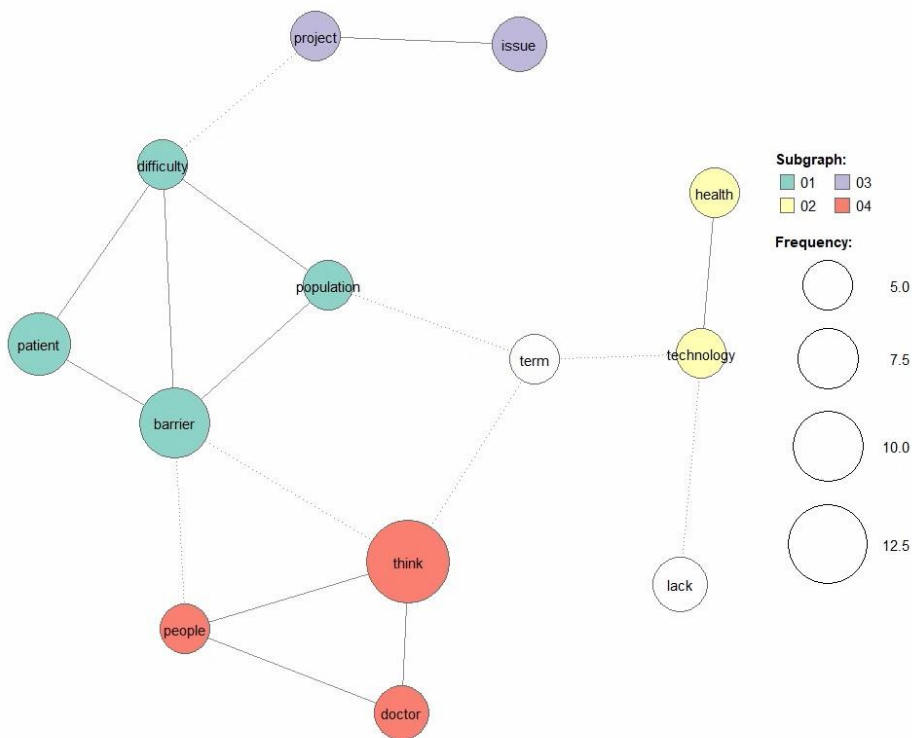


Figure 5.7 - Mind-Mapping for the theme Internet of Things

5.8. Pay-for-Performance programs

The tenth question aimed to give an overview about P4P programs, by exploring its advantages and disadvantages. This question deserved a lot of attention from all interviewees and differently from the other questions, different opinions and positions were assumed during the interview. The number of words in Table 5.10 portray it well.

Figure 5.8 illustrates the most addressed themes in this question, among them we find the discussion between the number/quantity of surgeries and consultations and its quality. The way this kind of model work, assessing how the payments are done to professionals and which are the terms it includes. The problematic of what people want from a hospital. And how this kind of programs may impact waiting lists. Besides all the answers, the words pay and patient were in the center of the discussion, despite of the position of the interviewees.

Word	Frequency
patient	32
pay	25
wait	21
hospital	19
think	19
list	17
time	17
work	17
term	13
quality	12
surgery	12
consultation	10
model	10
operate	10
sector	10
performance	9
HEALTH	8
situation	8
type	8
value	8
hour	7
number	7
problem	7
professional	7
public	7
SURGERIES	7
want	7

Table 5.10 - Word Frequency List for the theme Pay-4-Performance programs

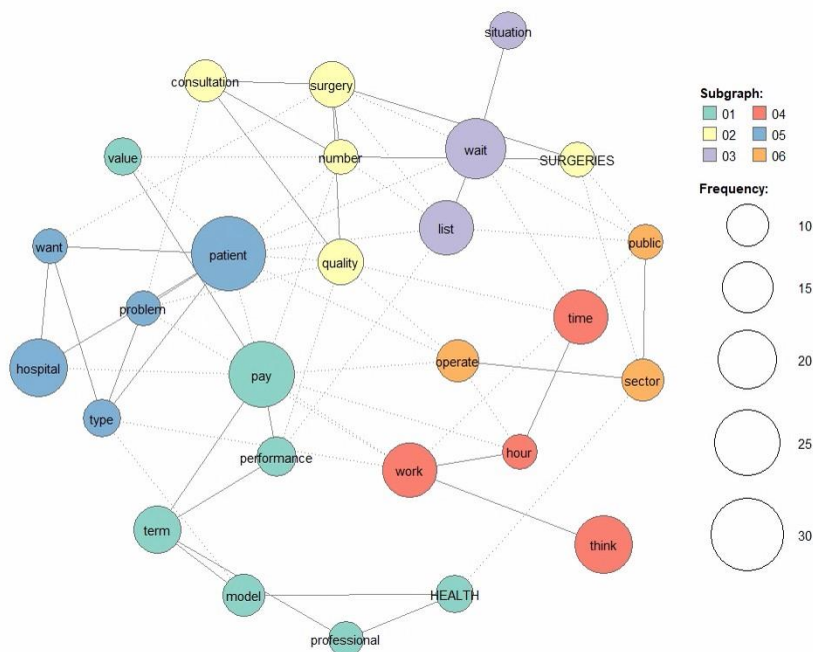


Figure 5.8 - Mind-Mapping for the theme Pay-for-Performance programs

6. Discussion

Business models in healthcare are changing, and technology is being the main driver of these changes. Regardless of the basis each business model relies on, the search for increased value for its stakeholders arises a necessity to improve its processes. These needs are fulfilled through the new technologies and the enablers discussed ahead.

The first research question “Does healthcare industry in Portugal see digitalization as a cost saving mechanism? How is it being implemented?” deserved similar answers by all the interviews, that addressed the importance of the digitalization in healthcare organizations, since it potentiates cost reduction, improve information accessibility and speed, and it allows the implementation of new technologies and physical equipment. Despite of the general idea that digitalization is a certainty and a priority in the short-term, not all healthcare organizations have finished this transition, since it involves costs and investment, and getting the financial means to proceed with digitalization in public organizations its sometimes a slow process. On the other hand, most of the interviewees from public organizations referred that besides governmental budget, there are a few initiatives that finance and promote digitalization in public healthcare organizations.

One of the most present concepts during the questions that addressed digitalization was “going paperless”. Indeed, all interviews see this concept as a way to reduce costs, since it will reduce the expenditure in paper, ink and storage for all the records and files that need to be kept. This comes in line with the work from Moro Visconti & Martiniello (2019) that says that innovation, dematerialization of “paperless” archives and software can drive cost-cutting policies and long-term savings.

Information accessibility and speed is a must in every field nowadays. All interviewees portrayed how digitalization promoted a huge increase in access and speed to access to information in healthcare organization. Digitalization allowed not only the access of healthcare professionals to patient’s data, as well as the management assessment of all data from the organization. This confirms the findings from Kontio et al., (2014) work, where they describe how digitalization promotes a share of data in real-time and instant access to digital records. Also Kruse et al. (2018), described that electronic records allowed more efficient procedures and processes, and more accurate data.

Despite the increase in investment, by healthcare organizations, in digital technologies, the investment on physical equipment did not decreased. Instead, the interviewees found a

strong connection between both resources. In accordance, in 2011, Kumar portrayed how digitalization can bring new technologies into healthcare field. Interviewees defended that, although physical equipment becomes obsolete at a faster pace and are more expensive to acquire and harder to pay-off, digital technologies do not substitute them. One of the biggest advantages reported regarding digital technologies payback is that most of the times they can be updated instead of getting totally obsolete. This advantage is also reported in (Ancker et al.'s (2015) work, where they state that digital investments have comparatively lower costs and higher benefits.

The answer to second research question “Is healthcare industry in Portugal using Big data to promote improvements in efficiency, mainly regarding forecasting and decision-making processes?” was also unanimous, with all interviewees identifying Big Data as a powerful resource to improve efficiency in healthcare organizations. However, not all interviewees admitted to be using Big Data due to the absence of data.

Interviewees described Big Data as a resource that allows high flows of information and that in a near future can provide better and faster decisions from management teams. These improvements can also be identified in Moro Visconti & Morea (2019) work. Besides the benefits in terms of management, the interviewees understood that Big Data may provide faster diagnoses and better treatments for patients, helping clinicians in these processes.

Some interviewees justify the absence of data due to the lack of cooperation between organizations, that most of the time do not want to change information with other organizations. In 2011, Lazarus addressed the importance of cooperation to improve performance in healthcare, through a “Blue Ocean” thinking culture.

“Is IoT viable in our current society? Which limitations have you found to apply these systems?” was the third research question, and all interviewees believe that IoT can be implemented in healthcare sector. Also, their opinions centered around the same issues: technological literacy; unwilling to change (this factor mainly associated with older healthcare professionals); and personal data protection.

As previously referred technological literacy was one factor that received a lot of attention from all interviewees. Even though the incremental utilization of wearable devices by population in general, like smartphones and smartwatches, usually older people have more difficulty in managing this kind of devices, many times associated with illiteracy. To minimize this problematic, a few interviewees suggested the creation of a standardization

in the development of healthcare applications, promoting an easier interface during the utilization of these resources. Associated with this factor is the second one, the unwilling to change that some professionals might present, since it may change entirely the way clinicians and patients interact. Similarly, Wang et al. (2018) described poor acceptance of new technologies by professionals, and consequently the urge to make them understand the benefits they may bring.

A major concern about this new resource is personal data protection, since a huge amount of data will be available to a big number of stakeholders, including doctors, pharmacies and suppliers. Besides cybersecurity, since these wearables potentiate real-time data flow, there is a concern on patient privacy. These issues were addressed in Sahoo et al.'s (2014) work, where they identify that this kind of technology present a higher security risk and that it may lead to patient privacy loss.

The fourth question was “Does IoT promote a cost-effectiveness driver? How can patient-empowerment improve healthcare services?” and again most interviewees identified the same advantages and limitations on applying IoT to healthcare sector. IoT was considered a cost-effectiveness driver assuming that it will allow a doctor to have access to more patients within the same period. This is exactly what Hajli & Featherman (2018) described in their work, that from the consumer perspective, new technologies can result in more cost-effective healthcare systems.

Although patient empowerment was discussed in this question, and its importance was addressed, the interviewees did not connect an improvement in patient empowerment and IoT in healthcare field. However, patient empowerment will be discussed in the following question. In 2018, Hajli & Featherman, 2018 portrayed a different point-of-view, inferring that new technologies improve patient empowerment.

However, IoT can bring new opportunities to our society. All interviewees identified IoT as a powerful resource to reduce the distance between patients and professionals, to improve and ease the access of patients to proper care and enable real-time data change between professionals and patients. Accordingly, in 2019, Nguyen Dang Tuan et al. portrayed that IoT may help faster diagnoses and feedbacks on treatments.

The last research question was “How often are P4P programs implemented in Portugal? Do they work properly? Is there any suggestion to improve them?” and here there was a huge discrepancy in interviewee’s opinions regarding P4P programs. In general, all

interviewees admitted that this kind of program can bring new solutions to solve old problems like long waiting lists in hospitals. However, some interviewees encounter in P4P programs major problems the way they are being implemented nowadays. Among these problems can be found the focus on quantity instead of quality, the danger of corrupting the system only producing results when extra payments are being received, and the need of the patients to leave the hospital to be treated in another one.

The problematic of quality and quantity was the factor that deserved more attention from our interviewees. Most interviewees addressed the importance of a high-quality service, some of them approaching the concept “Value-Based Healthcare”, where the outcome for patients is the most important factor. These interviewees admitted that it may be complicated to define objective key performance indicators in this system, but they assured that it’s the best option to deliver the best care to patients. These conclusions came in accordance to Nejm’s (2018) work that stated that “value-based healthcare” is gaining interest, leading hospitals to understand patient care in a different perspective (Nejm, C., 2018, as cited in Visconti & Morea, 2020).

Some interviewees believed that if these kind of programs were not closely regulated and supervised, professionals may decline the production, including number of surgeries and consultations, during normal labor hours and compensating when extra payments are being paid.

Lastly, some interviewees stated that the money used to finance these kind of programs could be used to improve internal teams and conditions that would allow patients to be treated in normal labor hours and in the same hospital. The two main problems identified in this situation were that hospitals were paying to other hospitals to treat the patients. And that often these patients needed to travel long distances to be treated and commonly they returned without the problem solved.

7. Conclusion

This work provided a current overview on the healthcare industry worldwide and more specifically in Portugal. The main objective of this work was to understand if new technologies are being implemented in healthcare industry. Healthcare organizations in Portugal are implementing new technologies in their business models, in both private and

public sectors. The speed of implementation and the degree in which it is occurring change between sectors and inside the same sector, even in the public sector, different organizations are in different implementation stages.

Business models in healthcare aim to provide the best outcome to all stakeholders, from environment, to professionals and to patients. However, different stakeholders have different priorities regarding all factors involved in a business model. Environment is playing an important role in business models, due to cost-saving mechanisms utilizing renewable energy sources.

Differences between the private and public sectors are increasing, and people resort to private sector to fulfill the needs left by the public sector. Long waiting lists are the major factor impacting this change. However, the increased number of insurance companies and the better quality perceived in private sector are other important factors to the growth of this sector in healthcare industry.

Digitalization is a huge priority in all healthcare organizations due to its relative low costs, its capability of reduce costs and to improve better and faster access to information.

Big data similarly to digitalization is on top of the agendas for major healthcare organizations. However, the inadequate amount of data available and the lack of cooperation between organizations makes harder a better utilization of this powerful resource.

Internet of things represents the next step in healthcare industry to approach both, professionals and patients. IoT rely on wearables used every day, what enables its potential to spread rapidly. Among the main advantages that this technology can bring, the flow of information in real-time and the faster diagnoses are the most important. However, cybersecurity and patient privacy, represent the main concerns when implementing this technology.

Pay-4-performance programs can bring major benefits for healthcare industry and its patients. However, their implementation and regulation need to be strictly supervised and the criteria used should be revised to assure incremental quality services.

Most of the practical results acquired in this work are in accordance with what it is described in the literature. However, some of these new technologies bring more concerns than the ones currently found in the literature available.

In this work it was portrayed the opinions of a panel of experts about topics that concern a lot of other stakeholders from the healthcare industry. It is proposed that future research should include other stakeholder's opinions about the same topics. Future research should consider a framework that would lead public sector to a more competitive balance with private sector.

7.1. Limitations

This work intended to portray Portugal's healthcare industry through interviews to an expert panel composed by C-level healthcare organization's managers. The main limitation that this work faced was the reduced number of experts representing the private sector.

Although the reliability of the data collected, the findings should be carefully extrapolated to other realities outside of Portugal.

8. References

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