DIGITAL TRANSFORMATION IN THE PHARMACEUTICAL INDUSTRY – A CASE STUDY ON THE PORTUGUESE NEUROLOGY SECTOR

Andreia Filipa Ramos Fernandes

Supervisor: Prof. Pedro Celeste

Dissertation submitted in partial fulfilment of requirements for the Master in Applied Management at the Universidade Católica Portuguesa

December 2021

Acknowledgments

This dissertation was the culmination of 3 years of academic commitment, 2 of them under the biggest pandemic we have ever lived. My sincere acknowledgments to all the professors, staff and colleagues from Católica-Lisbon for the learnings, development and growth! Most of all, it was an honour to do this journey with incredible and brilliant colleagues. We've learned with each other, stressed, laughed, and shared incredible moments.

I would like to express my gratitude and appreciation to my supervisor, Professor Pedro Celeste, for his guidance and knowledge.

Furthermore, I would like to express my sincere gratitude to Rodrigo Teixeira, Frank Peters, Yacine Hadjiat and Joana Santos Silva, who promptly gave up their time, knowledge and information to enrich this dissertation. My gratitude also to Biogen, the company I am privileged to work for the last 6 years.

Finally, my gratitude goes to my family and friends who have closely accompany and supported me throughout this journey.

Resumo

A pandemia da COVID-19 acelerou a transformação digital nos cuidados de saúde. Como tal, as empresas farmacêuticas devem adaptar-se rapidamente de forma a responder às alterações de comportamento dos seus clientes e também à crescente oferta dos seus competidores. Isso é possível através de uma estrutura ágil e equipas descentralizadas, análises em tempo real e processos digitalizados e centralizados que promovam a experimentação e inovação.

Os neurologistas Portugueses avaliam a oferta digital como satisfatória, referindo haver espaço para melhoria e os aspetos mais valorizados são a credibilidade da fonte, conteúdo *on-demand* e de acesso gratuito. A utilização massiva de formatos *online* pela indústria farmacêutica está a gerar saturação e sensação de falta de controlo por parte do médico. As farmacêuticas devem investir em conteúdos e serviços sem marca, com o objetivo de ir de encontro às necessidades do cliente. Relativamente aos canais de contacto, o canal preferencial é o e-mail e os canais *podcast* e redes sociais ainda não são valorizados relativamente ao apoio à prática clínica. O futuro será híbrido, com equilíbrio entre o presencial e o *online*. Os neurologistas demonstraram interesse nos temas Saúde Digital e Neurotecnologia.

O futuro das farmacêuticas passa por criar centros de inovação, com equipas multifuncionais e, paralelamente, promover colaborações externas com agentes do ecossistema de saúde (por exemplo, *startups*), para aumentar a quantidade e qualidade dos produtos e serviços e contribuir para o avanço da medicina digital e personalizada nas neurociências, fortalecendo a imagem de credibilidade e compromisso para com os seus clientes.

Abstract

The COVID-19 pandemics accelerated the digital transformation in healthcare. Companies need to match the speed of customer shifts and outpace the competition. That is only possible through an agile structure and capabilities such as real-time analytics, decentralized teams, flexible product platform, synchronized processes, rapid experimentation and open innovation. Understanding consumer preferences by prioritizing outcomes that matter to consumers and minimizing the patient/HCP burden while ensuring privacy and transparency is key.

Portuguese neurologists value the current digital offer as satisfactory and censure pharma companies for not respecting their time, exhibiting high saturation of all online channels. The most valuable aspects on digital content/platforms are the source credibility, on-demand content, and free subscriptions. Pharma should invest on unbranded content and services to improve HCP clinical practice and therefore gain their appreciation. Regarding the communication channels, email is the preferred channel and social media and podcasts are formats in growth phase (currently, little to no value). For neurologists, the future will be hybrid, with both face-to-face and online interactions and face-to-face is still the channel with higher impact. Health Tech and Neurotech content is of HCP interest, with low offer at this time, hence should be considered by pharma.

The future passes by creating internal innovation hubs, with cross-functional teams, and fostering external collaboration with local tech and digital health ecosystems (e.g., start-ups), to expedite digital HCP and patient engagement and contribute to the increase of high quality of care products and services, and ultimately, advancing digital and personalized medicine in neuroscience.

Table of Contents

List of Figures

List of Tables

1. Introduction

1.1. Background

The outbreak of Coronavirus, described as one of the biggest health disasters of the 21st century (Khan & Basak, 2021), responded in lockdowns and social distancing, (that lead to an environment of economic contraction, scarcity, and uncertainty), that ultimately, shifted the market landscape, altering not only the customer behaviour but also, the regulatory, political, and competitive nature of businesses. The restrictions that resulted from the coronavirus pandemics accelerated the digital transformation in the healthcare ecosystem. We live in a post pandemic era, where markets change faster, growth is not easy, disruption is relentless, customers are distrustful, and leaders are under pressure. The future is unpredictable, and companies should adapt their business models, ways of working and customer journeys by fostering agility, innovation, and experimentation. To keep the business fast pace in innovation, emerging technologies, such as Artificial Intelligence (AI), Natural Language Processing (NPL), Sensor tech, Robotics, Augmented and Virtual Reality (AR & VR), Internet of Things (IoT) and Blockchain, should be used. These technologies are fundamentally transforming the delivery of innovative science, operational excellence, and personalized customer experiences in healthcare. They are powerful tools for the development of products/services and to transform the marketing landscape by enhancing the customer experience.

The healthcare ecosystem includes healthcare facilities, patients, pharmaceutical companies, governments, universities, insurance companies and technology providers (Moro-Visconti, 2021). In a world where humans and machines live together, customers expect healthcare services, applications and products delivered over the internet: the so-called cloud computing concept “everything-as-a-service” (XaaS). Hence, companies should embrace new models and leverage “servitization”: the combination of products and services into a single package to provide customers with greater value than the products or services would provide as standalone offerings (Kamalaldin et al., 2020). XaaS is only possible using big data, IA and IoT, and many pharmaceutical companies are working to integrate data tools into their existing products to provide users with increased value. Data standardization and communication protocols enable IoT technologies to deliver efficient healthcare services. Better connectivity, user interfaces, the security of patient data, and data interoperability can increase the efficiency of healthcare

services (Jamil et al., 2020). Therefore, the emphasis is now on data management and the interface with the customer (Naicu & Sciences, 2020).

Big Tech companies such as Amazon, Google, Microsoft, Apple and IBM have approached medicine and its trillion-dollar market possibilities (Meskó, 2021). It is important to mention that the global pharmaceutical industry is an extremely lucrative market with revenues totalled 1.27 trillion U.S. dollars in 2020, according to Statista (Matej Mikulic, 2021). Big tech companies are successfully transferring its in-depth knowledge of algorithms to the field of medicine (example of the DeepMind acquisition from Google). Amazon also launch Amazon Pharmacy, which aims to make filling prescriptions as easy and convenient as other transactions performed on Amazon (Nawrat, 2021). Not surprisingly, pharmaceutical companies are announcing collaborations with big tech companies. Two of many examples are Biogen and Apple, that launched a pioneering study to develop digital biomarkers of cognitive health using the apple watch and iPhone (Relations, 2021); and Boehringer Ingelheim that partnered with Google for pharma research and development (Ingelheim, 2021).

Another stream where technology is being applied in healthcare, and particularly in pharmaceutical companies, is marketing. Marketing technology (Martech) can be applied to *Advertising* (usage of big data to improve segmentation, leading to personalization); *Content marketing* (AI to generate content that responds to audience's needs, increasing conversion); *Direct Marketing* (big data, AI and robotics allowing for personalization and continuous improvement due to the constant tracking of responses, enabling the algorithms to improve over time); *Sales Customer Relationship Management* (automation enables cost savings, facilitates scalability and provides workforces with recommendations to perform more effective engagements); *Distribution Channel* (software to ensure a frictionless customer experience); and *Products and Services* (to extend product line-up by offering customization options, dynamic pricing, and predictive analytics for product development) (Kotler et al., 2021).

The goal of marketers is to provide a frictionless experience between real and virtual channels. Omnichannel marketing provides a holistic view of the customer to improve stakeholder experience across all touchpoints (Quilici, 2021). Achieving this seamless omnichannel experience is more challenging than ever, not only to due to the increasing competition and constant necessity for reinvention but also due to an environment where four different human generations are living and working together. Even if baby boomers and generation X (born

before 1980) are still holding the majority of leadership roles, generation Y (also known as Millennials) and generation Z (the first digital natives) are now part of the workforce (Kotler et al., 2021). The way these generations experience and understand the pharmaceutical initiatives, products and services is different. Thus, the possibility to collect customers data (big data) is of the foremost importance to personalize the customer experience and empower the customer-facing teams. Furthermore, it allows companies to make more informed decisions, predict outcomes of marketing strategies and tactics, and speed up marketing execution.

1.2. Problem Statement

This thesis will focus on how pharmaceutical companies, namely the ones focused on neurosciences, should embrace digital transformation to provide better services to health care professionals (HCP) and patients and how to adapt the customer experience journeys to be more personalized, informative, interactive, and immersive; as well as to evaluate opportunities to better serve HCPs in their clinical practice in Portugal.

1.3. Key Research Questions

Aiming to study what is the best approach that pharmaceutical companies in Portugal dedicated to the neurosciences should follow, five questions were raised:

Q1. What are neurologists preferred methods to search and access to clinical and scientific information, namely channel and device preference?

Q2. What are the aspects/formats which HCPs value the most in digital offers in general and in the healthcare sector in particular?

Q3. What are the HCP preferences regarding omnichannel engagement with pharmaceutical industry and how they foresee the future of engagements once the COVID-19 pandemics is over?

Q4. What is the HCP perception on Neurotech and how could they beneficiate from technology applied to medicine, namely to the neurosciences area?

Q5. What are pharmaceutical companies doing to prepare for the future, in terms of organizational structure, open innovation approaches, digital health offer and customer engagement plans optimization?

1.4. Methodology

To better understand the digital preferences of neurologists in Portugal, this thesis will include two types of statistical approach: qualitative and quantitative. The first one consists of two focus groups, each one with 6 neurologists, representing the north, centre and south of the country. With the results from the focus groups, a second survey was built and sent to thirty-three neurologists that work at private and public hospitals in Portugal. The online survey had thirty-five questions, from which only one was an open question. To complement the market research, four representatives of pharmaceutical companies were interviewed. The goal was to assess how is the industry paving the future and preparing to respond to the neurologists and patients' needs.

The scope of this dissertation is mostly focused on neuroscience companies and doctors specialized in neurology. However, this work extends its conclusions regarding the digital assessment, to other healthcare professionals, such as nurses and pharmacists.

1.5. Key Words

Digital Transformation, Pharmaceutical Industry, Omnichannel Excellence, Digital Marketing, Neurosciences

2. Literature Review

The literature review is divided in two main sections: a first section dedicated to digital transformation (definition, drivers, and technologies) and a second section devoted to pharmaceutical marketing (customer journey, omnichannel planning, personalization, and customer experience management). For the first section topics, a large number of scientific literature papers was available. However, for the second section, this was not the case, and it was necessary to research on dedicated pharmaceutical industry websites and related online magazines.

2.1. Digital transformation

The healthcare ecosystem, as many others, is going through deep digital transformation (DT) to reduce the current inefficiencies and challenges and provide better healthcare services (Agarwal et al., 2010). Before assessing the hot topic of digital health, it is important first to define the concept of digital transformation.

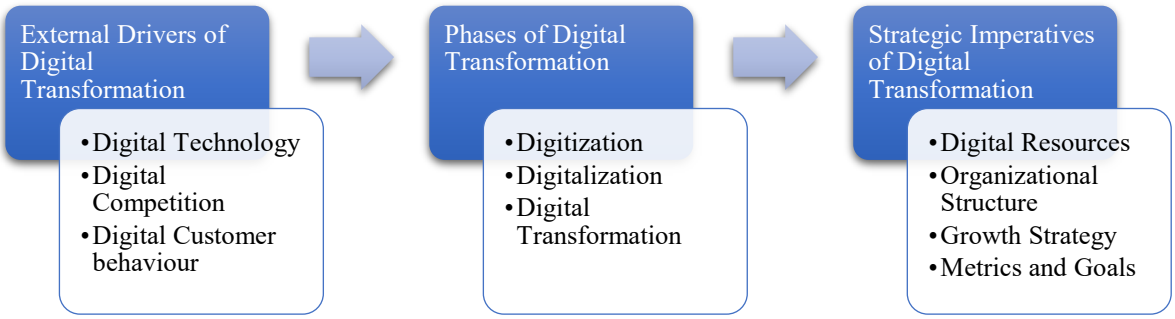

Figure 1 - *Flow Model for Discussion on Digital Transformation (Verhoef et al., 2021).*

The external drivers of digital transformation are the new digital technologies, the digital competition, and the digital customer behaviour, as represented in the figure above (Figure 1). Today's consumers are more proactive, connected, informed and empowered. The digital revolution translated by an increasing number of applications, and AI-based technologies, like Amazon Alexa or Google Home are changing the consumer behaviour. As a result, the use of digital technologies is becoming the new norm.

Digital transformation has three phases: digitization, digitalization, and digital transformation (definition in the Appendix, page 59).

The foundation for a successful digital transformation in a company is not only the digital resources and capabilities, but an internal organization structure that is able to execute the defined strategy and guarantee a sustainable competitive advantage to the company (Figure 2 and full description of the strategic imperatives of digital transformation in the Appendix, on Page 59) (Reis et al., 2018).

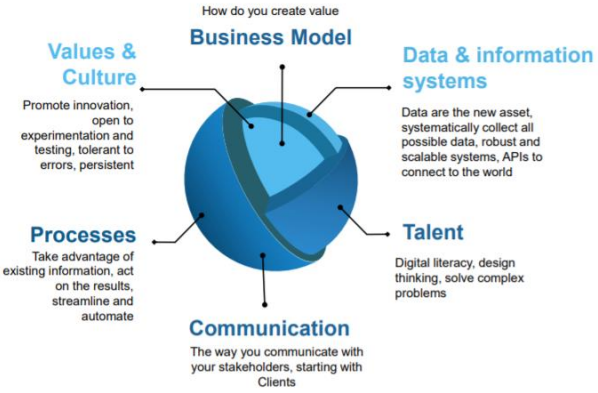

Figure 2 *- Value creation through a business model based on Digital Transformation (Loucks et al., 2016).*

Finally, it is important to note that digital technologies affect the companies' cost structure as they impact the human resources allocation by optimizing logistic streams and reducing supply chain costs. However, the Return On Investment (ROI) of technological progress is difficult to evaluate due to high Research and Development expenses and a complex connection of different variables (Kraus et al., 2021).

2.1.1. Digital Transformation in healthcare

Digital Health is a hot topic, with more than 252 published publications and represents the "use of information and communications technologies to improve human health, healthcare services, and wellness for individuals and across populations" (Senbekov et al., 2020).

Digital Therapeutics (DTx) is defined as "delivering evidence-based therapeutic interventions to patients that are driven by software to prevent, manage, or treat a medical disorder or disease. They are used independently or in concert with medications, devices, or other therapies to optimize patient care and health outcomes" (Dang et al., 2020).

The goal of DT in the healthcare (HC) sector is to:

- Improve the quality of care and operational efficiency by facilitating clinical and administrative processes (Laurenza et al., 2018).

- Provide enhancements in prevention, patient therapy & diagnostics (Agnihothri et al., 2020).
- Build a decentralized ecosystem of HC through real-time peer-to-peer communication (Gopal et al., 2019).
- Improve patient and health care professional's experience (supporting patients and physicians with cognitive training, monitoring, socializing) (Yousaf et al., 2020).
- Protect patient data and privacy (Gopal et al., 2019).

The digital technologies used in healthcare include AI - Integrated Management of Information Technology in Health; Medical Images and Electronic Medical Records; Blockchain; Smart devices and Portable Devices; m-health and self-tracking, e-patient communities; Telemedicine; Virtual Clinical Trials**;** Augmented Reality (AR) and Virtual Reality; 3D Printing and Digital Twin (Kraus et al., 2021). All these technologies are represented in Figure 3 and described as well as some of their applications in healthcare in the Appendix – Page 60.

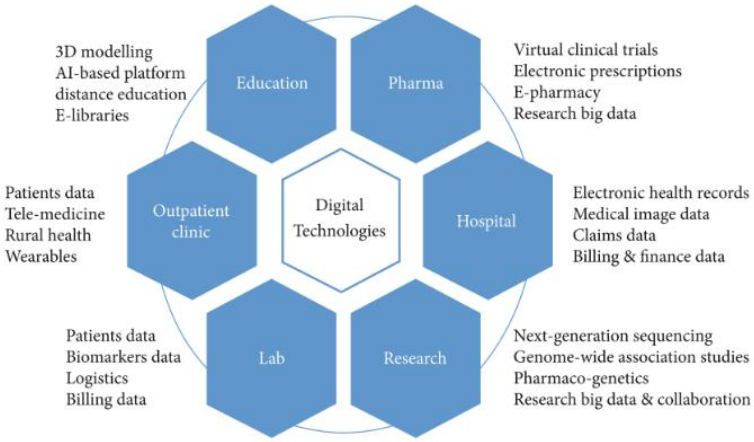

Figure 3 *- Scheme of main applications of digital technologies in healthcare (Senbekov et al., 2020).*

Ultimately, e-health implementation is dependent not only on technology, but also processes, professionals and people (patients and caregivers). One interesting framework for Digital Healthcare Systems implementation is the 6-ware framework™ by Henrique Martins that is based on six dimensions: *Hardware* (what), *Software* (how), *PeopleWare* (who), *LocalWare* (where), *IntegraWare* (when) and *Userware* (why) (Martins, 2021).

2.1.2. Ethics, Compliance, and data privacy

The ethics issue is a challenge of digital health. The situation is complicated due to the participation of various types of stakeholders, including big and small technological

companies, universities, healthcare providers, patients, and public organizations. Thus, the integrity and effectiveness of health digital platforms mainly depend on the responsibility and moral principles of the participants in the digital health market (Bélisle-Pipon, 2021).

Data security is a major public health concern. Between 2009 and 2017, more than 176 million patient records were affected by data leaks (including medical and genomic information) (Senbekov et al., 2020). Privacy encompasses security, confidentiality, discrimination, unintended uses of medical information, and the right of patients to know how their data will be used. To the present, there are no universal ethical regulations of health data protection. Nonetheless, there is a set of practices and recommendations for organizations, including the General Data Protection Regulation (GDPR, EU). When it comes to data protection, patients encounter insufficient access and control over health data (Hermes et al., 2020). Moreover, privacy policies of mobile health apps are often absent or opaque (Anderson & Agarwal, 2011). Stakeholders' reluctance to adopt innovative technologies will slow down the process of a DT in the sector.

2.2. Pharmaceutical marketing

According to the World Health Organization, drug promotion is defined as "all informational and persuasive activities by manufacturers and distributors, the effect of which is to influence the prescription, supply, purchase or use of medicinal drugs" (Chiplunkar et al., 2020).

In this thesis the focus will be on how pharmaceutical companies can use their own influence to increase the HCP attraction and curiosity and consequent commitment and affinity towards products and brands.

Pharma companies follow, mainly, a business-to-business (B2B) model, where product and disease information are conveyed to HCP and the wider healthcare community in a compliant and time-oriented manner. Both medical and commercial representatives aim to be the HCP first line contact to help them to understand the treatment options, new developments in the disease area (diagnostics, monitoring, clinical trials, amongst other), and methods to improve adherence and compliance of drug administration (Krendyukov & Nasy, 2020).

The pharmaceutical industry has long enjoyed a traditionally close relationship with the HCP community, based upon trust and credibility (Mackintosh, 2004). Until relatively recently, information about new products during the launch and post-launch phases was mainly directed

to HCP and largely provided by commercial teams (CT), including marketing and sales representatives. The past decade has seen a decline in CT access to physicians due to harsher regulations and digitalization. Moreover, it has been reported the perception of physicians that the product information communicated by CT had marketing bias.

In a study that compared the sales reps and HCPs perceptions regarding the value of specific services, such as, detailing new products, providing studies and research findings or recruitment to participate in FDA approval drug studies, the results showed that there were significant differences between them. The not surprisingly results reinforce the importance of periodically survey the physicians to determine what services are perceived as important and how to structure and prioritize their time and available marketing resources to provide those services (Gaedeke et al., 1999).

2.2.1. Transmedia Storytelling and Communication channels

Transmedia storytelling is the practice of designing, sharing, and participating in a cohesive story experience across multiple traditional and digital delivery platforms. Ideally, each medium makes its own unique contribution to the unfolding of the story (Jenkins, 2007). Storytelling can be used very effectively to communicate with HCPs without compromising the science. A Swedish study empathises the importance of storytelling in pharma: “Science communication often takes the form of summaries of scientific outputs. These are often designed and structured in a similar way to scientific papers. Our article suggests instead a structured approach to using storytelling so that (i) the research is better informed by, and grounded in, the reality of local communities and stakeholders, and (ii) the results are presented in a way that engages and empowers the end users” (Rivkin, 2021).

Today’s consumer is exposed to advertising messages from both traditional and online media (Table 1).

Table 1 *- Evolution from traditional to digital channels in pharma (Krendyukov & Nasy, 2020).*

Traditional	Digitalized
Mainly face-to-face interactions during scheduled visits or meetings	Pharmaceutical company websites
Field-based teams: commercial, medical science liaison, etc	Product-specifc websites

Educational (CME-accredited) events with attendance in person	Online educational platforms; HCPs or Medical Doctor only platforms; medical societies and patient advocacy group platforms
Industry-sponsored symposia	Webinars
Workshops, roundtables	Virtual meetings/roundtables, advisory boards
Exhibition stands/booth	Social media for HCPs or patient networks
Professional conferences	Wearable and mobile devices
	Electronic medical records and patient data monitoring (24/7)
	Online (24/7) medical information and call-in centres

2.2.2. Traditional pharmaceutical marketing – offline channels

Some of the traditional pharmaceutical marketing tactics are medical events, namely congresses, symposia (satellite congress or stand-alone), peer-to-peer meetings, roundtables and sponsorships. The promotional effort was mainly done by sales, medical and value and access representatives in face-to-face interactions and advisory boards with the aid of printed materials. Other traditional channels used for disease awareness campaigns are TV, radio and outdoors, all of them with a high cost associated.

2.2.3. Digital Pharmaceutical marketing – online channels

Digital Marketing is a more cost-effective and less time-consuming method to communicate with customers (Pestun & Mnushko, 2016). It allows marketers to use data to create more strategic engagements with HCP (Parekh et al., 2016). Apps, promotional websites and medical portals are used to promote company's products and services, disease related information, scientific materials and educational trainings. The several digital tactics are described in the Appendix, on page 63. Digital marketing allows customers to access to information on their own terms and according to their availability, on demand, 24/7. With these new tactical options has come the need for marketing managers to prioritize and determine in which digital marketing tactics to invest (Olson et al., 2021). Additionally, it is important to point out that pharmaceutical industries are mainly using the online channels for lead generation, while the reps are used for lead conversion. Leads are generated by marketeers, who are responsible for their quality. However, it is the sales rep responsibility to convert the prospective customer. Therefore, new compensation schemes that address the issue of moral hazard arising due to the

lack of observability and measurability of sales-leads quality for marketing teams, should be implemented.

2.3. Importance of personalization

According to the literature, the goal of personalization is the provision of the right content to the right person at the right time (Schreiner et al., 2019). Companies acknowledge that patients and health care professionals' preferences should be seriously taken in consideration as they are important in the decision making. For that reason, the technological advances related to the collection of customer data, improvements in algorithms and methodologies for the data analysis and exponential increase in processing power and storage capacity at increasingly low prices are of the foremost importance, as they allow a seamless "Data-driven marketing". With these data ecosystems in place, companies are better equipped to target their customers, to automate their processes and to perform predictive marketing. Khanna et al., describe the importance of AI and ML to insight generation related with HCP preferences (channel and content), leading to an optimized segmentation and generation of an enhanced digital engagement strategy, leading to an increase of prescriptions of 43% (Khanna et al., 2020).

2.3.1. Customer Segmentation

Segmenting the HCP through their attitude to treatment (focus on wellbeing, health economics and scientific data) is key to better optimize customer engagement plans. By understanding what messages or information are most likely to resonate with a physician, pharmaceutical companies can provide information of style and contents closer to HCP interest, resulting in improved relationships. By using customer relationship management (CRM) platforms and salesforce mobility tools, HCP can be profiled and interactions can be personalized and thus refined.

Traditionally, pharmaceutical companies would segment their targets according to the prescription potential (customer value segmentation) and internal perception of adoption ladder against own products and competitors. Currently, segmentation of internal data (administrative data) and survey data tailored to a certain business need should be combined. Behavioural segmentation uses administrative data to segment physicians. For example, behaviours such as attitude towards the technology according to internal registries, treatment options according to prescriptions, or HCP location. However, segmentation factors are ultimately limited to data constructs available in administrative data and therefore they might be biased; Attitudinal

segmentation, instead, uses survey tailored to the exact business need to measure characteristics such as peer influence, industry friendliness, perception of safety, mechanics of decision making and therapy choice, or receptiveness to channels of communication, and treatment selection making. Machine Learning attitudinal segmentation merges the best strengths of traditional primary and secondary research-based approaches, and combines an attitudinal focus with the statistical power of big data to help companies better understand their customers and enable ever-more precise targeting (Noy & Woywod, 2021).

Finally, on this subject, HCP' preferences are variable and changeable according to the external forces of the marketing environment. Therefore, pharma companies need clear, up-to-date perspectives on HCPs interests so they can tackle messages to individual needs and concerns. To reduce development cycles, content creation and review processes need to be streamlined and simplified. With agile approaches in line with compliance and regulations, pharmaceutical promotion content can be approved and refined within short approval cycles (Francer et al., 2014).

2.3.2. Omnichannel planning

An omnichannel marketing plan is a marketing communication plan which integrates seamless marketing channel activity across the customer journey. It focuses on selecting the inbound marketing techniques, content types, and channels that will satisfy customers' preferences and actively drive them toward the most efficient resolution (Amar et al., 2020). To maximize impact when engaging with customers, pharmaceutical companies should build and deliver innovative approaches of omnichannel planning and execution at scale.

For marketers, context plays a pivotal role on the levels of engagement a message will receive. Hence, meaningful messages should be aligned with the appropriate platform, to the right target. The distributed content should resonate with HCPs (top of mind content such as vaccination in the COVID-19 pandemics era) and personalized visual content to enrich communication should be used. Moreover, the message tone should be about helpful, informative, and non-coercive messages (Jain, 2021).

3. Case Study

To answer the research questions listed in the introductory section, the case study will explore two perspectives:

a. How HCPs perceive pharmaceutical companies' effort to support their clinical practices.
b. How pharmaceutical companies envision the near future and plan to adapt to current and future HCP needs and preferences.

Before diving into the market research, it is important to review the pharmaceutical marketing trends and structure and the neurosciences sector.

3.1. Pharmaceutical marketing trends

In a fast-paced digital era, companies experience shortened product and services lifecycles. Due to connectivity and social media, customer preferences towards products, services or brands are quickly changing. Always-on customers demand always-on brands/services, to meet their needs at any time. In a VUCA environment (volatility, uncertainty, complexity, and ambiguity), traditional, pre-planned go-to-market strategies are no longer effective. Companies need to match the speed of customer shifts and outpace the competition at the same time. Therefore, it is imperative that companies reorganize themselves towards an agile structure. For that, some capabilities should be in place: real-time analytics, decentralized teams, flexible product platform, synchronized processes, rapid experimentation and open innovation. Understanding consumer preferences and thereby achieving value in healthcare that prioritizes outcomes that matter to consumers (value-centred marketing), minimizing the patient/HCP burden, and ensure privacy and transparency) is a must. Each touchpoint in the customer journey should be carefully designed to provide a seamless experience where customers feel their time, thoughts, and data are being respected. The marketing mix typology, the 10 Ps (product, price, place, promotion, people, process, physical evidence, packaging, partnership, and policy) should be reassessed (Lim, 2021). For instance, in relation to 'People' the personal selling is shifting to online engagement, with the possibility to leverage not only virtual reality but also chatbots and optimized customer relationship management (CRM) platforms that can

lead to real time measurement of quality and quantity of relationships and accessing data which enables a deeper analysis of customer sentiment (Das et al., 2021).

Already in 2017, the IQVIA Institute for Human Data Sciences reported that health and wellness apps reached an estimated 3.35 billion worldwide (Agarwal et al., 2020). And even if this sector is known by its conservativeness conduct and strict regulations, the COVID-19 pandemics drove this industry forward. One example of how the pandemics accelerated the digital transformation in health is the digitalization of the patient monitoring systems driving an increase of U.S. patients who used telehealth, from 11 to 46 percent in only one year (from 2019 to 2020) (Sturchio, 2021). Another example are the cloud applications designed to manage data for clinical studies. These applications offer flexibility and agility to enable clinical teams to adapt based on trial outcomes an ensure timely changes implementation (even in real-time if necessary), keeping the studies on track. Veeva Systems recently announced that the number of biotechnology companies using Veeva Vault CDMS more than doubled in 2021 (Newswide, 2021).

The COVID-19 pandemics impacted with higher or less extension every section of the Pharma Value Chain (Figure 4). This case study and following market research will focus on the "Marketing" section, where the COVID-19 had a high impact and a long-term effect.

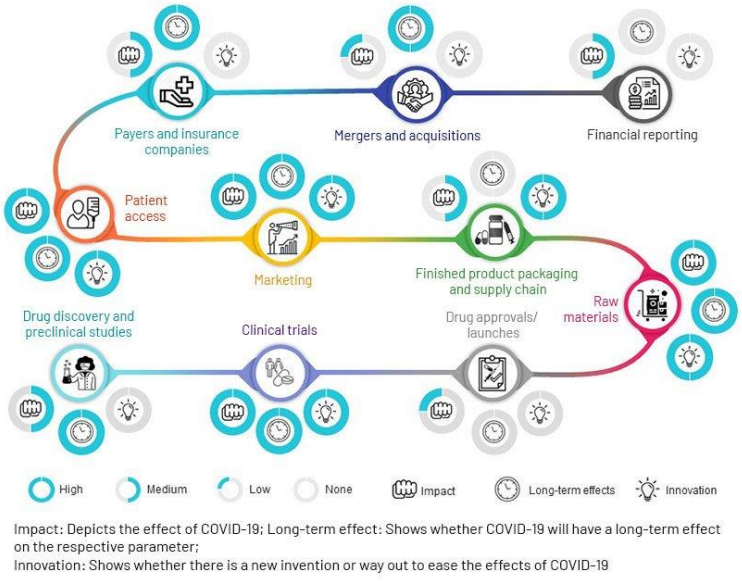

***Figure 4** – Impact of Covid-19 on the Pharma Value Chain (Moa, 2020).*

Combining two studies "Across health 13th annual Maturometer study" (CELforPharma, 2021) and "The gaps between HCP demand and pharma supply of medical information report"

published by EPG Health (EPG Health, 2021), the top priorities for 2022 are: transforming the field force (shift to a digital culture/mindset), optimizing content for digital consumption and HCP insight and customer experience (developing a well-defined customer journey across multiple touchpoints) - Figure 5.

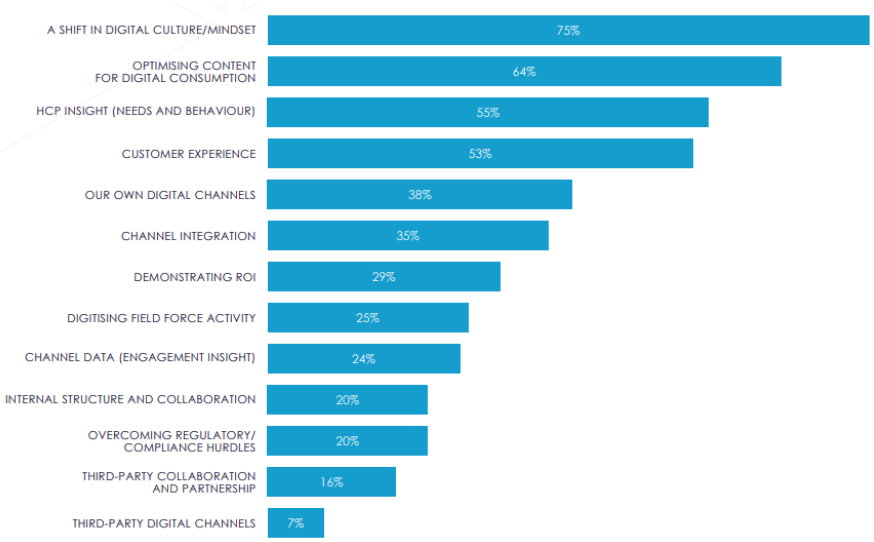

Figure 5 - *Where do you expect to prioritise strategic focus in the year ahead? Source: The gaps between HCP demand and pharma supply of medical information - EPG Health, October 2021 (EPG Health, 2021).*

In relation to field force engagement, according to IQVIA, 77% of the doctors believed that it was important to maintain contact with pharma companies during the COVID-19 phase (Chiplunkar et al., 2020). Moreover, in an Accenture study, 61% of the physicians surveyed said they were interacting more with their reps during COVID-19 than they did before the pandemic (Melville, 2021). Nevertheless, one can find some inconsistencies across studies.

In the 2021 medical affairs outlook report from ZS, 70% of key opinion leaders (KOL) said to be extremely comfortable with virtual MSL interactions, however, 86% said virtual has not worked well when meeting the MSL for the first time. Moreover, 60% of the KOL expect the interactions to be mainly face to face after 2022 (John et al., 2021).

Despite these results, the HCP perception might not be aligned with reality. In a recent publication from the consulting firm BCG, “a next-generation commercial model - one that capitalizes on digital and omnichannel interactions - can lead to a twofold or threefold increase in the productivity of pharma representatives, as measured in revenue” (Gerecke et al., 2021). According to this model, a new agile customer journey should be designed where marketing assumes a pole position to generate, nurture and qualify leads. Moreover, the sales force should be bionic and the goal is not only to sell but to make customers successful by deliver better

patient outcomes at lower costs, thus contributing to a more sustainable health care system. According to the same study, "there is a massive gap between companies' current capabilities and aspirations."

3.2. Pharmaceutical market characterization – Applied to Neurosciences

Business model

Big Pharma's traditional business model is based on the ability to identify promising new molecules, test them in large clinical trials and promote them with an extensive marketing and sales presence (Capo et al., 2014). Business models for pharmaceutical companies have been based on three approaches: The *Blockbuster Model* - success depends on large profits from these blockbuster drugs that pay for the high R&D, marketing, and sales costs (according to J.P. Garnier, the former CEO of GlaxoSmithKline, this is a "business model where you are guaranteed to lose your entire book of business every ten to twelve years"); *Diversification Model* - companies research and develop a bigger range of drugs, to be sold in smaller niche markets, where distribution cost is low; and *Intermediate Model* - selling both blockbusters and particular drugs, usually, through different branches. The current health market, scientific and technological trends have implications on the business models, as represented on Figure 6.

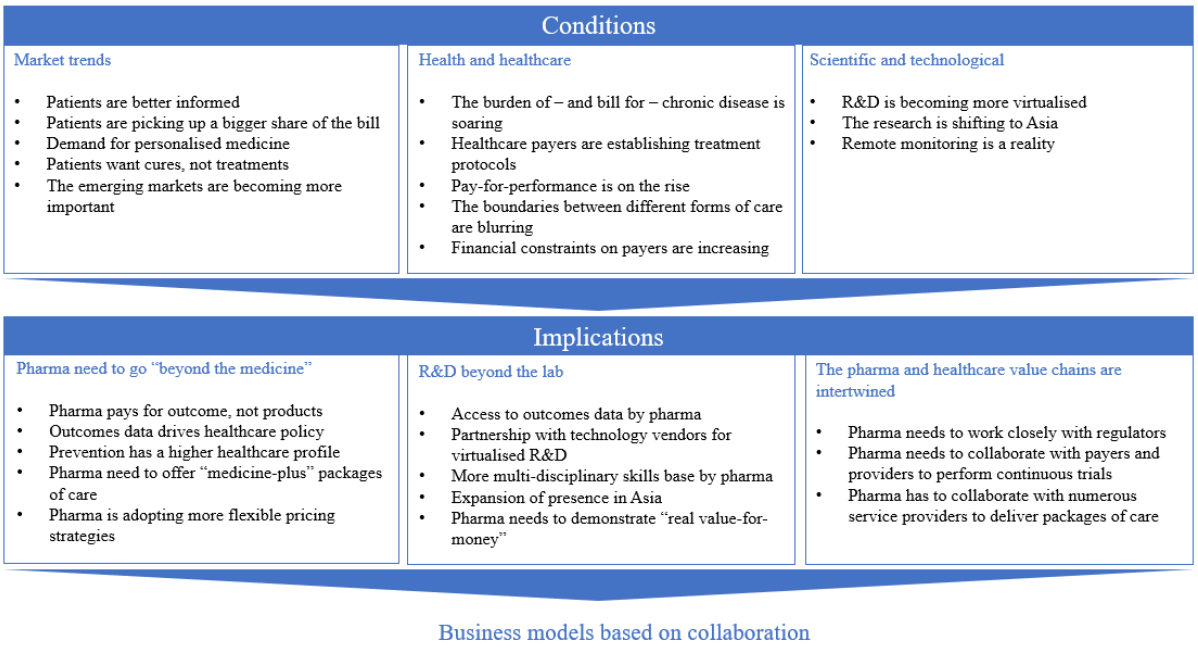

Figure 6 - *Key trends and implications for Pharma. Source: PricewaterhouseCoopers (PricewaterhouseCoopers, 2009).*

As explained in a Forbes article “with outcomes uncertain, drug development is ultimately a numbers game. The more experiments researchers run, the more successful drugs they will find. Instead of expecting a single organization to excel at both marketing drugs world-wide and inventing new ones, the most promising ideas depend on start-up companies - the disrupters/revitalizers in other industries - to expand capacity in the earliest stages, where large corporations have difficulty deploying large-scale resources. Rather than building larger organizations, the community expands by creating more companies. Using the for-hire facilities of contract research organizations (CROs), entrepreneurs can leverage existing productive capacity to expand output at minimal incremental cost” (Fleming, 2021).

Moreover, the trend is that pharma moves away from the mass-market molecule solutions and towards more tailored, patient-centred treatments. Biologics and cell-based therapies are taking centre stage to treat diseases previously untreatable. The pricing structure of these innovative therapies is often based on (large) one-time payments. One recent example is Zolgensma® from AveXis also known as the world’s most expensive drug (a gene therapy medicine for treating Spinal Muscular Atrophy). However, according to biologics manufacturers, these drugs, in long term, are cheaper when compared to the overall in-patient and out-patient costs of treating people throughout their lives. The high development cost of biologic treatments is driving pharmaceutical giants to switch from a “profit alone” strategy, where all stages of product R&D - from drug conception and experimentation to mass marketing – are kept in-house, to a new outsourcing model, where innovative biotech start-ups pioneer new therapies and sell-in to pharma companies further down the development cycle. According to Jeb Keiper, CFO and Chief Business Officer at Nimbus Therapeutics, “The biotech sector has been at the cutting edge of perfecting and industrializing the latest breakthroughs in biology, such as gene therapy and cell therapy.” HBM Partners reported that 64% of recently approved drugs have been developed by start-ups or small academic and biotech-driven ventures.

This new landscape enables biotech’s to position themselves for sale to Big Pharma at a premium. One example is Sanofi Genzyme that continually acquires biotech companies. Just in 2021, Sanofi announced the acquisition of Tidal Therapeutics and Kadmon. Besides investing their own venture capital funds in biotechnology companies, pharmaceutical companies are developing external innovation centres where they house biotech hubs (being Johnson & Johnson and Merck examples of that). With biotech therapies set to become ever more mainstream and investors eager to invest capital into promising new treatments,

tomorrow's pharmaceutical industry is set to be a more agile, dynamic and patient-centred environment (BNP Paribas, 2019).

Three common business models' innovation in pharma are personalized medicine, networked or open business model, and the federated model. Their descriptions can be found in page 59 in the Appendix.

Finally, empowered by new technologies, customers (both HCP and patients) are interested in products and services and do not longer accept "pushing" as a selling strategy. Thus, it is imperative to explore a "beyond the pill" approach. This means to drop the traditional business model based of "pushing" drugs to customers to try to make them purchase products and adopt a "pulling" approach: delivering new services and solutions that address patient's needs (health management: patient education, delivery, and drug administration services, monitoring and counselling, physiotherapy, nutritional advice, and wellness management).

Culture

When analysing the culture and values of the main pharmaceutical companies in the neurosciences sector, the most cited values are *Customer Focus* - keep patients, payers and physicians at the centre; *Inclusion* - encouraging diversity by embracing and leverage differences to foster an inclusive community; *Pioneer / Innovation / Courage* - challenging the *status quo* and experiment to create new possibilities, taking calculated risks and learn from failure; *Agility* - design and implementation of processes that enable the company to operate nimbly and effectively; *Accountability* – setting clear, aligned and measurable objectives to drive results and taking personal responsibility for them; *Ethics / Integrity* - doing what is right and committed to sustaining an environment of trust, honesty and transparency while ensuring appropriate confidentiality.

3.3. Structure and organization of a pharmaceutical company

The organizational structure of a pharmaceutical company is changing to adapt to the changes in the market landscape. It is now common that the executive committee includes a Chief Information Officer (CIO). The naming convention might change, for instance, Novartis, a Swiss pharmaceutical company, has in the board of directors, a Head of Customer & Technology Solutions (CTS). In this role, the director, leads efforts to drive innovation, simplification, and digital disruption at scale across a range of vital services, solutions, and

technologies for the business (including core operating areas such as human resources, procurement, or finance operations). Another example of this position, but with a small twist is the role of Chief Information & Digital Officer, present in the pharmaceutical company Merck, a German multinational. At Merck, the technology organization is focused on the areas of research, manufacturing, and business units to develop and leverage digital solutions to serve customers and achieve business value. Finally, some companies, have a director in the board, part of the executive committee, specifically dedicated to digital health. It is the case for Biogen and Sanofi. Sanofi, a French pharmaceutical company, created a position for a Chief Digital Officer (CDO). The company ambition is to become a global leader in digital in healthcare by accelerating the integration of digital, technology and data. Arnaud Robert, the CDO, is driving the company's new digital strategy forward to play a significant role in discovering, testing, and delivering medicines faster, running the business more efficiently, and creating engaging digital experiences for patients, doctors, and pharmacists. A similar case is Biogen, an American biotechnology company, that recently created a global unit called Biogen Digital Health (BDH). BDH, is focusing on the use of digital health technologies (sensors, digital devices, AI and big health data) to change the way neurological diseases are screened (digital biomarkers), detected, monitored, and managed (digital therapeutics), ultimately enabling patients to become more active participants in their disease journeys.

As one can see in Figure 7, there are three main streams that have an impact on HCP and patient interaction in terms of strategy, innovation, solutions and engaging: Product Strategy and Commercialization (highlighted in yellow), Finance & Customer Excellence & Operations (highlighted in light blue) and Digital (highlighted in green). The three streams have different purposes; however, they are very interconnected and collaboration and alignment between them is crucial.

- *Customer Excellence & Operations:* Responsible for the development of tools / platforms that allow the business to analyse internal and external data through analytical solutions. This stream is also responsible for providing digital capabilities such as, patient / HCP websites and other digital solutions as e-detailing software.
- *Digital:* This is the innovation hub, somehow independent of the main business, and which intent is to drive solutions to advance research, clinical care and patient empowerment, through data science and digital technologies.
- *Finance & Customer Excellence & Operations:* Within this stream there are several functions that work in close collaboration to ensure that the solutions build by the

previous streams (Customer Excellence & Operations and Digital) are implemented with success, helping the business to evolve in the right direction. With that aim, usually there are four main functions within this stream: Data & Analytics (responsible for the data quality and governance); Costumer and Market Insights (responsible for the analysis of external and internal customer data – to build business agility: hyperawareness, informed decision-making and fast execution); Customer Facing Excellence (responsible for supporting commercial and medical field teams to achieve better outcomes) and Omnichannel Excellence (responsible for maximizing the impact when engaging with customers, through innovative approaches of omnichannel planning and execution).

In Figure 7, highlighted in grey, is the Product Strategy and Commercialization unit. This unit includes marketing and sales teams. All the units mentioned above circulate and support the Product Strategy and Commercialization one. But not exclusively. The services developed by the Digital unit, allow the expansion of the life cycle of some products and/or increase the company brand credibility and loyalty. In summary, all these units work together to offer customers an improved experience and platform value.

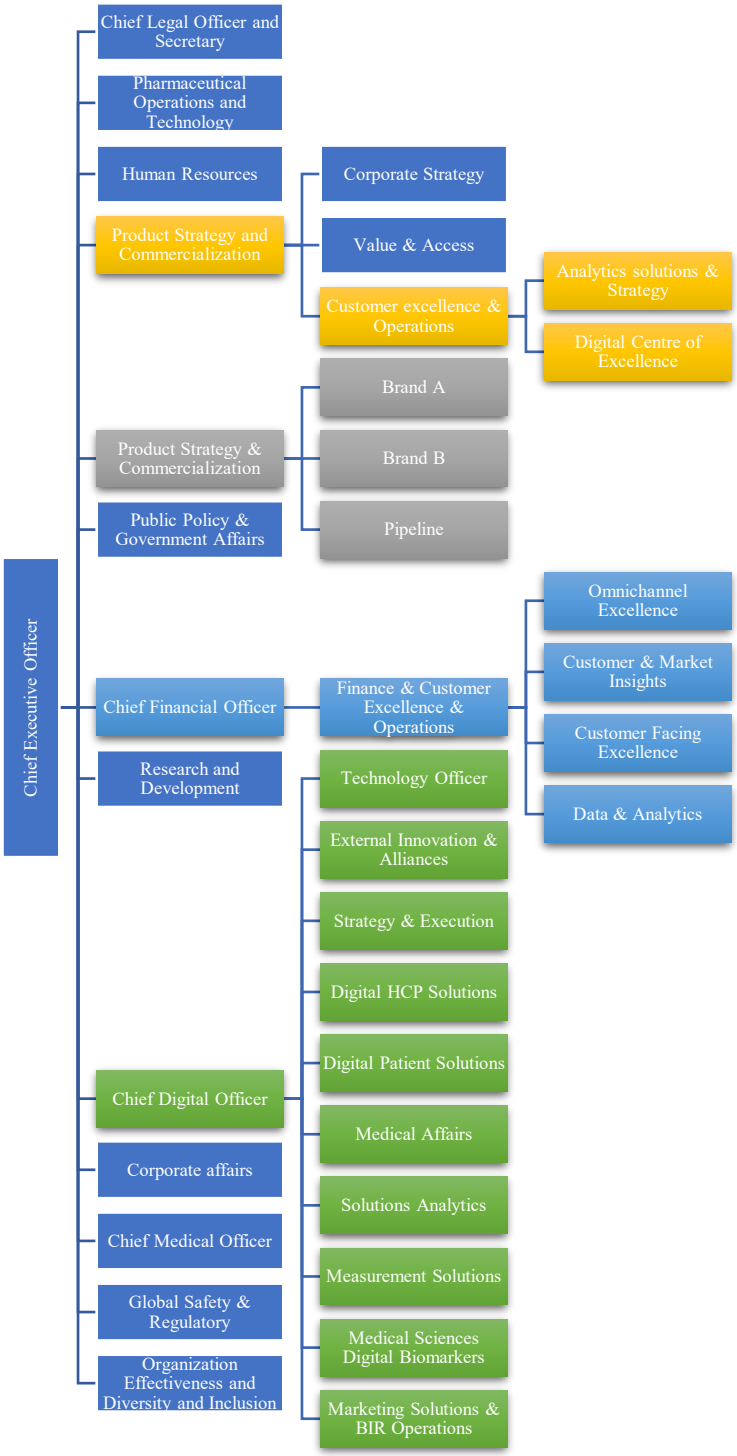

***Figure 7** - Example of a pharmaceutical company structure.*

3.4. Digital Maturity of pharmaceutical companies

A study from Across Health to the pharma efforts and ambitions in the digital and omnichannel space, exposed that even if the digital budgets are higher than ever, the satisfaction levels

remain low. When comparing the year of 2021 with 2018, several indicators of success of omnichannel capabilities decreased. For instance, the scores for "strong vision for digital transformation" and "multiyear strategy for digital transformation" do score well, over 50%, but both of them are 20% lower versus 2018 (Figure 8) (CELforPharma, 2021).

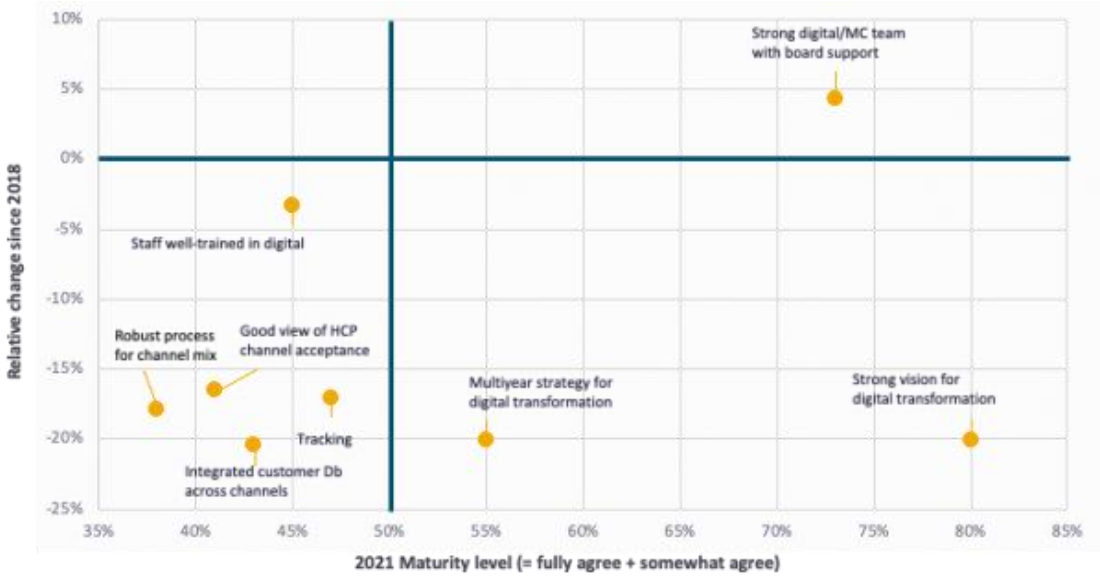

Figure 8 - *Pharmaceutical companies digital maturity level, a comparison between 2018 and 2021 (CELforPharma, 2021).*

The main barriers that pharma is facing to implement new digital initiatives, according to the data presented by Eyeforpharma, were by descending order, providing the value/ROI of digital; traditional culture and change resistance; inadequate digital resources and capabilities; compliance roadblocks and barriers; and finally disconnected affiliate, regional and global strategies. Therefore, one can conclude that the increasing budgets need to be invested more efficiently and effectively and that, currently, companies are still learning and adapting to ensure well trained staff, efficient customer segmentation, robust processes for optimizing the marketing mix, and actionable analytics.

3.5. The Neurosciences pharmaceutical market in Portugal: Omnichannel Customer Engagement

The base knowledge for this thesis research questions and questionnaires, was the Navigator 365 report from Across Health to the Portuguese neurologists in Q4 of 2020. The participants

were 51 neurologists, with a minimum of 51 patients per week, each. The sample comprised female (52%) and male (47%) neurologists, with the distribution represented in Figure 9.

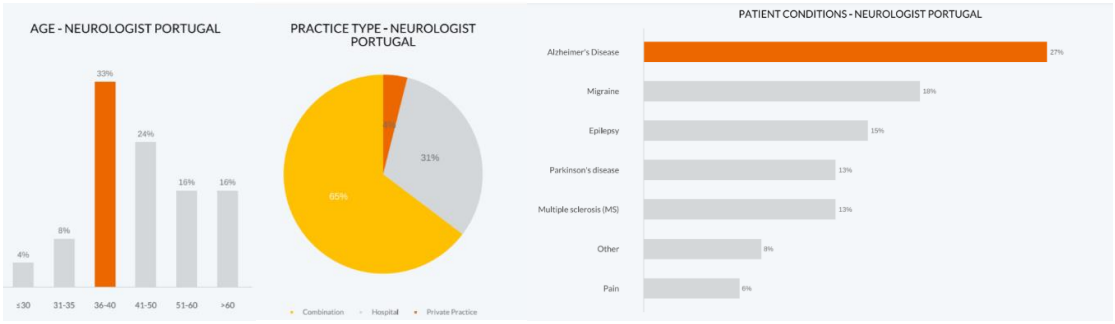

Figure 9 - *Demographics of the survey sample – 51 neurologists in Portugal. Source: Navigator™ from ©Across Health (Health, 2021).*

The first part of this report studied channels, frequency, and customer preferences. More than 50 channels were studied, as depicted below (Figure 10).

	Owned Promo	Owned Medical + Serv	Paid	Earned	
Offline	Pharma Call Pharma newsletter Pharma Representative	International Scientific meeting Local scientific meeting Medical education MSL Patient support programme Pharma service centre Phase IV	CME Conference booth Journal ad TV ad	Colleague Government Health insurance Hospital International congress KOL Medical journal National congress Nurse	Patient Patient association Pharmacist Professional association Treatment guidelines
Online	eDetail Email representative Pharma eNewsletter Pharma Social media Pharma Website Remote representative	Email MSL eMedical education Pharma app Pharma webcast Remote MSL	Banners eCME ePrescribing LinkedIn Scientific eNewsletter Scientific website Search engine	Health authority website Online congress Online medical journal Online physician network	Patient association website Professional association wesite Wikipedia

Figure 10 - *The omnichannel catalogue of channels. Source: Navigator™ from ©Across Health (Health, 2021).*

To assess the channel performance, both reach (the most encountered channels by HCPs) and impact (extent of influence of a given channel on HCPs prescription) were measured. The channels with highest reach (above 50%) and highest impact (above 7.5) were mainly the earned channels, namely, 'treatment guidelines', 'online medical journal' and 'online congress'. The other two channels in the first quadrant of the chart in Figure 11 were eCME and scientific website, both paid. Interestingly, only the treatment guidelines channel is offline, showing the relevance of virtual channels.

Another interesting analysis in the study is the archetype analysis, where physicians are divided into four behavioural segments according to their inclination towards a relationship with pharma – Independent, Transactional, Knowledge Seeker and Relationship Seeker (Figure 12). In contrast to what is the common belief, 47% of the participants were classified as Independents. Nevertheless, one might need to take in consideration that their perception might be different from their actions (reality). When comparing to the E5 countries (France, Germany, Italy, Spain and United Kingdom), 34% of the physicians belong to the independent segment, a slightly lower value than in Portugal.

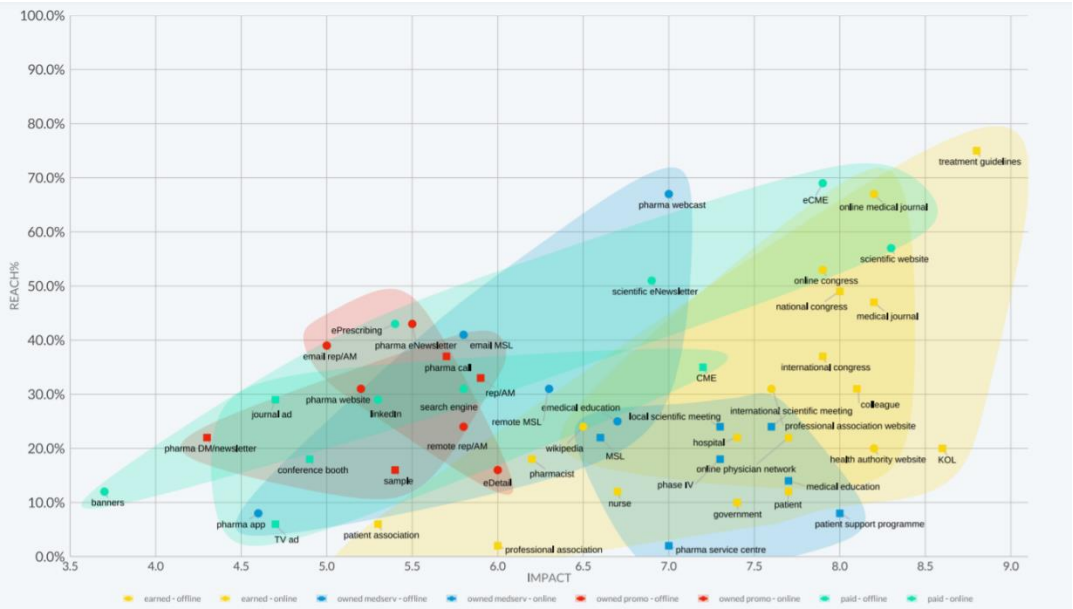

Figure 11 - Channel performance map. Source: Navigator™ from ©Across Health (Health, 2021).

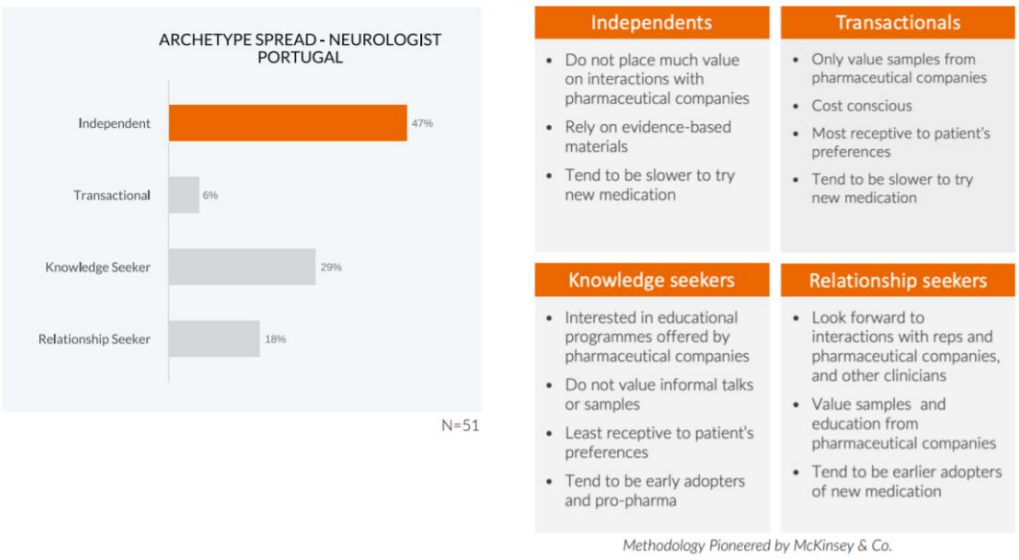

Figure 12 - Archetype Analysis: four behavioural segments. This analysis is derived from a methodology developed by McKinsey. Source: Navigator™ from ©Across Health (Health, 2021).

In terms of communication preferences, not surprisingly, one can see that most of the interviewed physicians prefer a mix of digital and face-to-face activities, and this behaviour is aligned with the EU 5 countries (Figure 13).

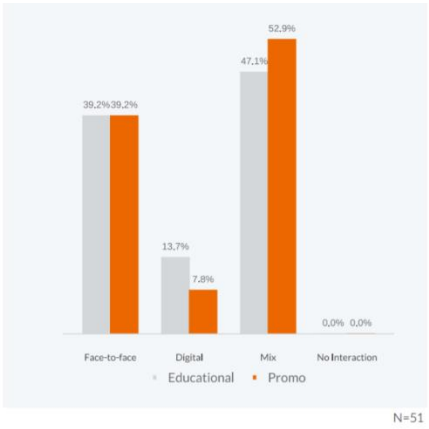

Figure 13 - *Communication preferences. Source: Navigator™ from ©Across Health (Health, 2021).*

To assess digital satisfaction (extent to which physicians are content with the digital offerings they receive from pharma), four areas were analysed: frequency, content, (number of) channels and user experience (Figure 14). Regarding the digital satisfaction, the average score was 3.2 which was higher than the EU 5 average (2.9). Moreover, in Portugal 49% of the HCPs were satisfied with the digital offer, versus 27% in the EU 5. These results might indicate that the offer in Portugal was better or that the Portuguese HCPs are less stringent when compared to the average of the EU 5 countries.

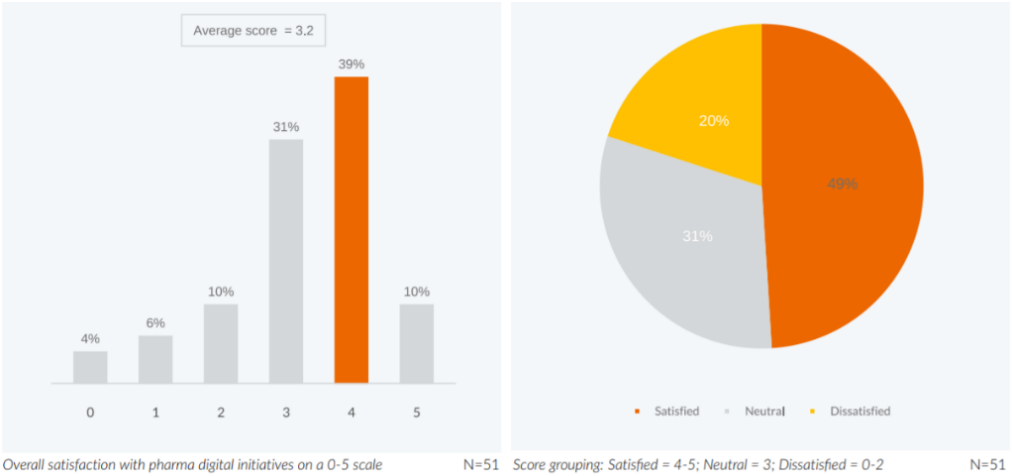

Figure 14 - *HCP digital satisfaction. Source: Navigator™ from ©Across Health (Health, 2021).*

In an analysis that compares the cost of channels with the reach, the scientific newsletters, pharma websites and MSL e-mails stand out as the channels with lower cost and higher reach (Figure 15).

Channel cost is calculated based on 1000 contacts (fixed cost + (var. cost per contact x 1000))
Low range = lower quartile, high range = upper quartile of variable

Figure 15 - *Cost versus reach. Source: Navigator™ from ©Across Health (Health, 2021).*

A more interesting analysis, however, is to compare the cost with the impact of the channel, using the multichannel equivalence factor. In this case, with high impact at medium cost one can consider the patient support program, scientific website and eCME (Figure 16).

Channel cost is calculated based on 1000 contacts (fixed cost + (var. cost per contact x 1000))
Low range = lower quartile, high range = upper quartile of variable

Figure 16 - *Cost versus Multichannel equivalence (MCQ). The equivalence model normalizes rep impact to 1, which yields a "common currency" to compare impact. Source: Navigator™ from ©Across Health (Health, 2021).*

A new study was recently published by EPG Health (October 2021) with the participation of 246 HCP from all continents and from over thirty medical specialities (EPG Health, 2021).

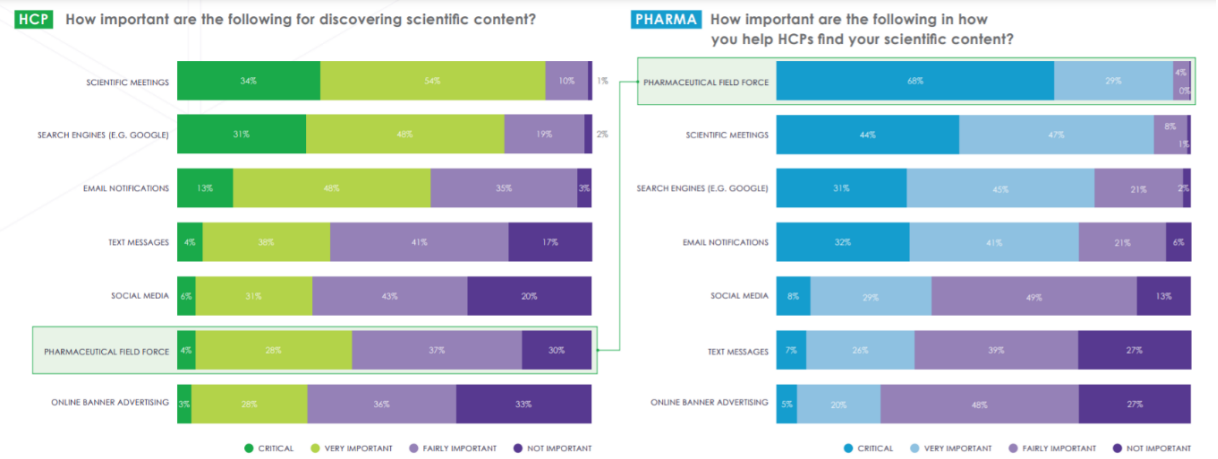

Figure 17 - *Importance of channels to scientific content research by HCP. Source: The gaps between HCP demand and pharma supply of medical information from EPG Health (EPG Health, 2021).*

In this study, the participants were interviewed one year after the previously presented study from Navigator™, which allows to understand the evolution of HCP preferences and behaviour. Eighteen months after the pandemics, HCPs still consider scientific meetings, search engines and emails the most important channels for discovering scientific information. They consider pharma field forces and online banner advertising least important. However, on the contrary, pharma relies most heavily on field forces for making HCPs aware of scientific content (Figure 17).

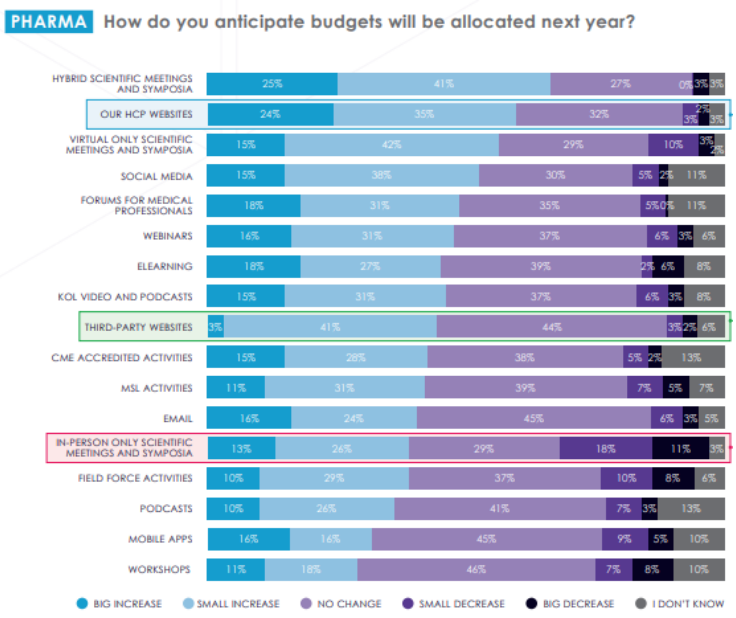

Figure 18 - *Pharma budget allocation for 2022. Source: The gaps between HCP demand and pharma supply of medical information from EPG Health (EPG Health, 2021).*

Regarding the budget changes for 2022, pharma expects an increase in budget for hybrid and virtual scientific meetings, their own websites and social media (Figure 18).

3.6. Digital therapeutics, neurotech and Digital Vision of pharmaceutical markets

As mentioned in the introductory section, as the technology developments evolve, namely the advances in software and hardware, the effectiveness of electronic monitoring tools also improve. That in addition to the cloud services, allow us to imagine a world where each patient is diagnosed, treated, and monitored in a personalized fashion (based on individual characteristics, lifestyle, diet preferences, disease subtype, risk, prognosis, or treatment response). According to Dr. Wim Van Hecke, CEO of the biotech company Iconometrix "To make more personalized and data-driven decisions, reliable and clinically validated information needs to be added at the different levels of the patient care path. The source of such data can be medical imaging, health records, health claims, data from wearable sensors, and mHealth apps, next to genomics, metabolomics, etc. Such data-driven insights require the organization and analysis of massive datasets to identify features that may indicate optimal treatment decisions. Hence, AI solutions play a crucial role, by integrating multimodal data to generate actionable insights. The resulting predictive models can aid in improved patient stratification, prediction of progression, and therapeutic response" (Van Hecke, 2021). This statement is aligned with the vision of Dr. Belachew, Head of Biogen Digital Health Sciences, that in a recent interview on The Boston Globe, said "Currently, clinicians have limited data to guide their judgments. Using digital tools combined with artificial intelligence and machine learning, however, we can enable a revolution in the instruments we use to investigate the brain". AI-driven solutions will allow HCPs to diagnose neurological disease earlier with greater accuracy and ultimately manage it more effectively, driving better patient outcomes at the lowest possible cost. By 2022 the spending estimated on AI-related tools will top $8 billion annually across the following seven areas: remote prevention and care, diagnostics support, treatment pathways and support, drug discovery and development, operations, marketing and sales and support functions (Aboshiha et al., 2019). The conclusion, in the same article, is only one, according to Martin Dubuc, Head of Biogen Digital Health, "as healthcare companies around the world embark on a race to realize the promise of a patient-focused and digitally

enhanced future, one thing's for certain: it's no longer a question of if digital health and neurotech will play a role in the future of healthcare, but how" (Sturchio, 2021).

The momentum is huge. There are more than 400 neurotech companies across the globe (Neurotech Analytics, 2020). Just in Europe, a list of 160 European start-ups active just in the field of mental health was recently published by Newfund (Figure 19). The main focus areas of Neurotech startups' today are: Assessment & Diagnosis, Monitoring & Evidence generation and Interventional & treatment.

EIT Health, established in 2015, is a 'knowledge and innovation community' (KIC) of the European Institute of Innovation and Technology (EIT). The idea behind the EIT KICs is that innovation thrives best when the right people are brought together to share expertise (European Union, 2021). The model followed is the so called 'knowledge triangle', where experts from business, research, and education work together as one, creating an optimal environment for innovation (Figure 20). So, pharmaceutical companies can strategically engage with EIT Health to enable the connection with best-in-class innovators in neurotech and therefore accelerate their efforts. These win-win partnerships can help pharmaceutical companies to build relationships with the local tech and digital health ecosystem to shape the future by pushing frontiers and be one step closer to advancing digital and personalized medicine in neuroscience.

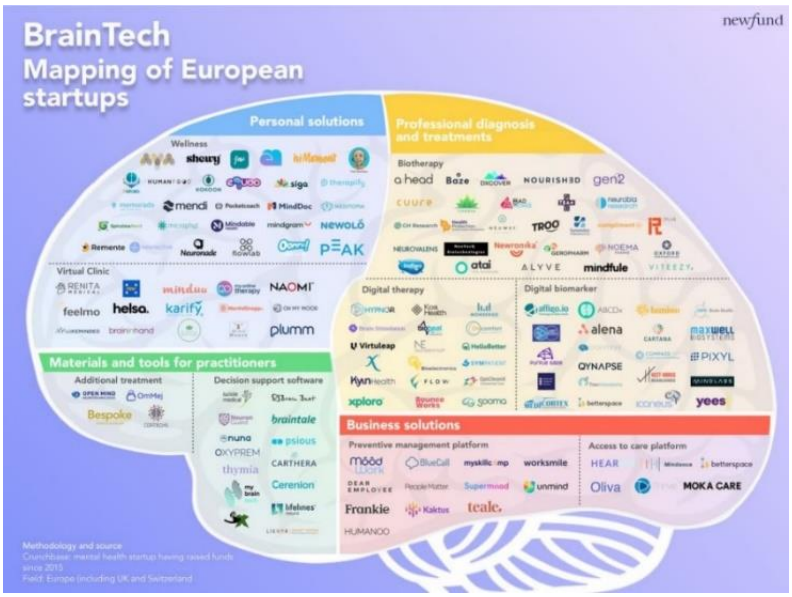

Figure 19 - *List of the 160 European start-ups active in mental health divided into four main segments, including personal solutions, professional diagnostics and treatments, business solutions and practitioner tools. Source: Newfund (Nedellec, 2021).*

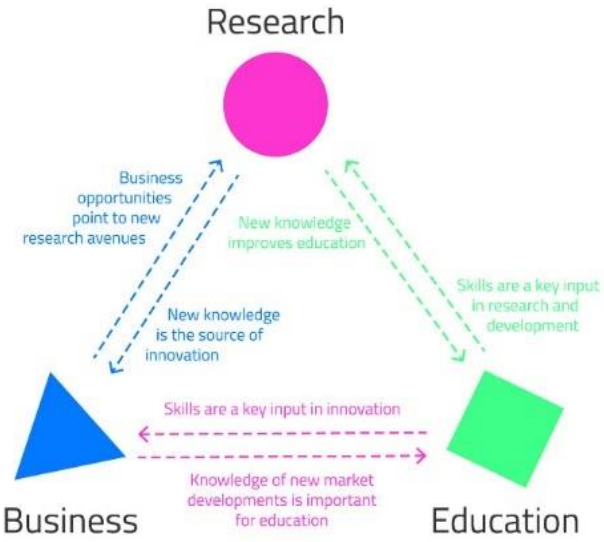

Figure 20 - *Knowledge triangle. Source: EIT Health* (European Union, 2021).

For this health digital transformation all healthcare stakeholders have a role to play, from biotech's, to pharma, to HCPs to governments. Moreover, a seamlessly integration into hospital systems is key to guarantee that the information is shared. Finally, this could only work if the solutions are compliant with local data security regulations and follow all the data privacy rules.

4. Market Research

4.1. Methodology

This market research will be divided in two chapters, as per image below (Figure 21). The first chapter will be focused on the digital preferences of neurologists in Portugal. The second chapter will address the perspective of a specialists who work for pharmaceutical companies on how they envision the future and what are their key recommendations for a company that aims to succeed in a technology driven post-COVID 19 era.

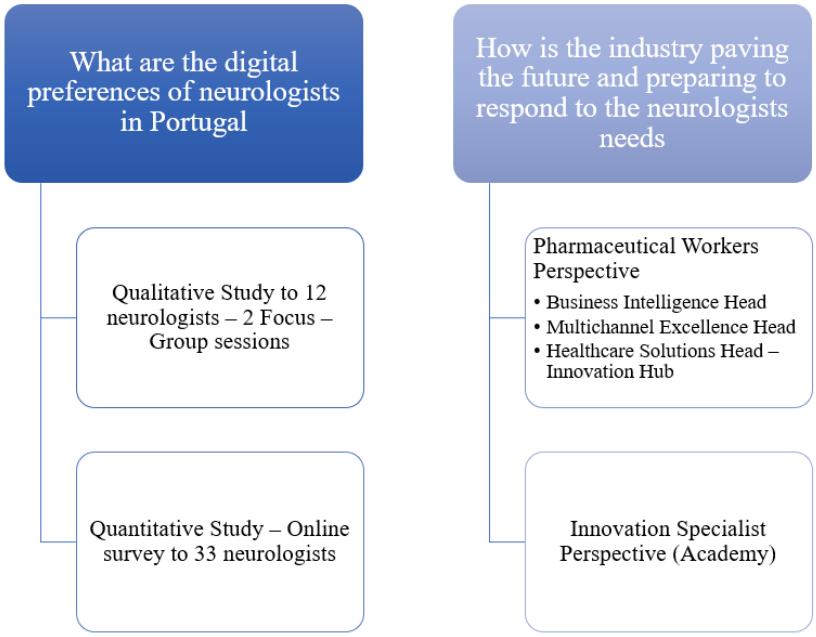

Figure 21 - *Market Research methodology.*

4.1.1. Neurologists Perspective

To investigate the digital profile of physicians in Portugal specialized in Neurology two studies were undertaken in sequence. The first one was the qualitative study, in which twelve neurologists were interviewed in two remote focus-group sessions. The groups were divided according to the region: six neurologists from the Center and Northern Portugal and six from Lisbon and Southern Portugal. During the focus groups five main topics were addressed: Internet usage at a professional level – Access to knowledge; Social media and new digital formats; Patient engagement in a digital era; Communication with pharmaceutical companies

and colleagues (peers); and Final considerations – Unmet needs and digital differentiation. The full script can be found in the Appendix, page 65.

The results and insights from the focus group sessions were used to create the online survey which was conducted to thirty-three neurologists and the script can be found in the Appendix, page 67. The sample characterization of the online survey was the following – Figure 22.

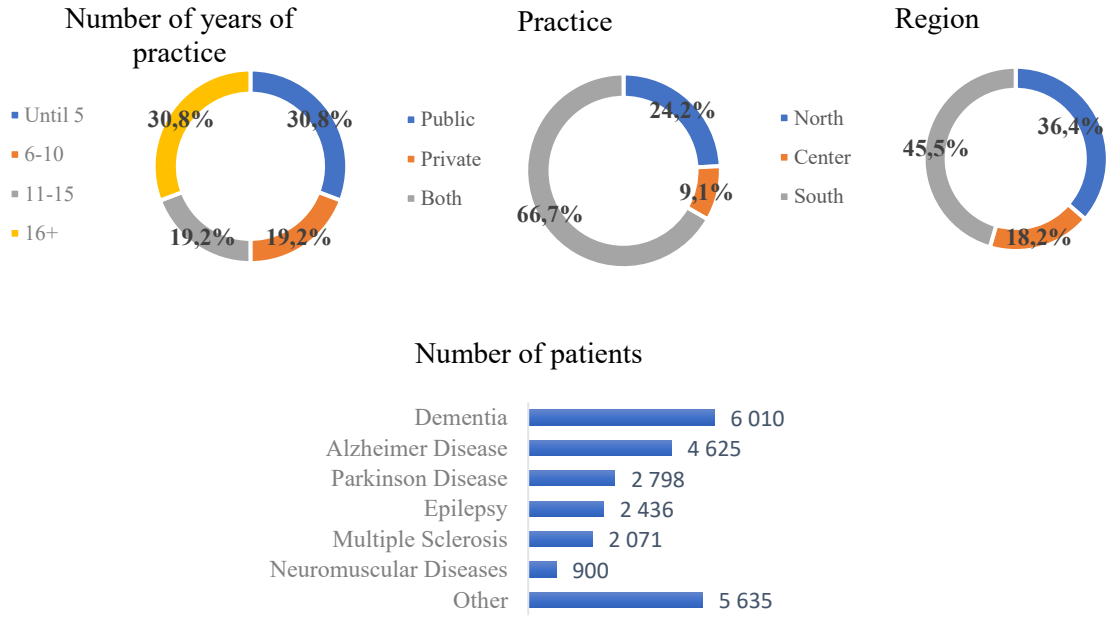

Figure 22 - *Sample characterization of the quantitative study of 33 Portuguese Neurologists.*

4.1.2. Pharma Specialist Perspective

To assess which are the key priorities within digital transformation where pharma companies are focusing their efforts, four specialists were interviewed (**Table 8 -** Pharma Specialists interviewed for the case study.Table 8, page 65 in the Appendix). The key areas of expertise of the interviewed experts (from different institutions) were: Multichannel Excellence, Healthcare Innovation, Business Intelligence & Analytics and Digital Health Solutions.

4.2. Analysis and findings

4.2.1. Neurologists Perspective

Neurologists in Portugal spend an average of ~6 hours online, from which 61.8% are dedicated to professional activities. One could also conclude that physicians with less than ten years of

experience, spend, in average ~7 hours online, whereas physicians with more than ten years of experience spend only ~5 hours online. This lower online activity time for more experienced and older doctors is not surprising and can explain why, in average, younger doctors are more prone to digital initiatives. During the focus groups, the answers to the question "How do you do your research online" showed that the search process is not structured, as physicians were not able to clearly describe it. Nevertheless, they were consistent regarding the device most used to their online searches: the smartphone, followed by the workplace computer and their own laptop (Figure 23).

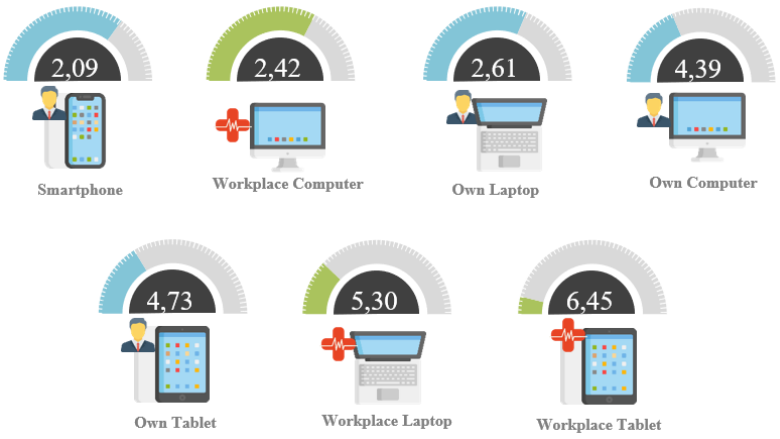

Figure 23 - *Quantitative market research (question 8): Please sort by order of preference to access to the internet, the following devices – 1 most used; 7 – less used.*

According to the qualitative study the device used depends on personal preferences, devices available and environment (during consultation appointments, the laptop is the preferred option, whereas in the urgency care unit, the preference goes to the smartphone). The subscription offerings by the health care facility and access restrictions were also mentioned as factors that affect the search process.

In general, physicians are satisfied with the current digital offer, however, there is space for improvement. When asked on how they rate the digital offer in terms of available information/tools, in a five points scale, the average was 3.5. The aspects they value the most when looking for a digital offer are the source credibility, free access and access to scientific papers written by national or international experts. As one can conclude from Figure 24, the factor "Independence of the pharmaceutical industry" comes in the fourth position, and it is very much linked to the factor "Source credibility". This way of thinking was confirmed during the focus groups where physicians emphasized the lack of trust they have on information

provided by the pharmaceutical industry, as it might be manipulated to favour the information owners. Very surprising was the fact that physicians prefer reading materials (when compared to video and audio materials) and that the possibility to share information with peers is more important than it is to share with patients.

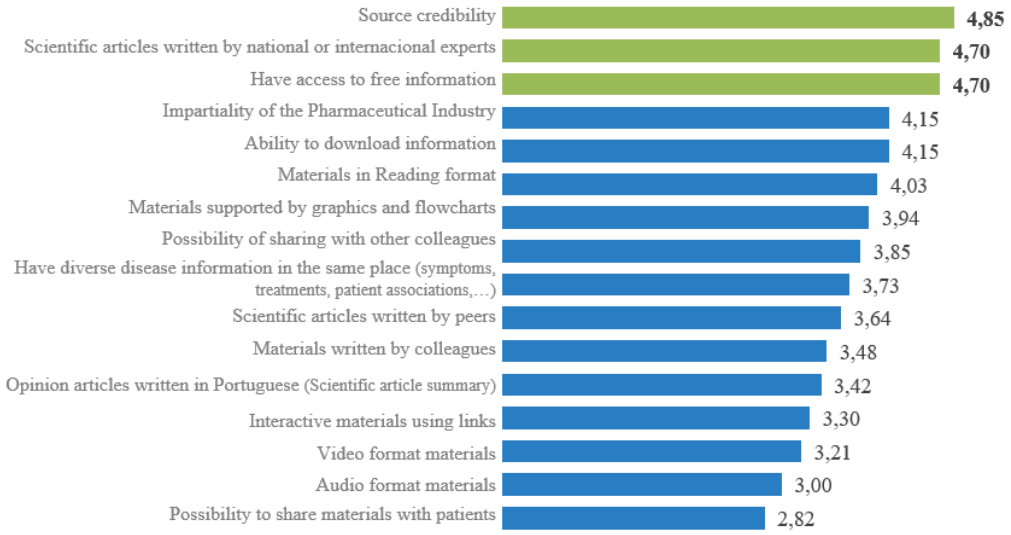

Figure 24 - *Quantitative market research (question 10): What are the most important aspects in the digital offer at a professional level: 1 - not important; 5 – very important.*

To deep investigate what are the methods that physicians use to keep themselves updated, they were asked to evaluate the available offer (Figure 25).

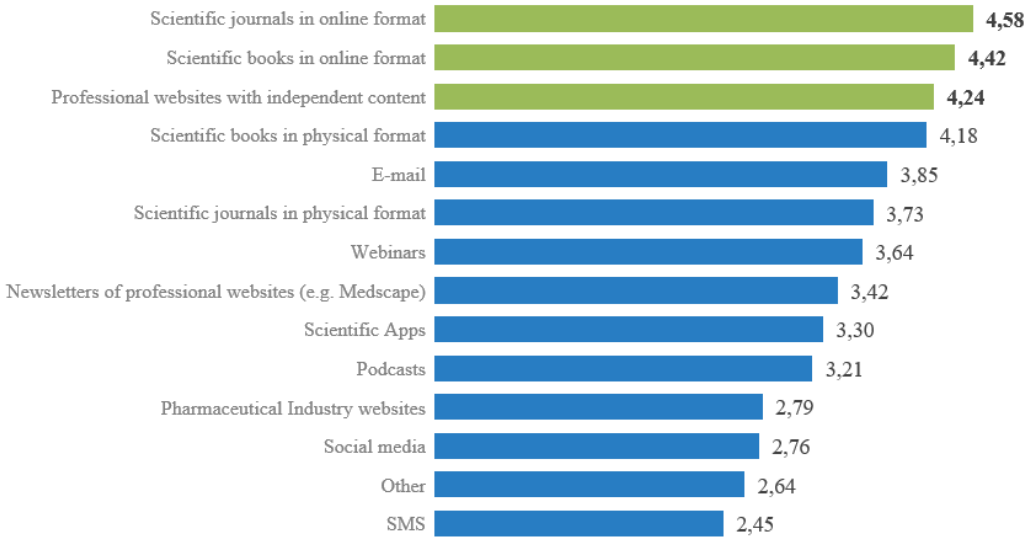

Figure 25 - *Quantitative market research (question 11): How do you evaluate the following methods to consume professional information: 1 – No or Low value; 5 – Very high value.*

The results show that online content is preferred, namely online scientific journals, books, and professional websites with independent content. Reinforcing what was mentioned above,

pharmaceutical websites are poorly rated. When specifically asking "how much do you value scientific information contained in pharmaceutical websites" in a ten-point Likert scale, the average was 5.6, confirming once more their preference for neutral content.

Some digital formats such as podcasts or social media, even if used during personal activities are not seen as work tools, yet. Nevertheless, physicians were asked to rate different social media platforms, at professional level (Figure 26). Generally, social media are not used to acquire scientific knowledge with an average of 3.8 in a ten-point Likert scale. Once more, not surprisingly, WhatsApp showed to be the preferred platform. However, only approximately 39% of the physicians reported to use this platform very often.

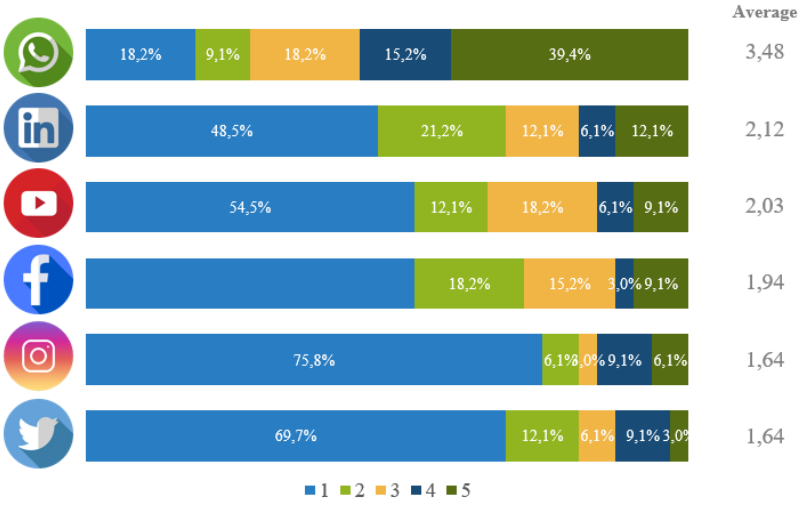

Figure 26 - *Quantitative market research (question 21): Regarding these social media platforms, how much do you use them at professional level: 1 – Poorly used; 5 – Highly used.*

During the focus groups physicians discussed that even if they do not use social media for professional activities, these platforms occupy such a space in people's daily life that their power should not be underestimated. For instance, a best practice in Centro Hospitalar e Universitário de Coimbra was shared – during the COVID-19 pandemics, a multidisciplinary team of this public hospital created a page on Facebook to keep their patients and caregivers informed about product updates, vaccines, and other disease related topics. The need behind this solution was that during the pandemics, physicians, nurses and pharmacists were confronted with an increased volume of questions from patients and caregivers, through several channels: SMS; e-mail, F2F and telephone. Thus, they considered this solution – the Facebook group - a win-win: a one stop-shop where patients see their questions responded and HCP can optimize their time and feel in control of the situation.

Besides the social media platforms mentioned in the survey, physicians also noted that ResearchGate is useful to follow peers and share scientific information. Other examples of professional utilization of social media that popped up during the focus group were Facebook – Médicos do Mundo and Patient groups; LinkedIn – Upcoming event news and to follow colleagues (e.g. Gavin Giovannoni, even if he is considered to be highly commercial – lack of credibility in his posts); Instagram: New England and neurologist and Twiter: SNS – Sistema Nacional de Saúde (Portuguese health system).

Finally, when asked about the relevance of the pharmaceutical industry presence on social media, the answers were consistent: "I do not look forward to follow pharma industries on social media, however, they must be there as a signal that they are following the market". Moreover, even if pharma pages are not very useful for physicians, they do assume an important role for patients and caregivers. Because of that, the content and information disseminated by pharma industries should be validated by experts in the area to ensure that the information is reliable, physicians say.

As shown in Figure 27, the top three channels are clinical sessions, face-to-face interactions and e-Mail.

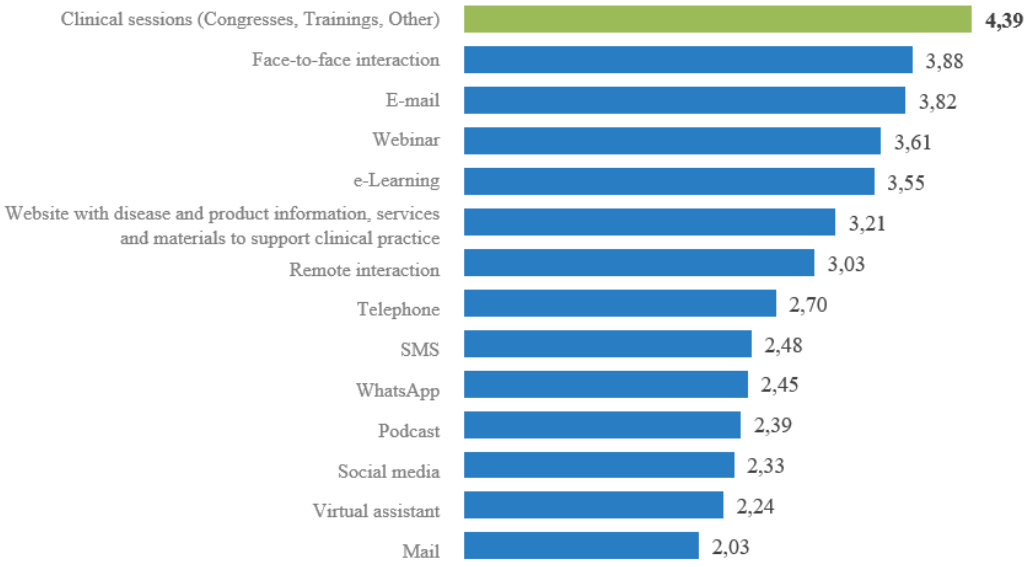

Figure 27 - *Quantitative market research (question 23): Regarding the pharmaceutical industry channels only, how you evaluate their relevance: 1 – Not relevant; 5 – Very relevant.*

These results were confirmed during the qualitative study where a consensus was achieved around the e-Mail as the elected channel, mainly because it is considered a time management friendly channel. In opposite, telephone, SMS and WhatsApp are sometimes seen as opportunistic and invasive channels. Many HCPs consider WhatsApp too informal and

regarding the SMS, due to the high volume received, most of them are considered SPAM (Sending and Posting Advertisement in Mass). Remote interactions are considered a valid channel, however there is a saturation of all virtual channels. Currently, the monthly average of remote interactions per neurologist is 5 (at least one per week). However, it is a channel to consider in the future as it can be very convenient. The ideal duration of a remote visit, according to the respondents, would be of approximately 9 minutes.

In the EPG Health report mentioned before in the Case Study, HCP also rank journals, independent websites and scientific meetings as their most important sources of information, with pharma channels and social media being least important (EPG Health, 2021).

Coming back to the e-mail channel, the neurology specialists receive, in average, 5 e-mails per week, from which they read 2. When comparing with a broader target of physicians (including other specialties), the number of e-mails is lower, and the percentage of e-mails open/read is higher (11 e-mails/day received and 4 read). This data can be found in the report "How can we be together, Perfil digital dos HCPs 2021" from 2Logical (https://pt.2logical.online).

From the qualitative study it was clear that personalization/customization of e-mails is perceived as very important: "If it is a mass e-mail, I do not even bother to open it" and "If the e-mail address is from a person, I will probably open it, but if it is from a pharma general e-mail address, I will probably not open it". Another insight was related to the subject of the e-mail: "The subject should be comprehensive enough, so I know what the e-mail is all about." And "ideally the full e-mail content would be enclosed in the subject".

Regarding the new formats, webinars, e-Learnings and podcasts, there is still some confusion between them. For instance, some neurologists confuse webinars with e-Learnings. One can also conclude that podcasts are highly connotated as an entertaining tool, and not so much as a training/educational tool. Moreover, because it is an audio format, it can create difficulties to the learning process. However, podcasts can be a good format to host lighter health content such as interviews with KOLs. This type of content can be consumed during moments that require less concentration, such as car travels (when commuting, for example). Interestingly, in the EPG international report, 72% of HCP expressed demand for podcasts while only 38% of pharma focus on providing them (EPG Health, 2021). So, one might infer that the next months/years will clarify the relevance of this channel and if the Portuguese culture/behaviour will follow what is already seen in other countries.

The ideal duration of these digital formats is represented in the table below (Table 2).

Table 2 - *Quantitative market research (question 17): Ideal duration of webinars, e-Learnings and podcasts.*

	Webinar	e-Learning	Podcast
Ideal duration (min)	35'44	64'	28'48

In relation to the attendance, only 15.2% of the respondents have not attended to any webinar on demand and 21.2% have not attended to a live webinar. With a slightly higher percentage, 24.4% of the respondents have not attended to any e-learning and 51.5% did not listen to any podcast. These percentages show that there is still a learning curve that needs to be completed and pharmaceutical companies have a job to be done here. However, to get the attention of more HCP, pharma companies need to have in consideration that the quantity of webinars and eLearning's available, on many occasions with repeated subjects and commercial goals, is a problem. There is also a saturation of this format, since most of the webinars occur after working hours (after 6 PM), leading to the sensation that their personal time is being affected. When asked about the ideal webinar of the future, neurologists were not very enthusiastic: "there are already so many webinars available that it is hard to think about somethings that has not been done yet". Nonetheless, they stressed the importance of the duration, that should not surpass the 45 min (30 min of talks plus 15 min of Q&A). They also commented how important it is to keep the pace and that a moderator can be a solution to ensure the dynamic. Moreover, more than one speaker and innovative/relevant subjects are appreciated. Finally, webinars should not take place during the weekends.

So, what leads an HCP, more specifically a neurologist, to attend to a virtual event? The answer to this question is represented in the figure below (Figure 28).

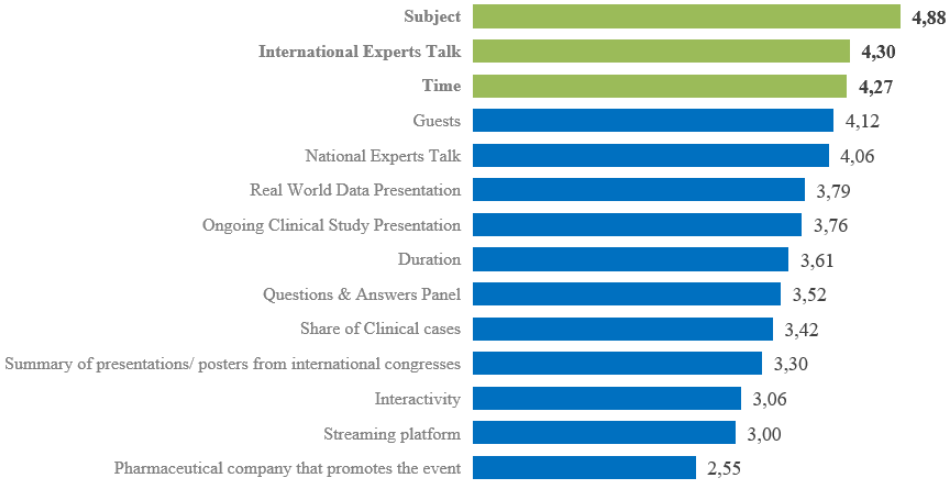

Figure 28 - *Quantitative market research (question 18): What are the most relevant criteria when deciding whether to attend to a virtual event: 1 – Not relevant; 5 – Very relevant.*

The three most relevant factors are the subject, the presence of an international KOL speaker and the date when the event takes place.

Similarly, one wanted to explore what triggers an HCP to finish an e-Learning and consider it a great learning tool. The results are depicted in Figure 29. Once more, independent content assumes the highest relevance to HCP, followed by the format (reading and recorded sessions mixed with live streaming).

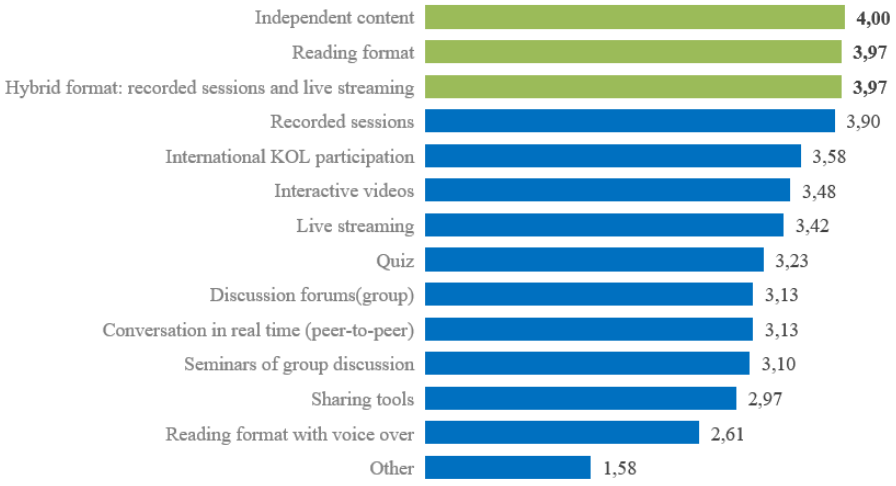

Figure 29 - *Quantitative market research (question 33): What criteria do you consider more relevant in digital services such as webinars or e-Learnings (5-points scale): 1 – Not relevant; 5 – Very relevant.*

Once more, the results above are aligned with the EPG Health report, where HCP expressed that their highest demand is for downloaded short, bite-sized content as well as webinars and interactive, modular learning.

A clear insight from the qualitative study is that neurologists feel that their time (work and personal time) is being controlled by external factors: “I feel like I am a pharma puppet”. In fact, they have the perception that due to the engagement restrictions caused by the pandemics, the interactions with pharma industry via other channels increased substantially, and without rules. “Virtual contacts created the illusion that we are working 24/7 and I feel that my time is not being respected by pharma”.

Figure 30, below, shows the best time to engage with neurologists. Even if they complaint about their free/personal time to be affected by the new normal, approximately 70% of the neurologists prefer the webinars to be hosted after 6PM. For e-mails, the time does not show to be relevant. On the contrary, remote meetings are preferred to happen in the morning. In what concerns the weekdays, there is no clear trend for any of the three formats. Nevertheless, from Monday to Thursday seems to be the most common preference.

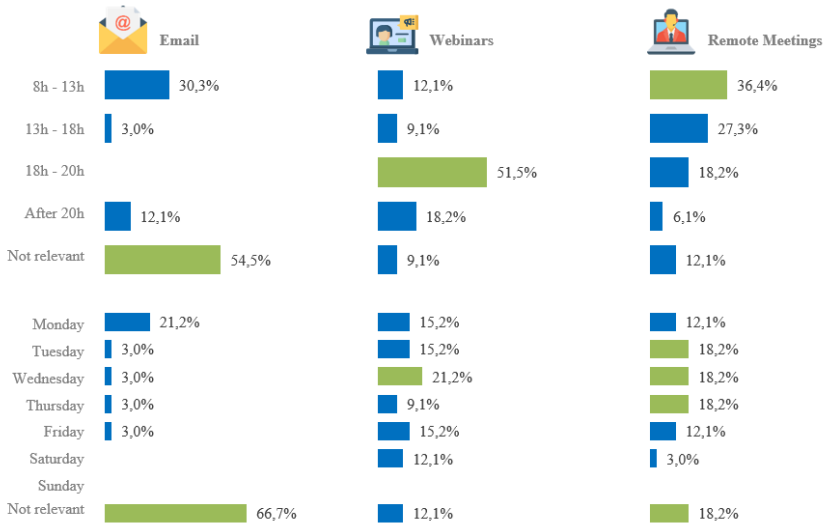

Figure 30 - *Quantitative market research (question 20): When is the best time and day to be engaged via e-mail, webinars, or remote meetings.*

Above all, neurologists want to restore control over their interactions with pharmaceutical companies. The interaction plan should result from a common agreement between the HCP and the pharma company. This collaboration is key to ensure that the HCP feels an active partner and to contradict the unilateralism idea which, in long term, might lead to HCP' alienation.

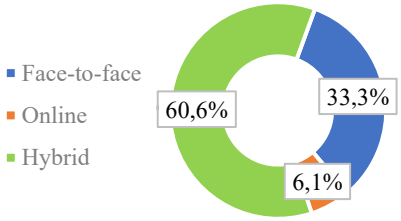

Figure 31 *- Quantitative market research (question 19): How do you envision the future of the interactions with pharmaceutical companies.*

When asked about the future, 60.6% of the respondents envision the engagement with pharmaceutical companies to be hybrid (Figure 31). This result is aligned with the study from Across health (Figure 13).

The next section of the survey was specifically about the Multiple Sclerosis (MS) therapeutic area. To understand how neurologists rate the current digital offer, a 10-point Likert scale was used, and the result was 6.8, meaning there is room for improvement.

The behaviour in terms of what type of information they search to support their clinical practice and to be updated on the most recent news and developments is represented in Figure 32.

International guidelines and product information are the two most researched topics and therefore where the pharma companies' efforts should be concentrated.

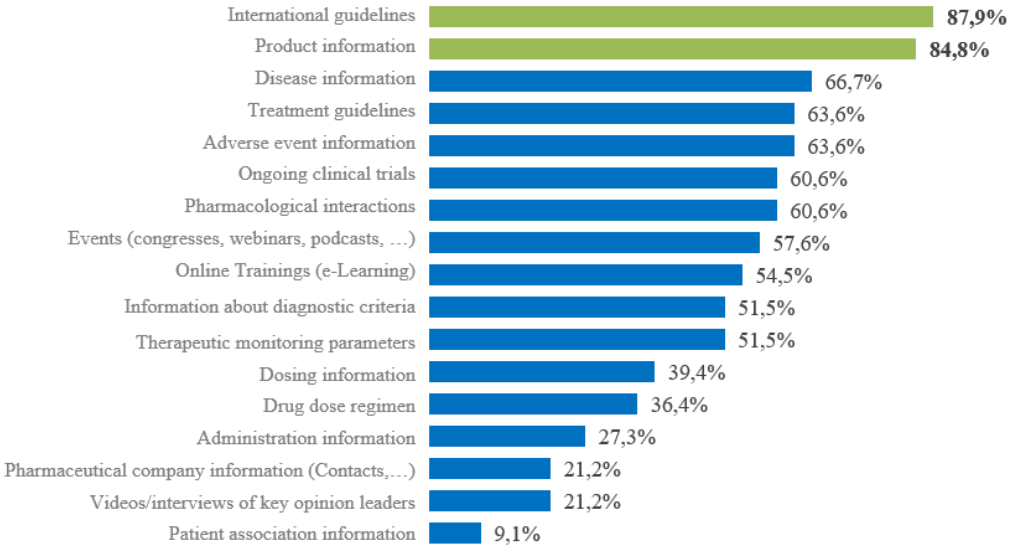

***Figure 32** - Quantitative market research (question 25): What type of information do you search most often, related to Multiple Sclerosis.*

And what topics within the MS area, would physicians like to see discussed in a webinar/podcast or e-Learning? The answer to this open question is represented in Figure 33. The three topics mentioned were therapeutic approach, new drugs and diagnosis (criteria, questions and differential). Interestingly, only 6.5% of the respondents mentioned Covid-19 vaccination and no one mentioned Neurotech or Health Tech (from the more than 60 topics mentioned). However, when specifically asked about their interest in neurotech, 80.6% of the respondents mentioned to be interested to know more about it (Figure 34).

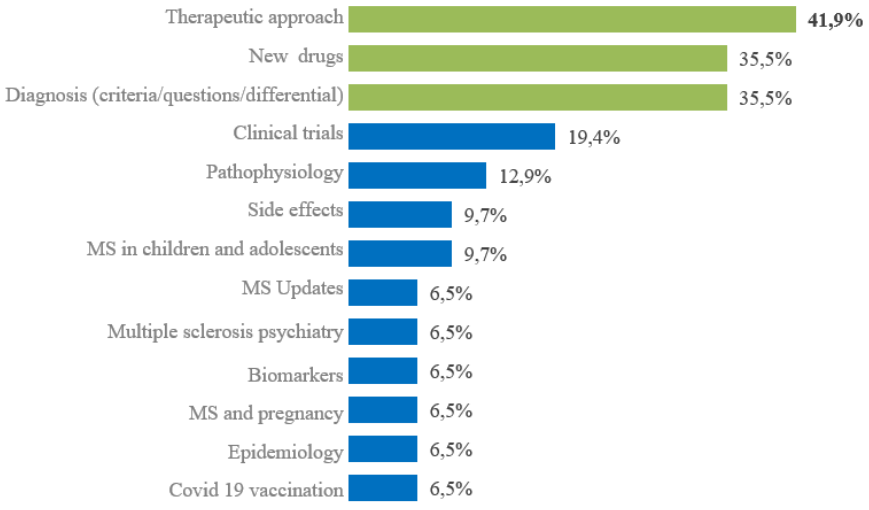

***Figure 33 -** Quantitative market research (question 31): What topics would like to see discussed in a webinar/ podcast or e-Learning about Multiple Sclerosis – open question.*

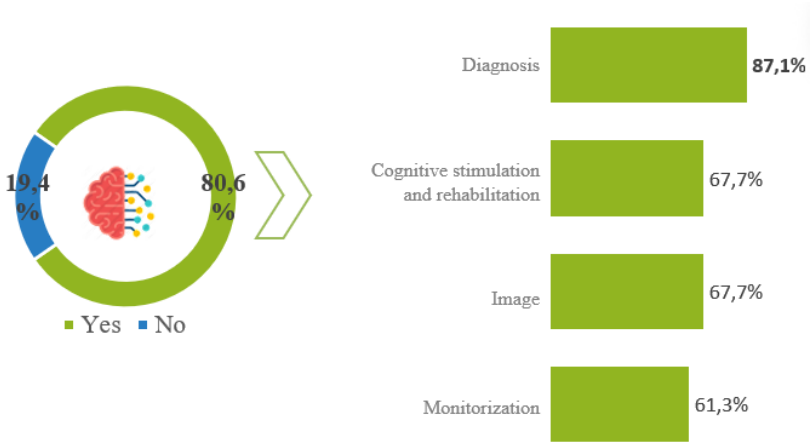

Figure 34 - *Quantitative market research (question 34 and 35): Would you be interested to know more about Neurotech and Health Tech. If yes, what are your main interests.*

The HCP preferences related to neurotech are depicted in the figure above (Figure 34). The four topics, all rated above 60%, were: diagnosis, cognitive stimulation and rehabilitation, image and monitorization. Because this is a new field, it might be a good bet for pharmaceutical companies to invest in webinars and/or podcasts about these topics.

To fully understand the neurologists' search habits, they were inquired about the websites/applications or tools they use, in a 5 points scale. The websites PubMed and The Lancet Neurology were the websites with higher frequency of utilization (Figure 35).

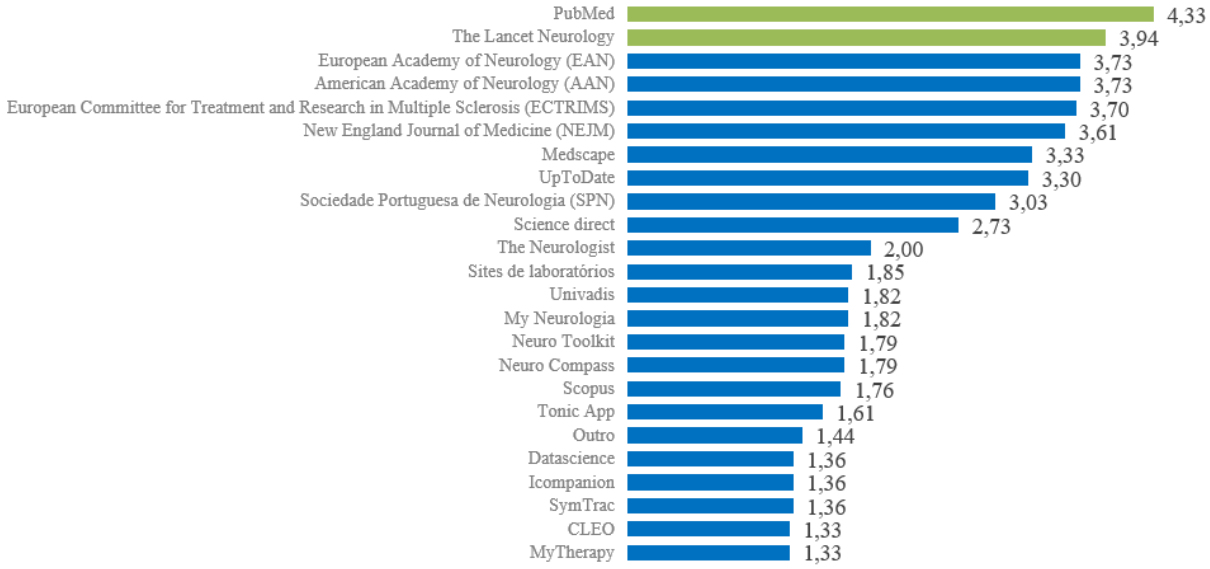

Figure 35 - *Quantitative market research (question 26): What are the websites/applications or tools you use more often (5-points scale): 1 – Poorly used; 5 – Highly used.*

The qualitative analysis was helpful to understand the differentiation factors between the three websites: PubMed (https://pubmed.ncbi.nlm.nih.gov/), Medscape

(https://www.medscape.com/) and UpToDate (https://www.uptodate.com). In the case of PubMed, it is mostly used to search for scientific articles. The intuitive and user-friendly platform allows to filter for information and has an algorithm that finds similar clinical cases/studies facilitating the research process. However, some disadvantages were also appointed: some neurologists mention that it is incomplete (when comparing with competitors) and that only allows sequential searches. An alternative platform named by the neurologists at the focus group was the Scopus website (https://www.elsevier.com/solutions/scopus). However, it did not score well in the quantitative study (Figure 35). In relation to MedScape, it is highly appreciated as it provides HCP with high quality summaries/articles of scientific papers/presentations and other medical news. It also allows HCP to subscribe to newsletters, with different frequency options (daily, weekly, monthly) which is perceived as a very positive feature. Moreover, the good customer experience of its interface was highlighted. The same for its personalization through gamification features, for instance, the quiz that helps the HCP to customize their profile and in consequence the content displayed. In the negative side, the strong presence of pharma was mentioned as well as the reduced depth of the articles. Finally, in relation to UpToDate, it is seen as a trustworthy, structured, organized, and intuitive platform. It is a tool intended to support the clinical practice, providing HCP with materials in the broad range of internal medicine. It also offers the possibility of sharing materials with patients (even if we have already concluded that feature not to be very important– Figure 24). The main disadvantage is that UpToDate is not free, and most of the public hospitals are not offering subscriptions.

To anticipate the customer needs in a highly fragmented environment, with scattered information, the idea of developing an aggregation app that could contain MS related information despite the pharmaceutical company disseminating that information was addressed. To assess if such a tool would be well received by the HCP community, the respondents were informed about the rationale behind the tool and asked if they perceived added value and what would be the features that would make this tool an useful one. Figure 36 shows that 78.1% of the respondents would have interest in an aggregator tool, from which 92% prefer this tool to be developed and launch by an independent entity. If the tool was exclusive from a given pharmaceutical company, the probability to install drops to 5.7%. In relation to the features, the conversation in real time and the event information are the two features with more interest.

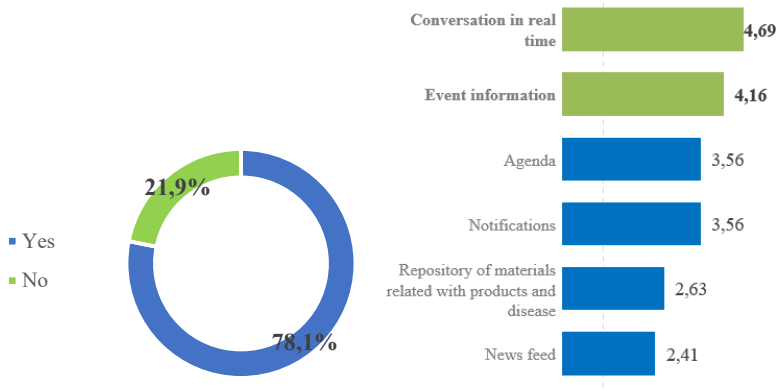

Figure 36 *- Quantitative market research (question 27 and 30): Would you be interested in a platform that aggregates content related to Multiple Sclerosis (disease, products, events, news)? Sort by order of relevance the features to be added to that platform.*

Finally, when asked about what type of materials they usually share with patients, one can conclude from Figure 37, that printed materials still assume a relevant position (61.3%). In an opposite direction, only 9.7% of the HCP show patient Apps to their patients. This low value is quite concerning, as these tools can benefit not only the patient but also the HCP clinical practice through a better patient monitoring and follow-up (via the patient reported outcomes). These results confirm that pharmaceutical companies should focus on showing the added value of patient applications.

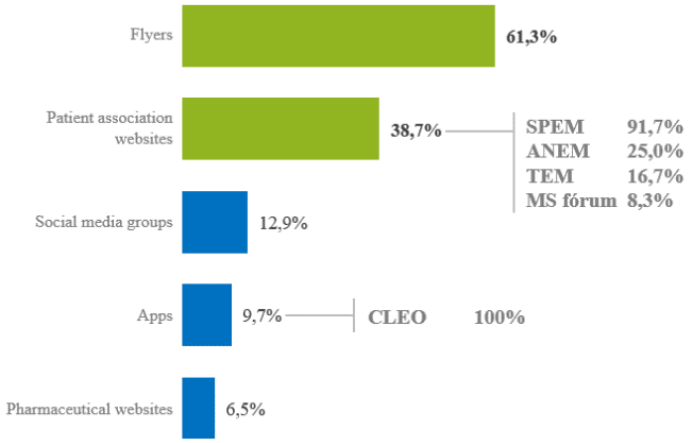

Figure 37 *- Quantitative market research (question 32): What type of materials do you usually share with your patients.*

4.2.2. Pharma Specialist Perspective

To access what are the strategic priorities beyond the pandemic, a set of four interviews around the topics Multichannel Excellence, Business Intelligence & Analytics, Digital Health and

Healthcare Innovation were performed. The full interviews can be read on the Appendix – page 68.

The priorities for the next couple of years are:

- *Pharma needs to adopt a much more detailed approach to (Omnichannel) Customer Engagement Planning*: with whom to engage, through which channel, with what content, in what sequence; This is needed to better plan and understand how pharma is engaging. Typically, the focus has been a lot on ensuring the most expensive channel is provided: the field force with materials to communicate with their customers. With the increased number of channels, there is the need to better plan what content is best shared through which channel and spend time on creating these. In addition, shifting to a real omnichannel way of working, requires channels and their data to be connected, so that an optimal personalized engagement can be built.
- *Data Analytics*: The same way Pharma companies are moving to Global/Regional CRM systems, that should also be the case for Reporting/Analytics system. In fact, there should be one Analytics tool within the company, unless others are needed. This simplifies the life of employees as they get one tool for everything related to data. Centralized data and reports allow for correct insight interpretation across countries, facilitating the internal benchmarking and identifying opportunities in the data. In an omnichannel context, analytics play an extremely important to role to understand which experience and set of channels are ideal for one individual and assess what is working, what is not, and adapt and improve. Finally, proper analytics depends on Data quality. Therefore, Data Governance policies are key to ensure amongst many things, mandatory fields, fit-for-purpose list-of-values dropdown options that give quality to the data but also detail. Data Stewardship should play a vital role in the organization and should be those roles that continually define what the Data governance policies should look like.
- *Deliver innovative solutions*: It is important to elevate the company capabilities to deliver innovative solutions. That is achieved through innovation teams and cross functional execution. The owner of each innovative team will decide upon resource allocation and priorities within a solution line. Moreover, they will be accountable towards design, development, and success of solutions from concept to realization per defined KPIs. External innovation & alliances (EI&A) are key to strive for Impact through excellence and innovation. Therefore, to accelerate internal digital health

efforts, a dedicated team to EI&A should serve as the connective tissue with external tech, start-ups, academia, etc. forging business development & strategic alliances. These include: Digital care & DTx, wearables & sensors, digital measures, imaging & AI/ML, neurotechlabs and academinc & research collaborations.

- *Listening to customers:* Listening to experts and key stakeholders, as well as the analysis of relevant documentation is key. Consider that reality of technology (hardware and software) varies from hospital to hospital. Great solutions can be generated through the partnerships of HCP, pharma, medical societies, and other stakeholders. HCP will always evaluate the cost/opportunity and assess if they should adopt the new service/technology/product or not. Information should be available in a self-service way, so HCP are autonomous to investigate by themselves.

5. Conclusions

The COVID-19 pandemics accelerated the digital transformation in healthcare and consequently in the pharmaceutical sector. Technology has a profound impact on behaviour: patients are now more empowered, and HCP have never had so much information and services available, making their attention more difficult to capture.

The case study results provided valuable insights to answer to the Key Research Questions (KRQ), on page 3.

KRQ 1: The preferred method to search and access to clinical and scientific information are online tools, namely independent websites. The most researched topics are treatment guidelines and product information, mainly through the websites PubMed, MedScape and UpToDate (due to their intuitiveness, credibility and user experience). To optimize HCP search process, an aggregator tool, produced by an independent entity, would be highly appreciated. Ideally, this tool would also work as a communication platform, where HCP could exchange ideas with peers around the globe in real time. In terms of channels, e-mail is the preferred channel as it allows for better time management. As per the use of social media, it is not considered relevant at professional level, yet. Nonetheless, social media have an important role on patient communication, and thus, HCP should be more involved on content production to guarantee neutrality and accuracy.

*KRQ 2: T*he HCP evaluation of the current digital offer is satisfactory, suggesting there is still room for improvement. The most important attributes for HCP in a digital offer are the source credibility, online access and free subscriptions. Moreover, the option of consuming content on demand, at their own time, is highly appreciated. Regarding the new formats webinars and e-Learnings, they are appreciated as they allow HCP to be updated on disease and product information and other relevant information to support their clinical practice. Regarding the podcasts, from the new formats it is the less known one, and it is not considered attractive as a learning tool, yet.

KRQ 3: When asked about the future, neurologists are peremptory to affirm that the future will be hybrid, with both face-to-face and online interactions, and that face-to-face is still the channel with higher impact. However, the offer is so large and the pressure from pharma is so high that it is leading to saturation. Concerning the patient management, patient applications

are, generally, not used, and the communication HCP-patient mainly occurs via e-mail or telephone, besides the consultation. Additionally, patient materials are usually printed. In the event of patients requesting more information, neurologists refer them to patient associations or to nurse care.

KRQ 4: Neurotech and Health Tech are areas with high interest to neurologists, particularly, how they can help to optimize the diagnosis process, as it is well known that early treatment has a huge impact on disease progression ("time is brain").

KRQ 5: From the experts' interviews, it was clear that pharma should focus on digital upskilling internal and external functions. Also, cross-functional collaboration between medical, commercial and value and access teams is important to plan and successfully implement omnichannel customer engagement plans (CEP). Data and Analytics play a key role on the planning and evaluation of the CEP and digital initiatives, allowing teams to react quicky and adapt. It is of the foremost importance to build an agile, centralized infrastructure, without siloes across functions. It was also clear the importance of creating innovation hubs and fostering external collaboration with universities, start-ups, biotechs, amongst other, to expedite digital HCP and patient engagement and contribute to the increase of high quality of care products and services.

In conclusion, in order to embrace digital transformation to provide better services to HCPs, pharma companies should implement digital organizational changes and redefine their operating models (information systems, marketing strategies, strategic management, innovation, and operations management). Moreover, it is not enough to bring the IT to the organization; digital transformation success relies on processes and operations management changes and employees must have the right mindset and be trained to quickly adapt to the new solutions presented by IT. Companies should adopt a "test-and-learn" framework or they will risk falling further behind in an industry that is still struggling to move beyond traditional channels and tactics. Furthermore, in a digital era, pharmaceutical companies should take proactive measures to account for concerns about data privacy.

The concept of value-based HCP-centric is not new to pharma, nor it is the concept of value-based patient-centric care. Nevertheless, to take pharma customer experience to the next level, three key building blocks should be addressed: (i) *Stakeholder engagement framework*: ensure that teams truly consider customer preferences and insights from an omnichannel perspective to shape the planning and execution of effective and meaningful stakeholder

scientific/commercial exchange and medical education; (ii) *Strategic measurement framework*: Define KPIs, metrics, and data collection methods that collectively allow teams to understand the impact of their activities and validate or optimize their initial thinking around stakeholder engagement; and finally (iii) *Operating model*: Create clear and centralized RACI matrices (responsible, accountant, consulted and informed), strategy, planning and execution of multichannel stakeholder engagement.

Finally, pharma should maintain the momentum and focus on the digital mindset and culture shift. Prioritise HCP needs to remain relevant in a competitive and saturated online space. Moreover, pharma, should prioritise the funding or generation of high-quality, unbranded, compliant, bite-sized medical education over high-volume branded promotion.

6. Limitations and Future Work

The main limitation of this thesis is the size of the sample of the market research to address the digital maturity of neurologists (n=45). Thus, the statistical analysis is not very robust.

In a future work the number of neurologists interviewed should be larger so that analysis such as the causal effect of on age, region the country, type of hospital (private *vs*. public) on digital maturity/preferences can be assessed with statistical significance. It would also be interesting to extend the survey to other HCP types, such as nurses or pharmacists to study if there are major differences and assess what are the tactics that work best for each class of professionals. Furthermore, some topics were only lightly analysed, namely, the neurotech topic. It would be beneficial to further investigate to better design tactics that responds to HCP needs/preferences.

Finally, regarding the interviews to pharma representatives, only 4 experts participated. Additionally, 50% of the experts interviewed work on the same company which might have led to a biased analysis. In future analysis more experts should be considered. Online surveys would allow for a better representation.

7. Teaching Notes

7.1. Synopsis

Pharmaceutical marketing can be stated as the actions focused on making health care professionals (HCP) and public aware of new and existing pharmaceutical and health companies, products and brands at the right time and place.

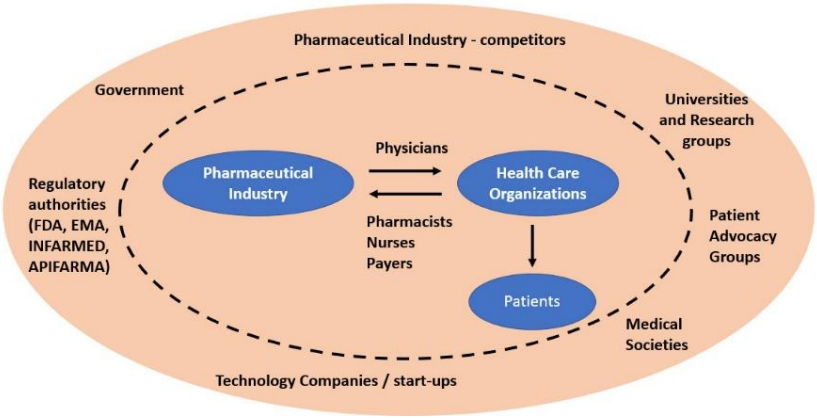

Figure 38 - *Pharmaceutical Market.*

As shown in Figure 38, the pharmaceutical market includes a complex network of stakeholders including industry, government, payers, regulatory authorities, associations and medical societies, health care professionals, patients and patient advocacy groups, pharmaceuticals, health brands and hospitals & clinics (ZS, 2021)

7.2. Teaching Objectives

This case study can be used in Marketing, Digital Transformation or Innovation and Digital Leadership classes for executive master students.

Objectives:

- Understand the theoretical concepts of customer experience management and drivers for a successful implementation.
- Analyse the digital maturity of companies or products – importance and methodologies.
- Discuss innovative approaches for a pharmaceutical company in Portugal to differentiate from competitors.

7.3. Relevant theory

To assess their answers, students should take in consideration not only the case study, but also the following articles:

- Chiplunkar, S. S., Gowda, D. V., & Shivakumar, H. G. (2020). Adaptation Of Pharmaceutical Marketing And Drug Promotion Practices In Times Of Pandemic COVID-19. *International Journal of Health & Allied Sciences*, *9*(1).
- Holmlund, M., Van Vaerenbergh, Y., Ciuchita, R., Ravald, A., Sarantopoulos, P., Ordenes, F. V., & Zaki, M. (2020). Customer experience management in the age of big data analytics: A strategic framework. *Journal of Business Research*, *116*. https://doi.org/10.1016/j.jbusres.2020.01.022
- Westerman, G., Bonner, D., & McAfee, A. (2014). *Leading Digital: Turning Technology into Business Transformation* (H. B. R. Press (ed.)).
- ZS. (2021). *Q&A with AbbVie: Powering CX innovation with digital transformation*. https://www.zs.com/insights

7.4. Teaching plan

Question 1:

According to the literature, customer experience (CX) has emerged as a sustainable source of competitive differentiation. Recent developments in big data analytics (BDA) have exposed possibilities to unlock customer insights for customer experience management (CXM). Figure 39 - A strategic framework for CXM based on CX insights resulting from BDA (Holmlund et al., 2020).

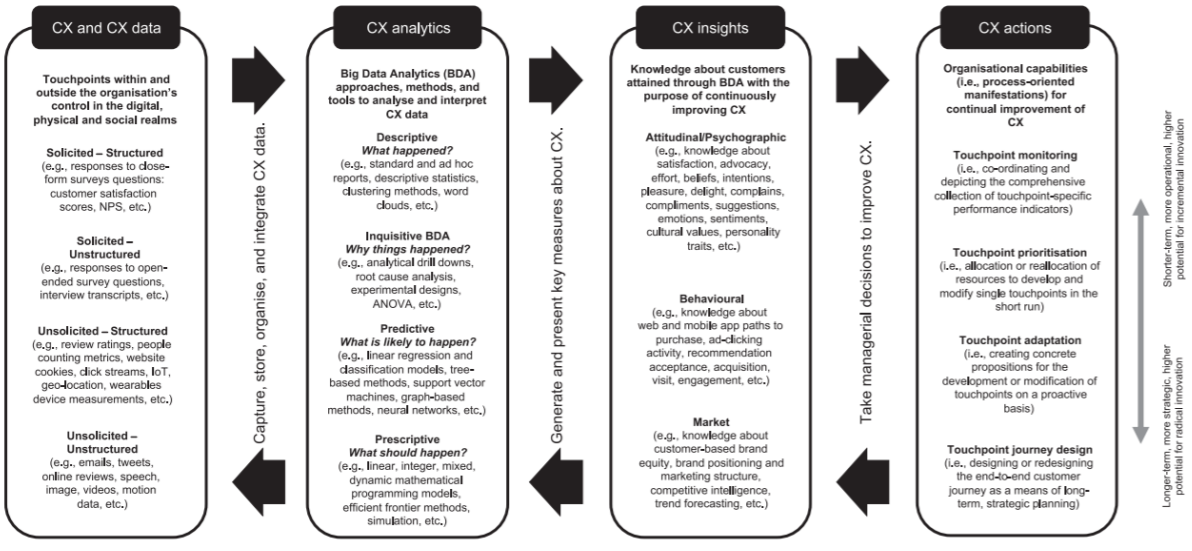

Figure 39 - *A strategic framework for CXM based on CX insights resulting from BDA (Holmlund et al., 2020).*

What are the most common methodologies pharmaceutical companies can use to implement customer experience management of HCP across the different touchpoints of the customer journey? Discuss the drivers for a successful implementation.

Question 2:

It is of foremost importance to assess the digital maturity of the company and its products to work towards an improvement of the same. There are several methodologies that can be used. Discuss the relevance of frameworks such as the Westerman Model and the Gartner Digital IQ Index and provide a new framework that can be more suitable for the pharmaceutical market.

Question 3:

Divide the class in groups of 4 to 6 people.

How can pharma companies stay ahead in the market - competitive advantages needed to survive and strive? Discuss innovative approaches taking in consideration the following topics:

a. Neuroscience's market
b. Partnership with technology companies/ start-ups
c. Open Innovation
d. HCP digital Maturity in Portugal
e. Digital Health and Neurotech

References

Aboshiha, A., Gallagher, R., & Gargan, L. (2019). *Chasing Value as AI Transforms Health Care*. BCG. https://www.bcg.com/publications/2019/chasing-value-as-ai-transforms-health-care

Afonso, E. (2021). *Os Portugueses e as Redes Sociais 2020*. Grupo Marktest. https://www.marktest.com/wap/a/grp/p~96.aspx

Agarwal, R., Dugas, M., Gao, G. (Gordon), & Kannan, P. K. (2020). Emerging technologies and analytics for a new era of value-centered marketing in healthcare. *Journal of the Academy of Marketing Science*, *48*(1). https://doi.org/10.1007/s11747-019-00692-4

Agarwal, R., Gao, G. G., DesRoches, C., & Jha, A. K. (2010). The digital transformation of healthcare: Current status and the road ahead. *Information Systems Research*, *21*(4), 796–809. https://doi.org/10.1287/isre.1100.0327

Agnihothri, S., Cui, L., Delasay, M., & Rajan, B. (2020). The value of mHealth for managing chronic conditions. *Health Care Management Science*, *23*(2). https://doi.org/10.1007/s10729-018-9458-2

Amar, J., Jacobson, R., Kleinstein, B., & Shi, A. (2020). *Redefine the omnichannel approach: Focus on what truly matters*. McKinsey & Company. https://www.mckinsey.com/business-functions/operations/our-insights/redefine-the-omnichannel-approach-focus-on-what-truly-matters

Anderson, C. L., & Agarwal, R. (2011). The digitization of healthcare: Boundary risks, emotion, and consumer willingness to disclose personal health information. *Information Systems Research*, *22*(3), 469–490. https://doi.org/10.1287/isre.1100.0335

Arni, P., & Laddha, S. (2017). Adoption of Digital Marketing in Health Industry. *Sies Journal of Management*, *13*(June).

Atzori, L., Iera, A., & Morabito, G. (2010). The Internet of Things: A survey. *Computer Networks*, *54*(15). https://doi.org/10.1016/j.comnet.2010.05.010

Bélisle-Pipon, J. C. (2021). Pharmaceutical Marketing Ethics: Ethical Standards for More Acceptable Practices. *Journal of Global Marketing*. https://doi.org/10.1080/08911762.2021.1939469

BHARSKAR, G. R., & SIDDHESHWAR, S. (2020). DIGITAL MARKETING IN PHARMACEUTICAL SECTOR. *INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCE AND HEALTH CARE*, *2*(10). https://doi.org/10.26808/rs.ph.i10v2.01

Birchmeier, M. E., & Studer, T. (2019). Automated rating of multiple sclerosis test results using a convolutional neural network. *Studies in Health Technology and Informatics*, *259*. https://doi.org/10.3233/978-1-61499-961-4-105

Birckhead, B., Khalil, C., Liu, X., Conovitz, S., Rizzo, A., Danovitch, I., Bullock, K., & Spiegel, B. (2019). Recommendations for methodology of virtual reality clinical trials in health care by an international working group: Iterative study. In *JMIR Mental Health* (Vol. 6, Issue 1). https://doi.org/10.2196/11973

BNP Paribas. (2019). *Biotechs investments disrupt Big Pharma business model*. https://group.bnpparibas/en/news/biotechs-investments-disrupt-big-pharma-business-model

Bove, R. M., Rush, G., Zhao, C., Rowles, W., Garcha, P., Morrissey, J., Schembri, A., Alailima, T., Langdon, D., Possin, K., Gazzaley, A., Feinstein, A., & Anguera, J. (2019). A videogame-based digital therapeutic to improve processing speed in people with multiple sclerosis: A feasibility study. *Neurology and Therapy*, *8*(1). https://doi.org/10.1007/s40120-018-0121-0

Capo, F., Brunetta, F., & Boccardelli, P. (2014). Innovative business models in the pharmaceutical industry: A case on exploiting value networks to stay competitive. *International Journal of Engineering Business Management*, *6*(1). https://doi.org/10.5772/59155

Cavaliere, C., Vilades, E., Alonso-Rodríguez, M. A. C., Rodrigo, M. J., Pablo, L. E., Miguel, J. M., López-Guillén, E., Sánchez Morla, E. M. A., Boquete, L., & Garcia-Martin, E. (2019). Computer-aided diagnosis of multiple sclerosis using a support vector machine and optical coherence tomography features. *Sensors (Switzerland)*, *19*(23). https://doi.org/10.3390/s19235323

CELforPharma. (2021). *Highlights of the 2021 Across Health Maturometer*. https://www.celforpharma.com/insight/highlights-2021-across-health-maturometer?utm_source=C.E.L.forPharma&utm_medium=email&utm_campaign=all&utm_content=emo

Chiplunkar, S. S., Gowda, D. V., & Shivakumar, H. G. (2020). Adaptation Of Pharmaceutical Marketing And Drug Promotion Practices In Times Of Pandemic COVID-19. *International Journal of Health & Allied Sciences*, *9*(1).

Collobert, R., Weston, J., Bottou, L., Karlen, M., Kavukcuoglu, K., & Kuksa, P. (2011). Natural language processing (almost) from scratch. *Journal of Machine Learning Research*, *12*.

Dang, A., Arora, D., & Rane, P. (2020). Role of digital therapeutics and the changing future of healthcare. *Journal of Family Medicine and Primary Care*, *9*(5). https://doi.org/10.4103/jfmpc.jfmpc_105_20

Darwish, D. (2020). Developing and Implementing Big Data Analytics in Marketing. *International Journal of Data Science and Analysis*, *6*(6).

Das, G., Jain, S. P., Maheswaran, D., Slotegraaf, R. J., & Srinivasan, R. (2021). Pandemics and marketing: insights, impacts, and research opportunities. In *Journal of the Academy of Marketing Science*. https://doi.org/10.1007/s11747-021-00786-y

Dixit, S., & Tedla, J. S. (2019). Effectiveness of robotics in improving upper extremity functions among people with neurological dysfunction: a systematic review. In *International Journal of Neuroscience* (Vol. 129, Issue 4). https://doi.org/10.1080/00207454.2018.1536051

Domingos, P. (2012). A few useful things to know about machine learning. In *Communications of the ACM* (Vol. 55, Issue 10). https://doi.org/10.1145/2347736.2347755

EPG Health. (2021). *The gaps between HCP demand and pharma supply of medical information*. https://www.epghealth.com/pharmaceutical-industry-reports/pharma-supply-of-medical-info.html?utm_source=Gaps_report_2021-AW_B%26Cs&utm_campaign=Gaps_report_2021-AW_B%26Cs

European Union. (2021). *eit Health*. https://eithealth.eu/

Fleming, S. (2021). *A New Perspective On How To Fix Pharma's Broken Business Model*. Forbes. https://www.forbes.com/sites/stanfleming/2021/01/27/fixing-the-broken-business-model-that-threatens-pharmas-future/?sh=2a7bd0363823

Francer, J., Izquierdo, J. Z., Music, T., Narsai, K., Nikidis, C., Simmonds, H., & Woods, P. (2014). Ethical pharmaceutical promotion and communications worldwide: Codes and regulations. In *Philosophy, Ethics, and Humanities in Medicine* (Vol. 9, Issue 1). https://doi.org/10.1186/1747-5341-9-7

Gaedeke, R. M., Tootelian, D. H., & Sanders, E. E. (1999). Value of services provided by pharmaceutical companies: Perceptions of physicians and pharmaceutical sales representatives. *Health Marketing Quarterly*, *17*(1). https://doi.org/10.1300/J026v17n01_03

Gartner. (2021). *Gartner Digital IQ Index*. https://www.gartner.com/en/marketing/research/digital-iq

Gerecke, G., Basir, M., Vikram, A., Can, S., & Laurent, S. (2021). *The Rise of the Next Generation of Medtech "Milkmen."* https://www.bcg.com/publications/2021/six-design-strategies-for-medical-technology-next-generation-commercial-model

Ghasemaghaei, M. (2020). Improving Organizational Performance Through the Use of Big Data. *Journal of Computer Information Systems*, *60*(5). https://doi.org/10.1080/08874417.2018.1496805

Gopal, G., Suter-Crazzolara, C., Toldo, L., & Eberhardt, W. (2019). Digital transformation in healthcare - Architectures of present and future information technologies. *Clinical Chemistry and Laboratory Medicine*, *57*(3). https://doi.org/10.1515/cclm-2018-0658

Hartmann, J., Heitmann, M., Schamp, C., & Netzer, O. (2019). The Power of Brand Selfies in Consumer-Generated Brand Images. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3354415

Hasselgren, A., Kralevska, K., Gligoroski, D., Pedersen, S. A., & Faxvaag, A. (2020). Blockchain in healthcare and health sciences—A scoping review. In *International Journal of Medical Informatics* (Vol. 134).

https://doi.org/10.1016/j.ijmedinf.2019.104040

Health, A. (2021). *Navigator bronze report - Neurology Portugal*.

Hermes, S., Riasanow, T., Clemons, E. K., Böhm, M., & Krcmar, H. (2020). The digital transformation of the healthcare industry: exploring the rise of emerging platform ecosystems and their influence on the role of patients. *Business Research*, *13*(3). https://doi.org/10.1007/s40685-020-00125-x

Holmlund, M., Van Vaerenbergh, Y., Ciuchita, R., Ravald, A., Sarantopoulos, P., Ordenes, F. V., & Zaki, M. (2020). Customer experience management in the age of big data analytics: A strategic framework. *Journal of Business Research*, *116*. https://doi.org/10.1016/j.jbusres.2020.01.022

Ingelheim, B. (2021). *Quantum Computing: Boehringer Ingelheim and Google Partner for Pharma R&D*. https://www.boehringer-ingelheim.com/press-release/partnering-google-quantum-computing

Institute, D. M. (2015). *The Beginner's Guide to Google's Pay Per Click Advertising*. Digital Marketing Institute. https://digitalmarketinginstitute.com/blog/beginners-guide-googles-pay-per-click-advertising

Jackson, K. C., Sun, K., Barbour, C., Hernandez, D., Kosa, P., Tanigawa, M., Weideman, A. M., & Bielekova, B. (2020). Genetic model of MS severity predicts future accumulation of disability. *Annals of Human Genetics*, *84*(1). https://doi.org/10.1111/ahg.12342

Jain, H. (2021). *5 Ways Pharma Marketers Can Enhance Physician Communications Without Call-to-Action Messages*. Pharmaceutical Executive. https://www.pharmexec.com/view/5-ways-pharma-marketers-can-enhance-physician-communications-without-call-to-action-messages

Jamil, F., Ahmad, S., Iqbal, N., & Kim, D. H. (2020). Towards a remote monitoring of patient vital signs based on iot-based blockchain integrity management platforms in smart hospitals. *Sensors (Switzerland)*, *20*(8). https://doi.org/10.3390/s20082195

Jenkins, H. (2007). *Transmedia Storytelling 101*. http://henryjenkins.org/blog/2007/03/transmedia_storytelling_101.html

Jiang, S., Cao, J., Wu, H., Yang, Y., Ma, M., & He, J. (2018). Blochie: A blockchain-based platform for healthcare information exchange. *Proceedings - 2018 IEEE International Conference on Smart Computing, SMARTCOMP 2018*. https://doi.org/10.1109/SMARTCOMP.2018.00073

John, S., Jarvis, S., & Gopalan, S. (2021). *The medical affairs landscape for 2021 and beyond*. ZS Insights. The medical affairs landscape for 2021 and beyond

Juhn, Y., & Liu, H. (2020). Artificial intelligence approaches using natural language processing to advance EHR-based clinical research. *Journal of Allergy and Clinical Immunology*, *145*(2). https://doi.org/10.1016/j.jaci.2019.12.897

Kamalaldin, A., Linde, L., Sjödin, D., & Parida, V. (2020). Transforming provider-customer relationships in digital servitization: A relational view on digitalization. *Industrial Marketing Management*, *89*. https://doi.org/10.1016/j.indmarman.2020.02.004

Khan, M. M. R., & Basak, K. (2021). Shifts in Pharma-Marketing Trends in Post COVID-19 Era. *International Journal of Multidisciplinary: Applied Business and Education Research*, *2*(2). https://doi.org/10.11594/ijmaber.02.02.04

Khanna, V., Ahuja, R., & Popli, H. (2020). Role of Artificial Intelligence in Pharmaceutical Marketing: A Comprehensive Review. *Journal of Advanced Scientific Research*, *11*(3), p54-61.

Kotler, P., Kartajaya, H., & Setiawan, I. (2021). Marketing 5.0: Technology for Humanity. In *Published simultaneously in Canada.*

Kraus, S., Schiavone, F., Pluzhnikova, A., & Invernizzi, A. C. (2021). Digital transformation in healthcare: Analyzing the current state-of-research. *Journal of Business Research*, *123*. https://doi.org/10.1016/j.jbusres.2020.10.030

Krendyukov, A., & Nasy, D. (2020). Evolving Communication with Healthcare Professionals in the Pharmaceutical Space: Current Trends and Future Perspectives. In *Pharmaceutical Medicine* (Vol. 34, Issue 4). https://doi.org/10.1007/s40290-020-00341-0

Lakshmi, B., & Patel, S. (2020). Digital Marketing in Pharmaceutical Industry-An Overview and Assessment. In *All Rights Reserved International Journal of Pharmaceutical Science & Innovation* (Vol. 1, Issue 1).

Laurenza, E., Quintano, M., Schiavone, F., & Vrontis, D. (2018). The effect of digital technologies adoption in healthcare industry: a case based analysis. *Business Process Management Journal*, *24*(5), 1124–1144. https://doi.org/10.1108/BPMJ-04-2017-0084

Law, M. T. K., Traboulsee, A. L., Li, D. K. B., Carruthers, R. L., Freedman, M. S., Kolind, S. H., & Tam, R. (2019). Machine learning in secondary progressive multiple sclerosis: an improved predictive model for short-term disability progression. *Multiple Sclerosis Journal - Experimental, Translational and Clinical*, *5*(4). https://doi.org/10.1177/2055217319885983

Lee Ventola, C. (2014). Mobile devices and apps for health care professionals: Uses and benefits. *P and T*, *39*(5).

Lim, W. M. (2021). A marketing mix typology for integrated care: the 10 Ps. *Journal of Strategic Marketing*, *29*(5), 453–469. https://doi.org/10.1080/0965254X.2020.1775683

Loucks, J., Noronha, A., Macaulay, J., & Wade, M. (2016). Digital vortex: How today's market leaders can beat disruptive competitors at their own game. *Global Center for Digital Business Transformation*.

Ma, X., Zhang, L., Huang, D., Lyu, J., Fang, M., Hu, J., Zang, Y., Zhang, D., Shao, H., Ma, L., Tian, J., Dong, D., & Lou, X. (2019). Quantitative radiomic biomarkers for discrimination between neuromyelitis optica spectrum disorder and multiple sclerosis. *Journal of Magnetic Resonance Imaging*, *49*(4). https://doi.org/10.1002/jmri.26287

Mackintosh, A. (2004). Innovation in Pharmaceutical Marketing Strategy: How to Overcome the 30-Second Detailing Dilemma. *Journal of Medical Marketing: Device, Diagnostic and Pharmaceutical Marketing*, *4*(1). https://doi.org/10.1057/palgrave.jmm.5040138

Marques, I. C. P., & Ferreira, J. J. M. (2020). Digital transformation in the area of health: systematic review of 45 years of evolution. *Health and Technology*, *10*(3), 575–586. https://doi.org/10.1007/s12553-019-00402-8

Martins, H. (2021). *Digital Healthcare Systems*. https://www.henriquemartins.eu/

Matej Mikulic. (2021). *Global pharmaceutical industry - statistics & facts*. https://www.statista.com/topics/1764/global-pharmaceutical-industry/#:~:text=The pharmaceutical industry is responsible,trillion U.S. dollars in 2019.

Matthews, P. M., Block, V. J., & Leocani, L. (2020). E-health and multiple sclerosis. *Current Opinion in Neurology*, *33*(3), 271–276. https://doi.org/10.1097/WCO.0000000000000823

Medina Aguerreber, P., González Pacanowski, T., & Medina, E. (2020). Promoting Pharmaceutical Companies' Reputation through Facebook: the case of Spain. *Harvard Deusto Business Research*, *9*(2). https://doi.org/10.48132/hdbr.306

Melville, D. (2021). *Post-Pandemic Physician Engagement: 4 Areas to Consider When Rethinking Your Sales Talent and Their Approach*. Pharmaceutical Executive. https://www.pharmexec.com/view/post-pandemic-physician-engagement-4-areas-to-consider-when-rethinking-your-sales-talent-and-their-approach

Meskó, B. (2021). *Big Tech In Medicine: How Amazon, Apple, Microsoft, Google, IBM & NVIDIA Disrupt Healthcaree*.

Moa, A. (2020). *5 Pharma Trends for 2021: Disruption and Transformation in the COVID Era*. TRiBECA® Knowledge. https://www.tribecaknowledge.com/blog/5-pharma-trends-for-2021-disruption-and-transformation-in-the-covid-era

Moro-Visconti, R. (2021). E-Health and Telemedicine Startup Valuation. In *Startup Valuation*. https://doi.org/10.1007/978-3-030-71608-0_14

Naicu, C., & Sciences, E. (2020). *Revista Econom ică 72:3 (2020) ECONOMY AND DIGITAL TRANSFORMATION IMPACTING HEALTHCARE COMPANIES*. *3*, 66–74.

Nawrat, A. (2021). *Enter Amazon Pharmacy: the beginning of a great online pharmacy fight?* https://www.pharmaceutical-technology.com/features/amazon-pharmacy-disruption-healthcare/

Nedellec, A.-S. (2021). *What can a VC do for your brain?* https://blog.newfundcap.com/what-can-a-vc-do-for-your-brain/

Neurotech Analytics. (2020). *Neurotech Landscape 2020*. https://www.neurotech.com/2d-mindmap

Newswide, C. P. (2021). *Veeva Vault CDMS Delivers Agility and Speed for Oncology Trials*. https://www.prnewswire.com/news-releases/veeva-vault-cdms-delivers-agility-and-speed-for-oncology-trials-301399149.html

Noy, T., & Woywod, B. (2021). *Market Segmentation with Novel Machine Learning*. Pharmaceutical Executive. https://www.pharmexec.com/view/market-segmentation-with-novel-machine-learning

Olson, E. M., Olson, K. M., Czaplewski, A. J., & Key, T. M. (2021). Business strategy and the management of digital marketing. *Business Horizons*, *64*(2). https://doi.org/10.1016/j.bushor.2020.12.004

Onik, M. M. H., Aich, S., Yang, J., Kim, C.-S., & Kim, H.-C. (2019). Blockchain in Healthcare: Challenges and Solutions. In *Big Data Analytics for Intelligent Healthcare Management*. https://doi.org/10.1016/b978-0-12-818146-1.00008-8

Paranjape, K., Schinkel, M., Panday, R. N., Car, J., & Nanayakkara, P. (2019). Introducing artificial intelligence training in medical education. In *JMIR Medical Education* (Vol. 5, Issue 2). https://doi.org/10.2196/16048

Parekh, D., Kapupara, P., & Shah, K. (2016). Digital pharmaceutical marketing: A review. In *Research Journal of Pharmacy and Technology* (Vol. 9, Issue 1). https://doi.org/10.5958/0974-360X.2016.00017.2

Paul, D., Sanap, G., Shenoy, S., Kalyane, D., Kalia, K., & Tekade, R. K. (2021). Artificial intelligence in drug discovery and development. In *Drug Discovery Today* (Vol. 26, Issue 1). https://doi.org/10.1016/j.drudis.2020.10.010

Paul, L., Renfrew, L., Freeman, J., Murray, H., Weller, B., Mattison, P., McConnachie, A., Heggie, R., Wu, O., & Coulter, E. H. (2019). Web-based physiotherapy for people affected by multiple sclerosis: a single blind, randomized controlled feasibility study. *Clinical Rehabilitation*, *33*(3). https://doi.org/10.1177/0269215518817080

Pestun, I. V., & Mnushko, Z. M. (2016). Effectiveness of current multi-channel marketing in pharmacy. *Upravlìnnâ, Ekonomìka Ta Zabezpečennâ Âkostì v Farmacìï*, *0*(1(45)). https://doi.org/10.24959/uekj.16.2

PricewaterhouseCoopers. (2009). *Pharma 2020: Challenging business models*. https://www.pwc.com/gx/en/pharma-life-sciences/pdf/challenge.pdf

Quilici, E. (2021). *Multichannel Marketing: Integrating Omnichannel*. Pharmaceutical Executive. https://www.pharmexec.com/view/multichannel-marketing-integrating-omnichannel

Raghavendra, U., Acharya, U. R., & Adeli, H. (2020). Artificial Intelligence Techniques for Automated Diagnosis of Neurological Disorders. In *European Neurology* (Vol. 82, Issues 1–3). https://doi.org/10.1159/000504292

Reis, J., Amorim, M., Melão, N., & Matos, P. (2018). Digital transformation: A literature review and guidelines for future research. *Advances in Intelligent Systems and Computing*, *745*(May), 411–421. https://doi.org/10.1007/978-3-319-77703-0_41

Relations, I. (2021). *Biogen to Launch Pioneering Study to Develop Digital Biomarkers of Cognitive Health Using Apple Watch and iPhone*. https://investors.biogen.com/news-releases/news-release-details/biogen-launch-pioneering-study-develop-digital-biomarkers

Restuccia, F., D'oro, S., Kanhere, S. S., Melodia, T., & Das, S. K. (2018). Blockchain for the Internet of Things: Present and Future Mobile Crowdsensing and Crowdsourcing View project Distributed Management of SDN/NFV networks View project Blockchain for the Internet of Things: Present and Future. In *IEEE INTERNET OF THINGS JOURNAL* (Vol. 1, Issue 1). https://www.researchgate.net/publication/329044700

Rivkin, S. (2021). *Scientific Storytelling for Medical Affairs*. Phamaceutical Executive. https://www.pharmexec.com/view/scientific-storytelling-for-medical-affairs

Salimzadeh, Z., Damanabi, S., Kalankesh, L. R., & Ferdousi, R. (2019). Mobile applications for multiple sclerosis: A focus on self-management. *Acta Informatica Medica*, *27*(1). https://doi.org/10.5455/aim.2019.27.12-18

Samuel, A. L. (2000). Some studies in machine learning using the game of checkers. *IBM Journal of Research and Development*, *44*(1–2). https://doi.org/10.1147/rd.441.0206

Schreiner, T., Rese, A., & Baier, D. (2019). Multichannel personalization: Identifying consumer preferences for product recommendations in advertisements across different media channels. *Journal of Retailing and Consumer Services*, *48*. https://doi.org/10.1016/j.jretconser.2019.02.010

Senbekov, M., Saliev, T., Bukeyeva, Z., Almabayeva, A., Zhanaliyeva, M., Aitenova, N., Toishibekov, Y., & Fakhradiyev, I. (2020). The recent progress and applications of digital technologies in healthcare: A review. *International Journal of Telemedicine and Applications*, *2020*. https://doi.org/10.1155/2020/8830200

Shrestha, Y. R., Krishna, V., & von Krogh, G. (2021). Augmenting organizational decision-making with deep learning algorithms: Principles, promises, and challenges. *Journal of Business Research*, *123*, 588–603. https://doi.org/10.1016/j.jbusres.2020.09.068

Srivastava, S., Vikram Singh, S., Bhadur Singh, R., & Kumar Shukla, H. (2021). Digital Transformation of Healthcare: A Blockchain study INO-ICAL View project Internet of things security View project Saijshree Srivastava Babu Banarasi Das Group Of Educational Institutions Digital Transformation of Healthcare: A Blockchain study. In *IJISET-International Journal of Innovative Science, Engineering & Technology* (Vol. 8). www.ijiset.com

Sturchio, J. L. (2021). *Digital health and neurotech: the future is now*. The Boston Globe. http://sponsored.bostonglobe.com/biogen/digital-health-and-neurotech/

Sun, R., Hsieh, K. L., & Sosnoff, J. J. (2019). Fall Risk Prediction in Multiple Sclerosis Using Postural Sway Measures: A Machine Learning Approach. *Scientific Reports*, *9*(1). https://doi.org/10.1038/s41598-019-52697-2

Survey Monkey. (2021). *Três métricas importantes para medir a experiência do cliente*. Survey Monkey. https://pt.surveymonkey.com/mp/measuring-customer-experience/

Tallner, A., Pfeifer, K., & Mäurer, M. (2016). Web-based interventions in multiple sclerosis: The potential of tele-rehabilitation. In *Therapeutic Advances in Neurological Disorders* (Vol. 9, Issue 4). https://doi.org/10.1177/1756285616640684

Van Beek, J. J. W., Van Wegen, E. E. H., Bol, C. D., Rietberg, M. B., Kamm, C. P., & Vanbellingen, T. (2019). Tablet app based dexterity training in multiple sclerosis (TAD-MS): Research protocol of a randomized controlled trial. *Frontiers in Neurology*, *10*(FEB). https://doi.org/10.3389/fneur.2019.00061

Van Hecke, W. (2021). *Personalized medicine in neurology*. Digital Health & CNS Disorders. https://www.linkedin.com/pulse/personalized-medicine-neurology-wim-van-hecke/?trackingId=

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Qi Dong, J., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, *122*(September 2019), 889–901. https://doi.org/10.1016/j.jbusres.2019.09.022

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. In *Journal of Strategic Information Systems* (Vol. 28, Issue 2). https://doi.org/10.1016/j.jsis.2019.01.003

Westerman, G., Bonner, D., & McAfee, A. (2014). *Leading Digital: Turning Technology into Business Transformation* (H. B. R. Press (ed.)).

Wolfgang. (2020). *Wolfgang Digest*. https://www.wolfgangdigital.com/

Yousaf, K., Mehmood, Z., Awan, I. A., Saba, T., Alharbey, R., Qadah, T., & Alrige, M. A. (2020). A comprehensive study of mobile-health based assistive technology for the healthcare of dementia and Alzheimer's disease (AD). *Health Care Management Science*, *23*(2). https://doi.org/10.1007/s10729-019-09486-0

ZS. (2021). *Q&A with AbbVie: Powering CX innovation with digital transformation*. https://www.zs.com/insights

Appendices

Appendix 1 – Complement to the Literature Review

Phases of digital transformation

Table 3 - Phases of digital transformation

Phases of digital transformation	Description
Digitization	It is the encoding of analog information into a digital format such that computers can store process and transmit such information. Digitization mainly digitalizes documentation processes but does not change value creation activities.
Digitalization	Describes how IT or digital technologies can be used to alter existing business processes or tasks. For example, the creation of new online or mobile communication channels that allow all customers to easily connect with firms, and which change traditional firm-customer interactions.
Digital transformation	Goes beyond digitalization, and describes a company-wide change that introduces a new business model to create and capture value (improve business performance), which may be new to the firm or industry, through the convergence of multiple technology innovations enabled by connectivity (Vial, 2019). Involves changes in strategy, organization, information technology (IT), supply chains and marketing (Reis et al., 2018). The most relevant technology innovations include big data and analytics; cloud computing and other platform technologies; mobility solutions and location-based services; social media and other collaborative applications; connected devices and the Internet of Things (IoT); artificial intelligence (IA) and machine learning (ML); and virtual reality (VR) (Loucks et al., 2016).

Strategic imperatives of digital transformation

Table 4 - Strategic imperatives of digital transformation (Reis et al., 2018).

Strategic imperatives of digital transformation	Description
Digital resources	One can consider the digital assets (storage of data, information and communication infrastructure and other technologies), digital agility (ability to sense and seize market opportunities provided by digital technologies), digital networking capability (ability to connect users to address their mutual needs through digital means) and big data capability (acquisition of large sets of information and decision making
Organizational structure	Agility is key as the company should be fast to detect valuable technologies and to recognize customer needs. Thus, flexible structures composed of separate business units from the headquarters, agile organizational forms, and digital functional areas are recommended in several studies. With autonomous and lean business units, companies can develop new and disruptive business models allowing for experimentation and quick learning, as well as avoiding cannibalization perils, bureaucracy, and conflicts. It is also important to empower IT and analytical functions, which should acquire an orchestration role, contributing to digital value creation.
Concerning metrics and goals	To measure the performance of digital transformation initiatives and continuously improve strategies/business models, companies use different key performance indicators (KPIs) according to the phase they are in (digitation, digitalization, or digital transformation). During digitization and digitalization, KPIs are usually based on metrics such as website clicks, video views, mobile downloads and overall outcome-related metrics like ROI, profitability, and revenue growth. In the digital transformation phase, it is important to track intermediate results via process-related metrics to assess how well the new digital business model is creating value (e.g., online sentiment, engagement, network co-creation and value sharing) as well as measure the generated revenues, profits and improved investor value.

Digital Technologies and applications in healthcare

Table 5 - Digital Technologies description and applications in healthcare

Digital technologies	Description and applications in healthcare
Big data and electronic health records (HER)	According to Gartner Glossary: "Big Data is high-volume, high-velocity and/or high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision making, and process automation" (Senbekov et al., 2020). Big data and data analytics is used in healthcare to improve and optimize the management, analysis, and forecasting. The application of big data systems in the management of medical practice has the potential to improve the quality and efficiency of the service, lower the cost of care, and the number of medical errors (Darwish, 2020). Apart from the pure clinical field, big data applications in healthcare also cover biomedical research, opening the floor for personalized medicine. Big data in HC is the foundation for electronic health records (EHR), "A repository of patient data in digital form, stored and exchanged securely, and accessible by multiple users". EMR are "digitalized systems which functionally provide patient history, patient demographics and registration details" (Kraus et al., 2021). Through EHR, patient data is stored in a standard and centralized manner, allowing for a correct and timely interpretation of information, which ultimately leads to informed clinical decisions, decreasing redundancy in services and medical errors (Agarwal et al., 2010). Besides data storage, information sharing and system integration, HER allows for real word data collection and statistical analysis of signs and symptoms before and after treatment, providing important sources for research (Marques & Ferreira, 2020). One example is the MSBase, by far the largest internationally aggregated registry for multiple sclerosis and neuroimmunological disorders. Recent applications using this database have improved estimates of the risk of disease progression (Matthews et al., 2020). Currently, the world-leading health organizations are working together to create a global Electronic Health Passport, that should contain clinical observations, medical history, information about treatment, vaccination, prescribed drugs, allergic reactions, symptoms, health status, and results from diagnostic studies, to strengthen health care.
Artificial Intelligence	Artificial Intelligence (AI) uses computer algorithms to perform specific tasks that once required human intelligence (Shrestha et al., 2021). Machine learning (ML) is a subdomain within the field of AI that provides computers with "the ability to learn without being explicitly programmed" (Samuel, 2000). Decision-makers in organizations can draw on such processing capabilities to learn and augment their decision-making capacity by gaining new insights into emerging phenomena, making predictions and extracting information from enormous quantities of data (Ghasemaghaei, 2020). Deep Learning (DL) algorithms, a subset of ML algorithms, excel at extracting patterns and making accurate predictions from unstructured data (such as images, text, and video), making them particularly pertinent to information processing in organizations (Hartmann et al., 2019). Deep learning–augmented decision-making (DLADM) is being used in targeting, monitoring and scheduling processes. Consumers' digital footprints, such as text, digital images, login information, and GPS location data, enable companies to target appropriate customer groups with product recommendation and marketing decisions (Shrestha et al., 2021). DL also allows for real-time monitoring of data, which could lead to proactive or preventive augmentation of decision making (Shrestha et al., 2021). Finally, DL is increasingly being used for developing prognostic systems for scheduling, resource allocation, and planning in manufacturing (Domingos, 2012). Another development in this area is Natural Language processing (NPL). In this case machines learn how to replicate the human way of communicating, which covers both written and spoken language. NPL is a critical aspect in the development of AI, especially for one requiring language inputs, such as in voice assistants (e.g. Apple Siri or Google Assistant) (Collobert et al., 2011). Other application of NPL is the extraction of information from clinical narratives in electronic health records (that contain valuable clinical information in the form of clinical narratives) (Juhn & Liu, 2020). The main areas of the applications of AI in medicine are health monitoring, patients' data management, drug development, surgery, remote consultation, medical statistics, personalized treatment, and imaging. The application of AI to diagnostic platforms, namely radiology platforms, can significantly increase the efficiency of medical operation capacities through self-training of machines for reading images (MRI, CT, and ultrasound) and their quick analysis in order to make

	an accurate diagnosis and treatment planning (Raghavendra et al., 2020). Moreover, it can contribute to the optimization of treatment processes thus leading to an increase in therapeutic efficiency, patient satisfaction, and lower costs. AI can also facilitate conducting biomedical experiments and clinical trials. Another promising field for AI application is medical education (Paranjape et al., 2019). According to the McKinsey Global Institute, the rapid advances in AI-guided automation will change the work culture of society. In literature, it is reported the association of several pharmaceutical companies and AI organizations that are working in fields including oncology, cardiovascular diseases, and central nervous system disorders (D. Paul et al., 2021) and (Ma et al., 2019). Also, in the area of the neurologic diseases, such as multiple sclerosis, there are several applications of IA for the selection of biomarkers, patient reported outcomes (PROs) and clinician-assessed outcomes (CAOs) predictive of the future progression of the disease (Cavaliere et al., 2019), (Jackson et al., 2020), (Law et al., 2019), (Sun et al., 2019) and (Birchmeier & Studer, 2019).
Smart Devices and Internet of things (IoT)	The basic idea of the Internet of Things (IoT) is the presence of things or objects around human - such as Radio Frequency IDentification (RFID) tags, sensors, actuators, mobile phones, etc. - which, through unique addressing schemes, are able to interact with each other and cooperate with their neighbours to reach common goal (Atzori et al., 2010). Smart devices can be utilized not only for collecting health information but also as communication platforms in healthcare. Such devices can create a continuous data flow, while monitoring the state of health, making them a massive data source (big data). Integration of this data with other existing medical data can help in monitoring health, modelling the spread of pathology, and finding ways to contain the outbreak of a particular disease. Due to the technological evolution, smartphones (mobile apps), wearable devices and sensors are now easily available at convenient prices. Also, open-source libraries have become more available and engineering frameworks integrated and application programming Interfaces (APIs) reduced. The combination of these factors with connectivity, allows self-monitoring, at real-time, of important health indicators, such as vital signs. Through these smart devices, information can be shared between patients and HCP and among health care professionals. This is particularly important for chronic diseases, where the patient has consultations every six months, and therefore, important information might be missed. Furthermore, it can also decrease healthcare costs by decreasing the number of hospitalizations or doctor appointments. A few promising early studies have reported combining wearables with internet-based interventions for gait rehabilitation (Tallner et al., 2016) and (L. Paul et al., 2019). Early efforts using a smart tablet-based app for dexterity training have been described (Van Beek et al., 2019). In the future, 'gamification' of rehabilitation (and testing) apps could promote adherence (Bove et al., 2019). Plus, there is potential to extend capabilities using robotics (Dixit & Tedla, 2019).
mHealth and Telemedicine	According to Prescient & Strategic Intelligence (2020), *mHealth* is the practice of delivering healthcare services with the help of mobile devices and personal digital assistants (PDAs), through wireless networks (Moro-Visconti, 2021). *Telehealth*, a form of mHealth, is the distribution of health-related services and information via electronic information and telecommunication technologies. It allows long-distance patient and clinician contact, care, advice, reminders, education, intervention, monitoring and remote admissions (Arni & Laddha, 2017). Moreover, telehealth can be used for rehabilitation, for instance, via a support group to reduce loneliness in multiple sclerosis patients. *Telemedicine* is a subset of telehealth that allows "the delivery of HC services, where distance is a critical factor, by […] using ICT for […] treatment and prevention of disease and injuries, research and evaluation, and for continuing education of HC providers, all in the interests of advancing the health of individuals and their communities" (Kraus et al., 2021). Telemedicine allows remote monitoring of patients, distance education, improving administration and management of healthcare, integration of health data systems, and patient movement tracking. Telemedicine is also broadly linked to *MedTech* – technology that can be used in a care setting to solve a health problems and improve quality of lives (Salimzadeh et al., 2019).
Virtual Clinical Trials	Another promising area in medical research is virtual clinical trials. These include technologies used for remote patient health information retrieval, including tablets, apps, wearables or sensors. These platforms can be described as decentralized trials, distance trials, patient-specific trials, or hybrid trials (Birckhead et al., 2019). A virtual clinical trial includes patients recruiting and consent and data collection, without the existence of physical sites and direct interaction with patients.

Blockchain	One more rapidly growing area is the application of Blockchain technology for healthcare. According to IBM, 70% of healthcare leaders predict that the blockchain's greatest influence in healthcare will be to improve clinical trial management, regulatory compliance, and a decentralized structure for sharing electronic medical records. Ensuring the safety and protection of medical data is currently the main application of blockchain. The global market for healthcare blockchain technology is expected to exceed $500 million by 2022 (Hasselgren et al., 2020). Blockchain technology is based on a peer-to-peer platform that provides an opportunity to securely store the information on thousands of servers. This information can be simultaneously used and shared within a decentralized and open network. Every new transaction made must be checked by an individual in this network. When every transaction is verified by all nodes in a network on a block of a blockchain, it becomes increasingly unchanged (Restuccia et al., 2018). Key components of blockchain technology (Srivastava et al., 2021): - *Decentralized:* Database system with open access control system for any person connected to the network. Multiple systems may access, monitor, store, or update data. - *Transparent:* For potential users, the recorded & saved data on a blockchain is transparent and easy to update. Blockchains ' transparency should certainly avoid data being modified or stolen. - *Immutable:* Once stored, records will always be stored, and it is not easy to modify without control of over 51% of the node simultaneously. - *Autonomy:* Blockchain system is autonomous & independent, allowing each blockchain system node to access, transfer, and store & updates data securely and free of outside interference and trust. - *Open Source:* Blockchain technology is designed to allow access to the open-source for all network- connected persons. This irrepressible versatility not only helps everyone to review documents publicly but also to build numerous imminent applications. - *Anonymity:* When data is transferred among nodes, the individual's identity remains anonymous and therefore makes it a safer and more reliable system. Because of the attributes mentioned above, blockchain can be used to improve and obtain a higher level of interaction, information exchange, access control, and the origin and integrity of the data among the healthcare stakeholders (Onik et al., 2019). Some applications of blockchain in healthcare are (Jiang et al., 2018): - *Electronic Health Records*: The incorporation of EHR software into a centralized blockchain directory from data generation to data recovery point without human intercession is assured. - *Clinical Research*: Blockchain introduced a decentralized secure framework for all possible clinical research information collaborations. This allows data to be shared securely with research groups. - *Medical Fraud Detection*: identify fraud and ultimately makes a transparent and secure transaction by not allowing replication or alteration of a transaction. - *Neuroscience Research*: brain enhancement, brain reproduction and brain thinking. It undoubtedly requires a platform to store the whole human brain and blockchain innovation might be the answer. - *Pharmaceutical Industry and Research*: Blockchain monitors each of the pharmaceutical supply chain stages using its power of detailed traceability: Medicine origin, its constituents, and ownership are often identified at every stage to prevent forging or stealing of goods.
3D Printing	Over the past decade, 3D printing technology has been increasingly used in healthcare. At this point, although direct printing of tissues and organs is still in its infant stage, domestic and international researchers using printed tissues and organs have begun to study the possibility of 3D printing of organs and blood vessels. In fact, 3D printing technology allows the surgeon to provide a physical 3D model of the desired patient's anatomy site, which can be used to accurately plan access and cross- sectional 3D imaging. 3D printing can also be used to make custom implants or surgical instruments, thus allowing the individualization of instruments and prostheses without increasing costs.
AR and VR	In the field of three-dimensional user interface innovation, Augmented Reality (AR) and Virtual Reality (VR) stand out. AR combines real-world and virtual objects, merging virtual & physical environments by integrating spatial & sensorial feelings and operates at common devices like iPads

	to create a learning experience with no additional equipment. Virtual Reality (VR), by comparison, is a virtual world immersive experience and implies the use of specialized hardware and headsets. In healthcare, AR helps to create rich interactive experiences that demonstrate the interaction of medicines & medical devices with the body. Also, brand teams & content providers may use this disruptive technology to better engage healthcare professionals (HCP) in their field. Finally, AR can help HCPs with patient education.
Digital Twin	Digital twins are utilized to create exact models of environment that are as dynamic as the physical environment, using computer systems & industrial technology. For healthcare, a digital twin provides a secure environment for providers & manufacturers, by testing in a virtual (person/ device) system version that is driven by abundant data from the actual system, to check the effect of a possible change on HC process.

Digital Marketing Tactics

Table 6 - *Digital Marketing tactics (Krendyukov & Nasy, 2020).*

Digital tactics	Description
Pay Per click Ads	Pay per click (PCC) ads are a paid strategy to increase traffic to a website. It is a model of internet marketing in which advertisers pay a fee each time an add is clicked. For a PCC Ads campaign to be successful, the company should carefully select the keywords and then organize them into clusters, each of them redirects to a landing page that is more prone to get conversion. With tools such as Google Analytics, the results from the campaign can be closely followed allowing the constant optimization of the keywords and Ads (Institute, 2015). This is particularly important in pharmaceutical industry websites for HCPs as, in general, they are gated, and conversion is harder to achieve. One of the most popular PCC advertising systems is Google Ads, but there are other PCC marketing channels such as LinkedIn Business Solutions, Facebook, or Instagram, very useful and efficient to reach general public about new events/webinars or patient Apps/websites.
Search engine optimization (SEO) and Search Engine Marketing (SEM)	The most common way to find products or details is via search engines. According to Bharskar et al, healthcare information search is one of the most common online activities among internet users. Moreover, it is known that the top 10 search results receive 78% higher visitors than trailing lists (BHARSKAR & SIDDHESHWAR, 2020). By using search engine optimization, search ranks are manipulated on Google or any other search engine. SEO search engine optimization is a search engine developed for the market research and development. Important aspects of search engine optimization are keyword usage in titles and URLs, internal links on the website, backlinks from other websites, proper use of alt tags with images, and social network activity. Search Engine Marketing (SEM) and programmatic advertising are the strategies to sponsor ads in search engines or in advertising space on website banners, e.g., Medscape or Univadis.
Social media marketing	Social Media Marketing (SMM) refers to the use of social media and social networks to market a company's products and services. As Jim Sterne alluded to the three main goals of social media are increase the revenues, decrease the costs (when compared with traditional advertising), and improve customer satisfaction. Social networks can operate at different levels, such as relationship networks (Facebook, twitter), professional networks (LinkedIn), community networks (social networks in neighbourhoods or cities), political networks, among others. According to Seth Godin in "Tribes: We Need You to Lead Us", "consumers are either connected to an idea (pools), to one another (webs) or to a leader (hubs)." Social media is the strongest and most stable form of community because the people in there are bound by many and varied relationships (web). In a Marktest report ("Os portugueses e as redes sociais 2020"), the top five features used in social media in Portugal are, by descending order, send/receive messages, watch videos, chat, comment posts from friends and read news. It was also reported that 96.0% of users visit, at least once per week, Facebook, 95.7% WhatsApp and 94.6% YouTube. Also to note that 73.3% of the respondents had an Instagram account and 40.7% a LinkedIn account (Afonso, 2021). In a study presented by Lakshmi et al, 65.2% of the respondents believed that social media marketing had a greater impact on them (Lakshmi & Patel, 2020). Moreover, social media marketing enables direct connection of the pharmaceutical companies with its consumers and strategies such as engagement with social influencers should be used to increase campaign success (15+% of click through rate when compared with banner)

	(Wolfgang, 2020). The management of social media for improving relationships with stakeholders involves three main aspects: 1) health organizations should spread accurate corporate information; 2) these organizations should establish an innovative knowledge management system in order to use the stakeholders' feedback to improve their services; and 3) health organizations should use social media for better understand patient and HCPs behaviours and expectations (Medina Aguerreber et al., 2020).
E-mail marketing	Connectivity and mobile make e-mails easily accessible. Because of its extremely low cost, e-mail has emerged as a high-intensity channel for delivering messages to consumers. Also, the ExactTarget report showed that 77% of consumers prefer receiving permission-based marketing communications through e-mail, compared to social channels (6%) and text messaging (5%) (BHARSKAR & SIDDHESHWAR, 2020). E-mail gives consumers the sense of control (due to the consent request) and personalization (they receive information they opted in to receive). Companies should also work on e-mail marketing optimization to increase the conversion rate and build long-lasting relationships with their audience. The pharmaceutical companies that use artificial intelligence will have a competitive advantage, as they can use it to accelerate the optimization, namely, to adjust the recipient lists/content (according to HCP segmentation) and the e-mail subjects and therefore reach higher open and click through rates.
E-detailing	Electronic detailing (e-detailing) describes the use of digital technology for promotional activities for pharmaceutical products, mainly via the Internet. E-detailing should be interactive, providing opportunities for HCPs (or other stakeholders) to actively engage with content. AR and/or VR can be an option in e-detailing. According to Bharskar et al, e-details can increase the total time of a face-to-face or remote call (BHARSKAR & SIDDHESHWAR, 2020).
Electronic continuing medical education / webinars	Online conferences, meetings and educational trainings can be organized and broadcasting through e-CMEs. Webinars enable remote participation of the HCPs, saving time and costs (travel, accommodation, meals and even attendance fees). Moreover, live broadcasting by means of streaming video of a conference will enable event organizers, in this case pharmaceutical companies to extend their meeting visibility. The future will probably be hybrid meetings, that combine live with virtual.
Mobile Apps	Faster processors, improved memory, smaller batteries, and highly efficient open-source operating systems paved the way for the development of medical mobile device apps. Patients and HCPs expect pharmaceutical companies to develop innovative apps that facilitate diagnosis, treatment choice, symptoms management and administration in remote settings. Many medical apps are already available for electronic prescribing, diagnosis and treatment, practice management, coding and billing, CME and e-learning. It is also available a wide choice of apps that support HCP clinical practice at the point of care, such as: drug reference guides, medical calculators, clinical guidelines and other decision support aids, textbooks, and literature search portals. Another example are apps, which can be resourced with virtual reality, that simulate surgical procedures or that can conduct simple medical exams, such as hearing or vision tests. The big data collected through these apps can be used for research and development (Lee Ventola, 2014). Finally, apps can connect stakeholders across the broader healthcare ecosystem to support the delivery of treatment and provide evidence of results, leading to better patient outcomes.

Business Models Innovation in Pharma

__Table 7__ - Business Model Innovation in pharma (PricewaterhouseCoopers, 2009).

Business Model Innovation in pharma	Description
Personalized Medicine	This business model focuses on customer needs and behaviours, monetising services and healthcare outcomes. Through personalized medicine, biotech's aim to deliver predictive and preventive diagnosis tools and allow personalized treatment solutions (that can be supported by software devices, developments tools, and patient management services).
Networked or Open Business Model	This business model is based on an in-licensing and out-licensing mechanism to deliver and capture value. Pharma companies work as venture capitalists, marketers and orchestrators,

	integrating a network of research groups working on a contract basis. This approach delivers more efficiency, cost savings and reduced R&D lead times.
Federated Model	In this business model (BM), pharma companies create a network of separate entities that share a mutual goal (e.g., management of outcomes). In this network, each player plays a definite role without forfeiting flexibility. The network intervenient share a common supporting infrastructure as well as funding, data, access to patients and back-office services. These networks may well include universities, hospitals, technology suppliers, contract research organizations and manufacturing, data analysis firms and key opinion leaders from numerous countries. Because of that this approach takes one step further from the Open Business Model, establishing longer and deeper partnerships. In this BM revenues come from selling products and from the health outcomes of the patients paying for the service.

Appendix 2 – Complement to the Case Study

List of experts interviewed

Table 8 - *Pharma Specialists interviewed for the case study.*

Company	Country	Job title	Name
Biogen	Netherlands	EU+ Head of Multichannel Excellence	Frank Peters
Lisbon School of Economics & Management	Portugal	Professor, Director of Innovation and Strategy Advisor	Joana Santos Silva
Novartis	Portugal	Customer Insights & Business Intelligence Manager	Rodrigo Teixeira
Biogen	France	Global Head of Biogen Digital Health Solutions	Yacine Hadjiat

Interview guide – Qualitative Study - Neurologists

1. HÁBITOS DE UTILIZAÇÃO DE INTERNET A NÍVEL PROFISSIONAL – ACESSO AO CONHECIMENTO
   - 1.1. Para começar, com que frequência recorrem à Internet a nível profissional?
   - 1.2. Através de que dispositivos? Porquê? (perceber se são os mesmos dispositivos no Local de trabalho vs. em casa)
   - 1.3. Como é que a Internet vos ajuda na vossa vida profissional?
   - 1.4. Que tipo de pesquisas costumam efetuar? (produtos, patologias, eventos (quais), simpósios, laboratórios, serviços de apoio ao doente, associações, sociedades científicas, …)
   - 1.5. Como é que avaliam a oferta em termos de informação / ferramentas digitais?
   - 1.6. E quais as páginas/sites/calculadoras/plataformas que costumam recorrer?
   - 1.7. Quais as mais frequentes? Porquê?
   - 1.8. Como é que cada uma dessas plataformas/sites vos ajuda?
   - 1.9. Quais as vantagens e desvantagens desses sites/plataformas?
   - 1.10. (Adaptar ao que tiver sido dito) E especificamente no caso de artigos científicos, o que é que valorizam num artigo científico? (Nacionais, internacionais, escritos por colegas, sociedades, revista onde foi publicado…)
   - 1.11. A que sites/plataformas recorrem para aceder a conteúdos e artigos científicos? Porquê?
   - 1.12. (Adaptar em função do que for dito: e no caso de informação cientifica inserida em websites da indústria farmacêutica? Qual a vossa opinião? (avaliar se preferem websites independentes e se sim porquê)
   - 1.13. Quais os formatos que consideram mais atrativos num conteúdo científico? (explorar: resumos, tabelas dinâmicas, vídeos, imagens, esquemas, possibilidade de download).
   - 1.14. Por exemplo no caso dos vídeos qual a duração ideal? O que consideram um vídeo longo?
   - 1.15. E far-vos-ia sentido ter um canal de YouTube apenas com os vídeos direcionados à vossa área, tal como já acontece com outras áreas da medicina?
   - 1.16. E por exemplo, em áreas como a Esclerose Múltipla (EM) ou Doença de Alzheimer (DA) têm algumas necessidades especificas? Utilizam algum site ou plataforma diferente?
   - 1.17. Se sim, quais?
   - 1.18. E o que é que ainda poderia ser feito nestas áreas, o que sentem falta?
2. REDES SOCIAIS E NOVOS FORMATOS
   - 2.1. E especificamente no que toca às Redes Sociais?
   - 2.2. Quais as que recorrem a nível profissional? Com que finalidade?
   - 2.3. E quais as que recorrem mais? Porquê?
   - 2.4. Seguem algumas páginas? Por exemplo na área da EM e DA, o que seguem?

2.5. (Adaptar ao que for dito) E tal como nos deparamos noutras áreas em que temos diversos influencers, na vossa especialidade há alguém que se destaque? Qual a vossa perceção sobre este tema, ou seja, o facto dos vossos pares/mentores terem presença nas redes sociais?
2.6. E consideram que esta pode ser uma fonte fidedigna? Porque sim/Porque não?
2.7. E costumam ser ativos nas vossas redes? O que costumam partilhar e com quem?
2.8. E especificamente no que toca à presença da indústria farmacêutica nas redes sociais … seguem alguma página? Se sim quais os tipos de conteúdo que mais valorizam? Ou até quais os que gostariam que estivessem disponíveis?
2.9. O que é que sentem falta neste âmbito? O que gostariam que fosse feito?
2.10. E relativamente ao acesso ao conhecimento noutros formatos alternativos, como podcasts, webinars, e-learnings, tertúlias, qual a vossa opinião? (espontâneo)
2.11. Algum destes formatos é mais fácil de conciliar com a vossa atividade profissional? (ex. podcasts podem ser ouvidos a caminho do trabalho ou no regresso a casa).

Podcasts:

2.12. Gostam deste tipo de formato?
2.13. Se sim: Quais os que costumam ouvir? (caso não tenham sido referidos)
2.14. Em que momentos / situações recorrem aos podcasts?
2.15. Com que frequência recorrem aos mesmos?
2.16. E preferem o podcast nas plataformas comuns (Soundcloud, Spotify, etc) ou em websites corporativos?
2.17. E se o podcast for restrito? Por exemplo através de registo / bloqueado por password? O que acham deste tipo de acesso?
2.18. Qual a duração ideal de um podcast?

Webinars:

2.19. Gostam deste tipo de formato?
2.20. Qual a duração e os horários ideais dos webinars? Depende de algum fator?
2.21. E especificamente na área da EM e DA, tem havido muita coisa?
2.22. Conseguem-me dar bons exemplos do que tem sido feito?
2.23. Que temas gostariam de ver debatidos nestas áreas?

Outros formatos:

2.24. Além dos webinars e podcasts há mais algum formato em que já tenham participado e que tenham gostado?
2.25. Quais? E o que tinha de diferente?
2.26. Têm mais alguma ideia diferente e interessante para acesso a conteúdos e partilha de conhecimento?
2.27. Finalmente, como tomam conhecimento destes conteúdos? (colegas, congressos, redes sociais, indústria farmacêutica, pesquisa ativa [onde?]).

3. INTERAÇÃO E COMUNICAÇÃO COM O DOENTE

3.1. Falando na vossa comunicação com o doente.
3.2. Quando estão em consulta com um doente com EM ou DA que tipo de informação facultam ao doente?
3.3. E a que tipo de ajuda/apoios recorrem? (folhetos, ferramentas digitais, …)
3.4. (Se não surgir) costumam recorrer a vídeos, imagens? E como o fazem? É fácil e prático? Como poderia ser melhorado? Em que é que a indústria farmacêutica poderia ajudar?
3.5. E normalmente recorrem a informação em Português? Porque sim / Porque não? Como estamos de conteúdos em Português na área da EM por exemplo? E isso é relevante?
3.6. (Se não surgir) e por exemplo comunicação/ "informação" com o doente através das redes sociais, por exemplo através do Facebook ou Instagram, faz-vos sentido? Já o fizeram, em que situações?
3.7. E por exemplo no que toca a associações de doentes, costumam falar neste tópico aos doentes? Porque sim/ porque não?
3.8. Qual a vossa opinião sobre a qualidade e utilidade da informação veiculada pelas AD em particular nas áreas da EM ou DA?
3.9. Costumam ter algum tipo de cooperação com as associações?
3.10. Digam-me então o que sentem necessidade neste campo? Algo que pudesse ajudar por exemplo na monitorização e acompanhamento do doente? Em que moldes? Conseguem dar alguns exemplos do que vos ajudaria?
3.11. (Se não surgir explorar) E por exemplo Apps para doentes, conhecem alguma? E costumam recomendar alguma que inclusive possam usar como ferramenta de gestão da doença e do doente?
3.12. (Caso não surja questionar diretamente) e por exemplo a CLEO, conhece? Costuma sugerir aos seus doentes? Porque sim/ Porque não?
3.13. E do lado do doente? Eles costumam questionar muito sobre aspetos da doença, fármacos que existem, outros doentes como eles?
3.14. E do vosso lado? Como costuma proceder?
3.15. Acham importante o doente estar informado? Em que sentido? E varia em função do tipo de doente?
3.16. No geral, acham que os vossos doentes deveriam ter mais literacia em saúde? Se sim em que moldes? Se não, porquê?

4. COMUNICAÇÃO COM OS COLEGAS E COM A INDÚSTRIA FARMACÊUTICA

<u>Entre colegas:</u>

4.1. E entre vocês? Como é que costumam comunicar?
4.2. Poderia existir algum tipo de ferramenta de apoio em que pudessem esclarecer dúvidas por exemplo?
4.3. Já recorrem a algo deste tipo? O que poderia existir para vos ajudar?
4.4. Por exemplo em situações de referenciação como costumam fazer? Interagem com os colegas? De que forma? É fácil? Fazem-no de forma digital? Porque sim/Porque não? (perceber as oportunidades)

Indústria Farmacêutica

4.5. E do lado da Indústria Farmacêutica (IF). Como é que costumam comunicar convosco (e-mail, webinar, visita virtual, presencial, Apps, SMS, Whatsapp, …)?
4.6. E quais as formas que mais valorizam? [Hierarquizar]
4.7. O modo de comunicação preferencial pode variar em função da informação transmitida? Em que sentido? (explorar para os vários métodos)

<u>E-mails:</u>

4.8. Por exemplo no caso dos e-mails. Costumam receber muitos e-mails por parte da IF?.
4.9. Quantos e-mails em média recebem por dia? Quando é que vocês costumam abrir os e-mails? (Semana / fim de semana / assim que recebem, …)
4.10. E como fazem a seleção do que vão ler ou não? Apagam alguns? Quais?
4.11. O que é que para vocês é importante num e-mail, ou seja, o que é que vos leva e motiva a ler o mesmo?
4.12. Que tipo de informação é que deve de ser enviada por e-mail?

4.13. Por exemplo na área da Esclerose Múltipla, conseguem dar-me alguns bons e maus exemplos?
4.14. Que sugestões querem deixar à IF relativamente aos e-mails?
Visita Virtual:
4.15. E relativamente às visitas virtuais, qual a vossa opinião? Quais as vantagens e desvantagens destas visitas?
4.16. Qual a plataforma que preferem? Na vossa opinião seria preferível a existência de uma plataforma única para a IF, ou para vocês é indiferente usar web apps diferentes?
4.17. E como é que olham para o futuro das visitas virtuais no pós-Covid? Vieram para ficar? Terão o seu espaço? Será um híbrido entre as duas vertentes, voltará tudo ao presencial? Tudo digital? Como idealizam e gostariam que fosse?
Webinars (complementar ao que foi dito no início no acesso ao conhecimento):
4.18. E quanto aos webinars? Podem ser vistos como uma forma de comunicação entre vocês e a indústria farmacêutica?
4.19. Valorizam o convite para webinars por parte da indústria farmacêutica?
4.20. Como fazem a seleção dos que vão ou não assistir? Vocês valorizam webinars On demand, ou seja, selecionados de acordo com as vossas preferências?
4.21. Além do que foi referido, que outras formas de contacto poderiam existir?
4.22. Alguma ferramenta online que vos permitisse estar em contacto com determinado laboratório / DIM / departamento médico?
4.23. Por exemplo, seria vantajoso ter uma app exclusiva onde poderia gerir as reuniões virtuais com a IF, fazer marcações, bem como alguns materiais/eventos que a mesma gostaria de partilhar consigo e de o envolver? No fundo um canal único, exclusivo, onde poderia gerir a IF ou determinada empresa da IF?
4.24. Ou até uma app conjunta que incluísse informação de diversos laboratórios farmacêuticos, onde pudesse personalizar de acordo com as suas preferências?

5. CONSIDERAÇÕES FINAIS: PRINCIPAIS UNMEET NEEDS - DIFERENCIAÇÃO DIGITAL
5.1. Depois de falarmos em todos estes pontos, quais os aspetos que consideram mais urgentes?
5.2. O que seria mesmo importante que fosse desenvolvido?
5.3. Se fossem os responsáveis pela comunicação com os médicos, mais precisamente na área da EM e DA, como o fariam? Quais os métodos que escolheriam?

Interview guide – Quantitative Study - Neurologists

Caracterização da população

1. Qual a sua especialidade? Neurologia; Outra □ Qual?
2. Por favor, refira os anos de prática clínica que tem na sua especialidade, desde que completou o internato médico: __ Anos
3. Indique o distrito onde exerce a sua profissão:
4. Onde exerce a sua prática clínica: Hospital Privado / Clínica / Hospital Público
5. Nos últimos 12 meses quantos doentes acompanhou de cada uma das seguintes patologias: Esclerose Múltipla; Doença de Alzheimer; Doença de Parkinson; Epilepsia; Doenças Neuromusculares; Demência; Outra □ Qual?
6. Em média, quantas horas por dia se encontra online? |__|__| horas
7. Do tempo que se encontra online, como divide em termos de percentagem o tempo que dedica a nível profissional e a nível pessoal?
7.1. Profissional |__|__|__|% Pessoal |__|__|__|% [∑ = 100%]
8. Hierarquize por ordem de frequência de uso os seguintes dispositivos no que respeita ao seu uso para acesso à internet a nível pessoal? Coloque como 1 o dispositivo que mais utiliza: Computador fixo próprio; Computador fixo do local de trabalho; Portátil próprio; Portátil do local de trabalho;Tablet próprio; Tablet do local de trabalho; Smartphone próprio.
9. Como avalia, de uma forma geral, a oferta profissional em termos de informação / ferramentas digitais? Por favor, considere uma escala de 1 a 5, em que "1" significa “Muito fraca” e “5” significa “Muito boa”. |__|
10. Quais os aspetos que, de uma forma geral, mais valoriza na oferta digital que tem a nível profissional? Por favor, considere uma escala de 1 a 5, em que 1 significa “Não valorizo nada” e 5 significa “Valorizo bastante”: Credibilidade da fonte; Imparcialidade da Indústria Farmacêutica; Artigos científicos escritos por peritos nacionais ou internacionais; Artigos científicos escritos por colegas que conheço; Materiais escritos por colegas que conheço; Materiais em formato de vídeo; Materiais em formato de leitura; Materiais com apoio de gráficos e fluxogramas; Artigos de opinião escritos em português (resumo de artigo científico); Materiais interativos com recurso a links; Materiais em formato áudio; Possibilidade de fazer download da informação; Ter informação de acesso gratuito; Possibilidade de partilha com outros colegas; Possibilidade de partilha com doentes; Ter informação diversificada de uma doença no mesmo local (sintomas, tratamentos, associações de doentes, …).
11. Como avalia o seu grau de preferência de cada um dos seguintes métodos para se manter atualizado(a) a nível profissional? Utilize uma escala de 1 a 5, em que 1 significa “Não gosto nada” e 5 significa “Gosto bastante”: E-mail; Redes sociais; Websites de teor profissional de conteúdo independente; Websites da Indústria Farmacêutica; SMS; Apps científicas; Revistas científicas em formato online; Revistas científicas em formato físico; Livros científicos em formato online; Livros científicos em formato físico; Webinars; Podcasts; Newsletters de websites profissionais (ex. Medscape); Outro □ Qual?
12. Numa escala de 1 a 10, em que 1 significa “não valorizo nada” e 10 “valorizo muito”, até que ponto valoriza a informação científica em websites corporativos da Indústria Farmacêutica. |__|__|
13. Em média, quantos e-mails costuma receber diariamente da Indústria Farmacêutica e destes que percentagem efetivamente costuma ler?
13.1. # E-mails que recebe |__|__|__|
13.2. # E-mails que lê |__|__|__|
14. Em média, quantas visitas remotas por parte da Indústria Farmacêutica recebe por mês? |__|__|__|
15. Em média, quantos webinars e podcasts assiste/ouve por mês?
15.1. Webinars em direto |__|__|
15.2. Webinares em diferido |__|__|
15.3. Podcast |__|__|
16. Em média, quantas formações de e-learning realiza por mês? __|__|__|
17. Qual a duração ideal deste tipo de interação?
17.1. Visita remota |__|__|__| minutos
17.2. Webinars |__|__|__| minutos
17.3. Podcast |__|__|__| minutos
17.4. Formações e-learning |__|__|__| minutos
18. Quais os critérios mais relevantes que o(a) levam a participar/assistir a um evento digital? Utilize uma escala de 1 a 5, em que 1 significa “pouco relevante” e 5 significa “muito relevante”: Duração; Horário; Tema; Convidados; Partilha de casos clínicos; Informação sobre

estudos clínicos em curso; Painel de discussão com perguntas e respostas; Palestra de experts internacionais; Palestra de experts nacionais; Apresentações com dados reais (Real World Data); Resumo de apresentações ou posters, apresentados em congressos internacionais; Laboratório que promove o evento; Formato interativo; Plataforma de transmissão utilizada.

19. Relativamente a eventos/reuniões num futuro próximo, 12 a 24 meses, qual o formato preferencial? Presencial; Online; Híbrido.
20. Qual a melhor altura, em termos de horário e dias, para a Indústria Farmacêutica comunicar consigo através dos seguintes meios digitais? Classifique para: E-mail ;Webinars; Visitas remotas.

Durante o período da manhã (8h às 13h)		Durante o período da tarde (das 13h às 18h)		Entre as 18h e as 20h		Entre as 18h e as 20h		É indiferente
2ª feira	3ª feira	4ª feira	5ª feira	6ª feira	Sábado	Domingo		É indiferente

21. Das seguintes redes sociais, com que frequência as utiliza a nível profissional? Por favor, considere uma escala de 1 a 5, em que "1" significa "Pouco frequente" e "5" significa "Muito frequente": Facebook; Instagram; LinkedIn; Twitter; WhatsApp; Youtube
22. Até que ponto as redes sociais são uma plataforma onde pode adquirir conhecimento científico? Por favor, considere uma escala de 1 a 10, em que "1" significa "Pouco conhecimento" e "10" significa "Elevado conhecimento". |__|__|
23. Pensando agora nos vários canais de contacto por parte da Indústria Farmacêutica, como avalia a relevância de cada um dos seguintes canais de contacto? Utilize uma escala de 1 a 5, em que 1 significa "pouco relevante" e 5 significa "muito relevante": Correio postal; E-mail; Redes sociais; Sessões clínicas (Congresso, Formação, Debate, outras); Webinar; Chamada telefónica; SMS; WhatsApp; Visita remota; Visita pessoal; Assistente virtual; Podcast; Plataforma de formação (e-learning); Website com informação sobre produtos, serviços e materiais de apoio à prática clínica

Mundo Digital na área da Esclerose Múltipla

24. Falando especificamente na área da Esclerose Múltipla, qual a sua satisfação face à oferta de informação digital nesta área? (sites, Apps, calculadoras). Por favor, considere uma escala de 1 a 10, em que "1" significa "Nada Satisfeito" e "10" significa "Muito Satisfeito".
25. Que tipo de informação costuma pesquisar online sobre a Esclerose Múltipla? Informação sobre a patologia; Informação sobre novos produtos; Informação sobre critérios de diagnóstico; Guidelines Internacionais; Informação sobre esquemas de tratamento; Ensaios clínicos a decorrer; Esquemas posológicos; Interações farmacológicas; Informações sobre dosagens / Ajustes de doses; Informações sobre modo de administração; Parâmetros de monitorização terapêutica; Efeitos secundários; Informações sobre laboratórios (ex. contatos diretos); Eventos (congressos, webinars, podcasts …); Associações de doentes; Vídeos/entrevistas de opinião de peritos da especialidade; Formações online (e-Learning); Outra. Qual?
26. E com que frequência utiliza os seguintes sites, aplicações e/ou ferramentas online para as suas pesquisas na área da Esclerose Múltipla? Utilize uma escala de 1 a 5, em que 1 significa "Não utilizo" e 5 significa "Utilizo bastante": Medscape; UpToDate; Pubmed; Univadis; Scopus; Neuro Toolkit; Neuro Compass; Datascience; The Neurologist; My Neurologia; Science direct; New England Journal of Medicine (NEJM); The Lancet Neurology; European Academy of Neurology (EAN); American Academy of Neurology (AAN); European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS); Sociedade Portuguesa de Neurologia (SPN); Icompanion; CLEO; MyTherapy; SymTrac; Tonic App; Sites de laboratórios; Outro□ Qual?
27. Tem interesse numa plataforma que agregasse diversos conteúdos relacionados com a área da Esclerose Múltipla num único local? Os conteúdos seriam sobre a patologia, eventos, novidades, notícias, fármacos: Sim; Não
28. Preferia que esta plataforma fosse lançada por um laboratório da Indústria Farmacêutica ou por uma entidade independente? Laboratório da Indústria Farmacêutica; Entidade independente
29. Qual a probabilidade de instalar uma aplicação exclusiva de um laboratório que permitisse a comunicação otimizada entre si e esse mesmo laboratório, assim como receber as novidades sobre produtos, serviços e materiais de apoio à prática clínica? Por favor, considere uma escala de 1 a 10, em que 1 significa "Não vou instalar" e 10 significa "Vou instalar de certeza". |__|__|
30. Continuando a pensar numa aplicação onde teria todas as novidades sobre produtos, serviços e materiais de apoio à prática clínica, ordene por grau de importância cada uma das seguintes funcionalidades. Considere como 1 a funcionalidade mais importante: Agenda; Notificações; Conversação em tempo real; Repositório de materiais relacionados com o produto e/ou doença; Mural com as últimas novidades; Informação de eventos; Outra □ Qual?
31. Quais os temas/conteúdos que gostaria de ver abordados num webinar/podcast/e-Learning sobre a Esclerose Múltipla? [resposta aberta]
32. Que tipo de material costuma partilhar com os doentes de Esclerose Múltipla de forma a ajudá-los no seu dia-a-dia com a patologia? Folhetos; Sites de associações de doentes □ Quais?; Sites de laboratórios □ Quais?; Grupos de redes sociais; Aplicações □ Quais?; Outra □ Qual?; Não costumo partilhar material com os doentes [resposta múltipla]
33. Pensando agora nos vários tipos de e-learning, como avalia a relevância de cada um dos seguintes formatos/funcionalidades? Utilize uma escala de 1 a 5, em que 1 significa "pouco relevante" e 5 significa "muito relevante": Vídeos interativos; Formato leitura; Formato de leitura com Voz Off; Sessões gravadas; Sessões com transmissão em direto; Híbrido entre sessões gravadas e sessões com transmissão em direto; Seminários de discussão em grupo; Avaliação de conhecimento; Presença de KOL internacionais; Ferramentas de partilha; Fóruns de discussão (grupo); Conversação em tempo real entre pares (peer-to-peer); Conteúdo independente; Outro. Qual?
34. Estaria interessado em saber mais sobre Neurotech e Health Tech? Sim; Não □ Porquê?
35. Dentro da área da Neurotecnologia (Neurotech), assinale quais os temas de maior interesse? Diagnóstico; Estimulação Cognitiva e reabilitação; Monitorização; Imagem; Outro □ Qual?; Não estou interessado neste temas.

Expert interviews summary

Multichannel Excellence - Interview with Frank Peters, EU+ Head of Multichannel Excellence

"For Pharma the way we communicate and engage with HCPs has typically been oriented towards face-2-face engagement. With Covid-19 pandemics, however, a fast transition was and is still needed, and this is proving to be a catalyst for many transformational activities. And this comes with opportunities!"

According to frank Peters, the priorities for the next couple of years are: i) *Pharma needs to adopt a much more detailed approach to (Omnichannel) Customer Engagement Planning*: "Who are we engaging with, through which channel, with what content, in what sequence"; This is needed to better plan and understand how pharma is engaging. Typically, the focus has been a lot on ensuring the most expensive channel is provided: the field force with materials to communicate with their customers. With the increased number of channels, there is the need to better plan what content is best shared through which

channel and spend time on creating these. In addition, shifting to a real omnichannel way of working, requires channels and their data to be connected, so that an optimal personalized engagement can be built; ii) *Communication mix:* During Covid, in many countries the Field Forces were (and sometimes still are) in lock-down, requiring companies to look for alternative ways of communicating. This opens the door to shift the field force focus from only face-to-face engagement to a much more hybrid model, where phone, e-mail, virtual meetings (like MS-Teams and Zoom) are being used as part of the communication mix; iii) *Data Analytics*: More than ever pharma needs not only to look at the Quantity of their engagements with customers (Share of Voice), but increasingly to focus on optimizing the Customer Experience (CX) - the Quality of their engagements.

According to Peters, "although these opportunities may seem obvious, executing against those is not as simple as it looks". Many elements such as changing mindsets (one should not underestimate the time and effort to change people's behaviour), training (many field force members are not used to some of the new channels and do not use them as part of their daily routine), infrastructure (new capabilities need to be established and rolled out), content creation (create once, use many times), data and analytics (one needs to be able to understand and measure the engagement) etc., come into play, and require a thoughtful planning and execution. This is where pharma is often still considered to be quite conservative.

In the opinion of Frank Peters, overcoming these challenges requires a good and focused roadmap, where (people) change management needs to play a central role. "Do not overwhelm the organization with too much change at the same time in too many areas, but define very concrete steps, that are manageable, and where employees can see what's in it for their customers, but also what's in it for them". Looking at the broader "Digital" opportunities, with more and more advanced technologies becoming available rapidly and the huge amounts of data that can be generated nowadays, there is also a need for looking at an organization differently. Innovation requires different structures, where innovation can happen, and where "start-ups" can thrive. Digital champions need to be enabled to set the direction, and to experiment. "Learn fast, fail fast".

Business Intelligence & Analytics - Interview with Rodrigo Teixeira, Customer Insights & Business Intelligence Manager

During the interview with Rodrigo Teixeira, the topics data quality and governance, organizational structure, strategic thinking, and mindset and how they are all interconnected was discussed. According to Rodrigo Teixeira, Data Quality is key for any industry not only for Pharma. However, having a proper Data Governance in place that accounts for minimizing data quality issue is easier said than done. While on paper, many Pharma companies do understand its importance, it is scarce the number of companies that do it. "When we think of one of the main systems used within the Pharma sector (CRM, e.g., Salesforce), rarely do you see proper Data Governance policies in place that ensure amongst many things, mandatory fields, fit-for-purpose list-of-values and dropdown options that give quality to the data but also detail. Data Stewardship should play a vital role in the organization and should be those roles that continually define what the Data Governance policies should look like. When thinking about regional or global CRM systems, it is also vital to ensure the specificities of each country/region, but everything can be achieved if it is thought through. Data Governance is hence key for any successful Analytics as the cliché sentence says: *Garbage In, Garbage Out*."

In an era where omnichannel is a reality, the value of data is not put in question anymore, however, only once a company is able to have adequate Data Governance and "trusts" the quality of its own data, it is feasible and adequate to transform "data" into "reliable Information". "Data" are separate sets of datasets or data, information is typically when one organizes it and presents it in a simple, intuitive, and flexible manner to its stakeholders in need for information. The same way Pharma companies are moving to Global/Regional CRM systems, that should also be the case for Reporting/Analytics system. In fact, there should be one Analytics tool within the company, unless others are needed (e. g., Tableau for R&D as it has some additional functionalities for data exploration). This simplifies the life of employees as they get one tool for everything related to data. Many Pharma companies still have a plethora of reporting/analytical systems: One for Sales, one for Logistics, one for Financial, one for CRM, one for Market Shares, etc. "If you centralize all data coming in and apply company-wide rules (e. g., calculation of a Market Share metric) exactly the same way regardless of countries, then you achieve a level of standardization in the company that is key. Not only the internal benchmarking is facilitated, but also identifying opportunities in the data is easy and should be explored consistently."

According to Teixeira, that previously worked in technology companies, such as Uber, only when companies are able to add the concept of "Data Democratization" (such as Uber or Airbnb), employees have access to the same information and opportunities can be explored at every seniority level within the organization. Gone are the days where information was secluded in a certain level or department. "Today, with the appropriate Analytics system in place, an analyst can get an alert when a certain hospital is falling short on its mean frequency order history and alert the Commercial teams. If Data democratization is put into place, the responsible sales representative can see the same alert and act upon it swiftly. This is where the Mindset, in my opinion, plays a key success factor. Having a wrong mindset of secluding information, tends to lead

to information silos and move away from a true data-driven or information driven-culture. Ensuring we have the right people with the right mindset is key."

The importance of reporting for timely and business-focused decisions was also addressed during this interview. Pharma is one of the most regulated industries, so how can teams overcome the bureaucracy to respond with agility to the market changes? For Rodrigo Teixeira, the foundations for agility are good data governance and seamless reporting/analytics systems: "I believe it affects more the day-to-day of a marketeer of trying to get some promotional material to the commercial teams, or when a commercial team that is planning an event, rather than reporting. Agility is in essence, in my opinion, mindset driven. If the company is open to new ideas, to change, then it is just a matter of adjusting to market changes and dealing with it in a positive way." Building proper Analytical solutions, already encompasses a flexible and agile approach, otherwise it would fail. The ability to adapt to either market changes or new promotional channels for example is also key.

Lastly, the main areas where pharmaceutical industries in Portugal should focus to be prepared for the challenges after the COVID-19 pandemics was addressed. The focus should be on its Reporting/Analytical solutions both for internal and external data. The COVID-19 pandemics led to a dramatic increase of virtual customer engagements. Surveys are showing that Health Care Professionals will prefer a hybrid engagement of face-to-face and digital, but it really depends on each HCP. "I do believe that pharma industries should adapt all their promotional content into a true Omnichannel approach that focuses on the experience of the HCP rather than the channels used (Multichannel). And Multichannel is still in norm in pharma industries in my opinion. I would say making this shift to Omnichannel, with the capability to understand which experience and set of channels are ideal for one individual is key. This is where Analytics play an extremely important to role to understand what is working what is not and adapt and improve. This is what Analytics is all about."

Digital Health Solutions - Interview with Yacine Hadjiat, Global Head of Biogen Digital Health Solutions)

"At Biogen Digital Health, we aspire to transform Biogen & patients' lives by making personalized & digital medicine in neuroscience a reality". This was the motto to start the conversation with Yacine Hadjiat. To achieve that vision the team defined five strategic imperatives to be achieved by 2025: 1) Shape a high performing digital health organization and catalyse company's broader digital transformation; 2) Create sustainable strategic advantage in core disease areas with validated digital biomarkers enabling R&D and real-world evidence generation; 3) Establish leading personalized medicine analytics & data science capabilities in Neuroscience; 4) Differentiate the portfolio by enabling digitalization of patient journey and clinical care with brand agnostic solutions; and 5) Explore adjacent business models and meet patient needs with synergistic digital therapeutic interventions in core disease areas.

For that, even if there is a separated innovation hub – Biogen Digital Health (DBH), it is important to support affiliates as, at the end of the day, they will need to implement the solutions. Thus, it is important that there are single points of contact to support local affiliates, to design the go to market plans and ensure a "launch excellence" framework. These solutions will be internal and external and include five areas: Patients, HCP, Measurement. Evidence Generation and VR & Mental Health.

Finally, it is important to elevate the company capabilities to deliver innovative solutions. That is achieved through innovation, agile teams, strategic plans and cross functional execution. The responsible of each innovative team will decide upon resource allocation and priorities. Moreover, they will be accountable towards design, development, and success of solutions from concept to realization per defined OKRs/KPIs. Obviously, external innovation & alliances (EI&A) are key to strive for Impact through excellence and innovation. Therefore, to accelerate internal digital health efforts, a dedicated team to EI&A will serve as the connective tissue with external tech, start-ups, academia, etc., forging business development & strategic alliances. These include digital care & DTx, wearables & sensors, digital measures, imaging & AI/ML, neurotechlabs and academinc & research collaborations.

Healthcare Innovation - Interview with Joana Santos Silva, Professor, Director of Innovation and Strategy Advisor

Joana Santos Silva is able to look to healthcare innovation from two sides: as the director of innovation and strategy advisor and as a healthcare professional herself. With a deep knowledge in healthcare systems, she can point out several needs from healthcare professionals and what could be done to meet them. She is also able to explain why certain technologies are more difficult to implement than others. For instance, the results around virtual meetings. Even if very interesting on some occasions, the networking logic deeply linked to clinical sessions or congresses is hardly mirrored in virtual meetings, even recurring to VR or other technologies. So, in the near future, as many things in life, HCP will always evaluate the cost/opportunity logic and assess if they should be present to a meeting or attend virtually. Therefore, ideally, meetings should be hybrid, so HCP

can choose. Moreover, the option of webinars/e-Learning etc. on demand opens new doors to HCP as they can choose how to utilize their time. The same applies to product, disease, service information search – it should be available in a self-service way, so HCP are autonomous to investigate by themselves.

The goal of health care professionals and governors is to bring high quality healthcare to the population. As life expectation increases, it also increases the number of patients with chronic diseases, which means more long-term treatments and therefore more costs and resources. There are simple technologies that can help tremendously to mitigate these costs of the national healthcare system (SNS), namely telemedicine. The chart below, Figure 40, aims to map the digital maturity of certain technologies related to health. One can see that telemedicine appears in what is called the Plateau of Productivity. In other words, it is not an emerging technology but one that has already achieved a certain level of maturity and consequently, market penetration. As a matter of fact, it has a huge global market opportunity, estimated in $175,5B, as reported by Forbes. However, in a Digital Health report published in Business Insider Intelligence in May 2020, only 48% of US physicians were treating patients via telemedicine (*vs.* 18% in 20218).

Additionally, beyond doubt, when considering the adoption of digital tools, it is always important to take in consideration HCP segmentation. For instance, segmentation based on age (digital native HCP and digital immigrant HCP) or the Mckinsey's archetype segmentation model (independents, transactionals, knowledge seekers and relationship seekers), are important to explain the variability of adoption.

Talking about adoption, Joana Santos Silva also pointed out that the reality of technology (hardware and software) varies from hospital to hospital. For instance, the random-access memory (RAM) is not always satisfactory. At some hospitals there is only one server what makes the processing memory extremely low. Moreover, even within the same hospital, it might happen that systems do not communicate well, leading to data gaps. The systems interfaces are, may times, not well designed, offering a bad user experience. Furthermore, systems are not always ready to normalize the data entry. Consequently, data cannot be treated and the output (patient evaluation, monitoring, AI), will not be reliable. In terms of hardware, some equipments are obsolete. All these issues compromise technology adoption and increase the HCP resistance to well established technologies such as the one already mentioned telemedicine or other more evolved, such as the ECHO Alexa for medical emergencies. There are some good examples though, one of them is the digital key from SPMS (Serviços Partilhados do Ministério da Saúde). SPMS has a fundamental role in the advancement of strategies through the development and implementation of Information Technology systems and platforms to support the health information ecosystem. Nevertheless, there are always room for improvement, e.g., the digital key would ideally be linked to private healthcare services/hospitals as well. Finally, according to Joana Santos Silva, listening to experts and key stakeholders, as well as the analysis of relevant documentation is key. Great solutions can be generated through the partnerships of HCP, pharma, medical societies, and other stakeholders.

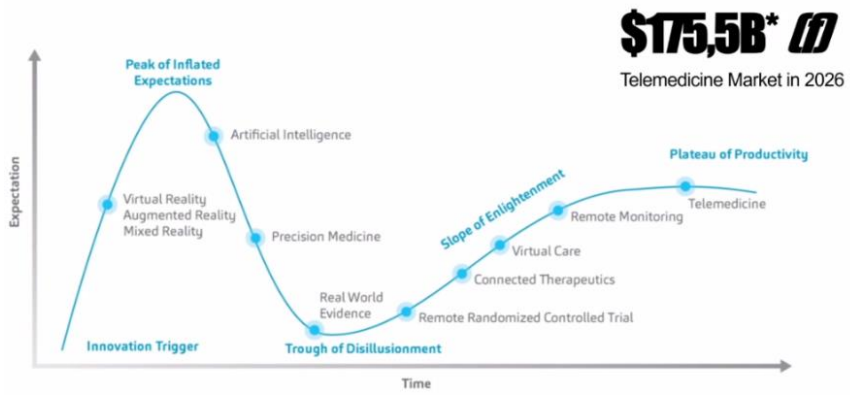

Figure 40 - *The Digital Health Cycle, adopted from the Gartner Hype Cycle from Joana Santos Silva. * Global market insights, in Forbes May 2020*

Appendix 3 – Teaching Notes Resolution

Question 1:

To measure customer experience of HCP across the different touchpoints of the customer journey, scales such as the Net Promoter Score (NPS) or the Customer Effort Score (CES) should be used. NPS is a numeric value that quantifies the extent to which the experience would be recommended to a colleague. NPS has been found to correlate with revenue growth through improved loyalty and additional purchase propensity from promoters (Survey Monkey, 2021). CES focuses on promoting ease

of use, simplicity, and effortless interactions. A good CES is a score >4.5 indicating that the experience was effortless and well executed. Overall scores and distributions should also be provided for the touchpoint specific questions which assess participants' experience with various aspects of the engagement and are tailored to the specific type of engagement (e.g., e-mail, website, congress participation). Lastly, free text responses can capture rich feedback on the experience. Such feedback can shed light on the "why?" behind the responses and set the foundation for actionable insights on how to improve customer experience (Survey Monkey, 2021).

Question 2:

The Westerman Model aims to respond to the question: How well is the organization building digital and leadership capabilities. There are 10 questions within each main question that should be scored with a scale of seven values (score 1 - strongly disagree; 4 - neutral; and 7 strongly agree). According to this model organizations can be divided in four main categories: *Fashionistas* (are building every possible digital capability but due to the lack of a strong leadership capability and governance, they are wasting a lot of their investment), *Digital Masters* (are excelling both in digital and leadership capability), *Beginners* (have an immature digital culture, having only basic digital capabilities and lacking leadership capability to make a transformation happening) or *Conservatives* (have useful leadership capabilities, but they are not building strong digital capabilities, due to prudence and lack of concern about technology fashion (Westerman et al., 2014). By using both the scores of digital and leadership capabilities, the organizations can pinpoint their place in the digital mastery matrix and have an idea of where they stand.

Deepening the analysis into the customer and operations excellence in pharma there are seven categories that must be assessed: Omnichannel Mindset and training, Channels and Digital Services, Initiative planning and execution, Initiative insights, Platforms and Ecosystems, Approval Processes and Operating Model. Each category has several points to analyze and according to the result organizations can classify as "Foundational", "Developing", "Advanced" or "Expert". Then, according to the results, they can work towards excellence.

Table 9 - *Omnichannel Evolution Categories.*

Category	Description
1. Omnichannel Mindset	Acquiring a forward omnichannel mindset across the entire organization
2. Omnichannel Training	Understanding omnichannel strategy, planning and execution, as well as channels and digital capabilities
3. Channels and Digital Services	Enabling paid and owned channels and capitalizing digital capabilities, including automation
4. Initiative Planning & Execution	Planning and executing Customer Engagement sequences across channels, including goals setting and optimization
5. Initiative Insights	Capturing and analyzing data across channels according to KPI framework, including Customer Experience
6. Platforms and Ecosystems	Capitalizing platforms and ecosystems within the customer engagement sequences
7. Approval Processes	Developing processes to comply with regulatory, legal and compliance requirements across channels
8. Operating Model	Building teams for seamless cross functional omnichannel planning and execution

Finally, one tool to assess the digital maturity of brands is the Gartner Digital IQ Index that provides clients with research and recommendations to benchmark digital performance relative to peers and competitors. This tool allows companies to perform a digital SWOT analysis to benchmark the digital competence of brands and uses four dimensions: Site, Digital Marketing Channels, Social Media and Path to Purchase. Figure 41**Error! Reference source not found.** shows the comparison between 2nd line therapies for Multiple Sclerosis (MS): Tysabri® from Biogen, Ocrevus® from Roche and Mavenclad® from Merck.

Figure 41 - *Gartner Digital IQ Ondex for MS products (Gartner, 2021).*

Question 3:

For digital innovation to be sustainable in the long term, interoperability of the different players within the public and private sectors is key. As stated in the literature revision, as part of HealthTech, NeuroTech emerged from a group of startups that focused or adapted their research and solutions to neuroscience specificities and needs. NeuroTech can also be defined as a neuroscience-focused branch of HealthTech, where players attempt to solve the customer journey challenges of people living with neurological diseases and HCPs.

A new initiative, impactful on customers, would be to create a neurotechprize in Portugal. For instance, Biogen Portugal could collaborate with a startup accelerator in Portugal, such as Builing Global Innovators, to launch an innovation challenge to engage entrepreneurs pioneering in neurotech and accelerate their efforts. For that, first Biogen would select respected Portuguese Key Opinion Leaders (KOL) to define the challenge around the four areas of intervention: i) Accelerating diagnosis; ii) Improving disease monitoring; iii) Easing burden on patients and iv) Helping to maintain quality of life.

The program would be:

- Open Innovation Brainstorm with selected Biogen key people and KOL, who will identify challenges and opportunities that HCP face, to understand how can outside innovation support in value creation or cost reduction. The Biogen key people, preferably 3 to 5 people will receive training on how to work with open innovation and how to launch pilots and collaborations between Biogen and startups.
- After those challenges/opportunities are clearly identified there will be a 2-month open call. After a careful selection process, shark tank style, 5 start-ups will be selected.
- A tailored three-month journey focused on team's objectives, established individually at the beginning of the program.
- Intensive mentoring from top experts in business and science. This includes the startup accelerator key people that were trained, plus involving other healthcare stakeholders, creating a pioneer movement of innovation and the entire system while reinforcing its innovation-driven positioning in the market.
- Speed Dating between startups and industry stakeholders (Biogen) on an internal DemoDay.
- 5,000 € funding per startup to support the participation of founders and/or key team members in the journey.
- Following the work with mentors and experts, the teams will present their solutions in a pitch competition in front of a Jury at a national Biogen-sponsored event, deciding on each one(s) would be viable to launch a pilot with Biogen.