The report is about the marketing manager internship at Klinik Sankt Moritz, founded by Sergio D'Arpa. It provides an overview of the strategic plan of the first Swiss digital clinic.

Klinik Sankt Moritz. World's first digital clinic

Internship report

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Index

Introduction

This report is about the Klinik Sankt Moritz, the first digital clinic in the world, structured around the patient's Digital Twin technology. This report briefly describes the complex scenario of disruptive technology and its implementation within the health care sector. The report was written under the supervision and invaluable contribution of Klinik Sankt Moritz's founder, Sergio D'Arpa, where I have enrolled as a marketing manager intern.
This report will introduce the concept of Patient's Digital Twin (DP), starting with the definition of Digital Twin technology. Industry 4.0 introduced us to this innovative model in production and engineering. Although many stakeholders evaluated this research as revolutionary in health, it has shown how it can work in a digital clinic with patients' digital twins. The technology arises from combining virtual models of physical assets that allow an asset or system to be modeled by its users. Digital twins of medical devices and patients have been created in the healthcare sector. As the patient's physical characteristics and changes in the body are transferred to the digital world, a Digital Twin is made. This technology provides innovative and definitive solutions for correct diagnosis and treatment processes tailored to the patient's needs, which is one of the essential principles of medicine. The use of technology is also evident in studies in personalized medicine and pharmaceuticals. Due to the vast potential of Digital Twin technology in the field of health, this study emphasizes the need for qualifying studies that will guide future studies. Research on digital twins in the health sector has mainly focused on creating twins of human organs. It has been done by understanding the behavior of cells within the body and applying appropriate medicines and treatments. The development of sensors, IoT, learning technologies, and imaging systems will also accelerate with the Patient's Digital Twin concept. As technology advances, we will create Digital Twins of the entire human body for everyone, a long-cherished desire. The Patient's Digital Twin will also make a substantial contribution to solving the management problems associated with hospital systems and medical resources that have arisen in the wake of the COVID-19 pandemic. Additionally, we expected Patient's Digital Twin solutions to expedite the vaccine and medicine development processes associated with COVID-19.
The intent was to provide an overview of the future development plan of DP and its broad horizons. The internship's purpose was to understand better and develop the business model of the Company's unique technology implementation. As part of the internship, the main task was collecting literature and feedback from stakeholders. We investigated how customers felt about the Patient's Digital Twin technology and the digital clinic concept. By the business proposals gathered from the business partners and investors, we have identified a marketing strategy for commercializing the idea of a Patient's Digital Twin. A number of these documents were collected, analyzed, and presented throughout the daily roundtables with the co-founders of Klinik Sankt Moritz. Building a digital clinic was necessary to define a project vision and mission. These concepts, along with others, were introduced at MIHMEP 22 and reported in this final thesis. During the internship, they focused on engineering and technical issues of a mobile clinic with a digital twin patient, followed by simplifying this complex organization into a marketable structure based on milestones, which allowed us to monitor the Company's performance and predict market changes. The first step in redesigning the marketing strategy development process within the Company was to declutter the various elements found on a to-do list received at the beginning of the internship. Therefore, defining the first and most fundamental component of implementing effective marketing strategies and driving a digital clinic using digital twin technology. Several market analyses were required to understand its dynamics, including the health policies and the international players involved. Various aspects of advanced predictive modeling techniques are discussed, including the impact upon stakeholders, the global scenario, the costs, the financial factors, and how to access the market.

Furthermore, as part of the agreement signed with Klinik Sankt Moritz, details concerning the commercialization and financial strategies developed during the internship cannot be disclosed. This final report describes the organization's challenges and opportunities encountered during the internship to provide insight into an innovative project. It is envisioned that in the future and the health fields mentioned in this study, detailed studies will be carried out on the Digital Twin technology from different perspectives. Moreover, studies can be conducted for more specific applications in the health field which have not yet been explored.

About the project

Overview

Klinik Sankt Moritz Mission & Vision

A digital clinic for Patient's Digital Twins

Digital Twin from spacecraft to healthcare

Context

4P

Stakeholders

Klinik Sankt Moritz Mission & Vision

We had the opportunity to practice various concepts from the master's course entitled "foundations of management in health care organizations. The Company has given an overview of the various functions that a healthcare marketing manager is expected to perform and consider. Working in such areas as strategic planning and strategic management, organizational development, market planning design, and performance management was. It was a great responsibility to translate theory into practice by identifying the specifics of management related to the digital clinic context and its professional organization by working on this process for several months. The has been a confrontation. with various issues and problems, including discretion, professional autonomy, organizational culture, coordination, hyper-specialization of digital twin technology, innovation versus bureaucratization, and the various cultures within the company partnerships. While trying to find a way to manage global health digitally, the adaptation of a management style by understanding the issues associated with the theory and practical applications of management went along with the developing tools and frameworks to evaluate the Company's performance. In developing an evaluation of the Company's strategic plan, it was necessary to analyze innovation and change management in the healthcare sector and enhance leadership abilities.

Standing on the shoulders of transformational leaders at Klinik Sank Moritz was an honor. KSM has become one of the world's most highly respected centers for digital medicine due to its vision and courage. The institute has created a world-class digital twin research institute known for making breakthrough discoveries and developing previously unimaginable therapies. The internship started by creating a new strategic plan, which defines the next massive era for Klinik Sank Moritz; the premise is simple but powerful: transform Patient's Digital Twins' health by empowering a world-class team supported by a global community. The KSM mission is to serve more users more efficiently, with even better outcomes in the coming years. This new strategy will provide a guide for us to accomplish this goal. It begins with revised versions of the mission, vision, and values statements. After presenting our significant points of focus, the plan outlines how we will meet the challenges and opportunities set by the rapidly changing environment of healthcare. The physician, hospital, research

institute, medical technology company, foundation, and guild association will work together seamlessly to achieve our goals as a unified organization.

With a spirit of unity and cooperation, a new strategic plan reflects the thoughts and opinions of everyone associated with Klinik Sank Moritz. We have developed a thoughtful and inspiring plan for the future due to our collaboration. Hope, care, and cure can be combined to accomplish great things. Preventing illness is possible like chronic diseases cured. As well as this, by educating users and promoting prevention, we can make society healthier. The goals are clear. The efforts are aligned. Klinik Sank Moritz's future has never looked brighter, thanks to the collection of real-time health data, the analysis of this information, and its interpolation by artificial intelligence to discover future trends in patient health. The clinic's commitment to this mission made its partnership with med-tech companies vital to mapping, integrating, and interpreting the trillions of dynamic and biological features that express each individual's state of health using artificial intelligence (AI) and machine learning.

The Klinik Sainkt Moritz Patient's Digital Twin offers a B2B solution for clinical research organizations (CROs), pharmaceutical companies, and nutritional supplement manufacturers. By merging proprietary AI models with one of the world's largest multi-omics databases, The Patient's Digital Twin helps to create nutritional and pharmaceutical products, enhance or repurpose existing medications and compounds, and as a result, produce new and innovative products at a faster rate and with a greater degree of efficiency. Using the Patient's Digital Twin Health Intelligence, we will create 'digital twins' of individual patients and simulate their variability over time to find the most effective and efficient ways to enhance brain health for each person over time. Additionally, these models may be used in B2B collaborations with pharmaceutical, healthcare, and biotechnology companies to develop new treatments for Alzheimer's and other neurodegenerative diseases. As a leading innovator in health and wellness technology, Patient's Digital Twin offers our users technology-enabled insights, products, and services to help them improve and maintain their wellness. Part of the strategic plan to access the market is partnering with a pioneer in developing digital twin platforms for precision medicine, precision wellness, and biopharmaceutical research. Through B2B partnerships, we analyze longitudinal multi-omic datasets to identify and characterize analytes that will be input into the digital twin platforms. In addition, our partners can provide predictive analytics to support their research activities and consumer and physician applications using the collaboration's API-driven platforms. A current strategic plan of the Company includes the development of an innovative digital twin platform that has applications in the health care industry for the treatment of Alzheimer's, Parkinson's, and multiple sclerosis.[1]

A Digital clinic for Patient's Digital Twins

In order to fulfill the vision of a fully digitalized clinic, in the last six months, we have been developing the strategic plan to enter the market, partnering with some of the world's leading companies in the digital healthcare sector. As a result, KSM offers the highest quality healthcare to dynamic, savvy, and multicultural individuals worldwide seeking the best health care possible for themselves and their loved ones.
A concept related to the organization's vision, described in the Patient's Digital Twin paragraph, is the aim of healthy individuals who wish to enhance their bodies and prevent the entry of

[1] Onegevity and EmbodyBio Announce Collaboration to Explore BrainHealth By: PR Newswire, PR Newswire US, 04/19/2021

potentially hazardous areas at any time and from anywhere. Known for its revolutionary solutions, the Company utilizes cutting-edge technology and the concept of a Digital Twin, developed as an ally in the fight against diseases, thus creating a Patient's Digital Twin project. It represents a revolution in medicine by providing comprehensive and interconnected information on a user's health status at home. Creating the Patient's Digital Twin requires collecting data from various sources, such as pre-existing medical records, real-time data from mobile applications, and results of molecular medicine tests, such as metabolomics and microbiota. By keeping the health parameters of Patient's Digital Twins at an optimal level, the Company helps improve its users' health. It detects deviations that may result in risk areas, using a detailed image of the Digital Twin, feeding into artificial intelligence and physicians' systems. In just a short time, data can be collected in an enormous quantity to create a digital twin of a person, which provides a complete picture of our complicated body, which was previously viewed only from a limited range of specialized perspectives. Due to this development, a new era of healthcare has emerged as it is possible to collect large amounts of data very quickly. For example, heart rate and temperature data are interconnected, providing information about the patient's health. Clinical practice is key to this revolution. According to the Company's vision, it hopes to discover over time more about the inter-connected data than we know today. As a result, patients' Digital Twins can live longer than their physical counterparts and protect future generations.

Digital Twin from spacecraft to healthcare

To adequately explain the potential profitability of the emerging technology to stakeholders, investors, and venture capitalists, it was necessary to better understand the Digital Twin technology for patients. While technology is advancing rapidly today, despite such origins as the early days of computers, the concept is becoming more popular in the 21st century as more advanced technology becomes available. Even though a digital twin concept is not standardized, it has unique characteristics. Essentially, it is a model of physical objects modeled digitally, which can update in real-time by receiving data from physical objects. Therefore, maintaining consistency throughout the lifecycle of a physical object is essential. Using digital twins, it can analyze, predict, diagnose, train, and so on, and feed the results of simulations back to the physical objects to optimize and make decisions about them.[2]

2002 saw the introduction of the first virtual representation of physical systems. Researchers at the University of Michigan proposed a computerized mirror image of the actual life cycle of a manufactured product. They wanted to make manufacturing more efficient and cost-effective. Despite this experimentation, the idea dates back decades. Since NASA's earliest days, engineers have used digital twins to test and monitor spacecraft. In 1970, after an onboard explosion damaged numerous systems while the astronauts were thousands of miles away from Earth, Earth computers programmed like those on space vehicles were often used to test different scenarios. These tests were essential to save the lives of the Apollo 13 astronauts. Essentially, a digital twin is an exact virtual replica of an existing system, item, or process.

Companies can create a computerized representation of a car, a building, the delivery process for pizzas, or even mechanical systems. In theory, these replicas function like real-world

[2] A Digital Twin-driven Human-robot Collaborative Assembly-commissioning Method for Complex Products, May 13th, 2021, Donghua University

objects and are used for many purposes. Their cost-effectiveness allows us to test how real-world counterparts will look. Development testing can monitor products for problems, testing updates, and testing repairs before their performance on the real-world version. It is advantageous for engineers and technicians to predict problems, identify solutions and improvements, and test scenarios with no unintended consequences in real-life situations. For example, technicians can create a digital version of a new product to evaluate its functionality and practicality before manufacturing. Thus, to find potential problems and ways to improve the product, even while it is in the design phase, is possible without creating a physical component of the item. Such an approach is advantageous in reducing production errors and determining how a change or improvement may affect an existing real-world item or how it would react to a changing environment. Digital twin technology, for example, can be used to simulate how devices and electronic systems might react to solar radiation from a solar flare or to evaluate how a car might function during sweltering and cold conditions. As a result, engineers can prepare for such circumstances in advance. In addition, digital twins can link to their physical counterparts. Usually, these twins collect information and serve as a means of monitoring for possible issues. Furthermore, they may also be used to evaluate potential solutions to problems.[3]

According to one expert, digital twin technology is disrupting the healthcare industry. Digital twins are gaining in popularity in the age of digital transformation. The term' digital twins' appears in nearly all reports about digitalization in healthcare (Fuller et al. 2020; Kritzinger et al. 2018; Liu et al. 2018), and market reports rank it among the top ten strategies for the next five years (Saracco 2018). A stakeholder pointed out that this term shows up in nearly every research proposal related to digitalization in healthcare. The team has acknowledged that the term 'digital twin' can have many meanings, making it difficult to determine whether the claims can be considered legitimate. Though stakeholders generally agree with the definition of a Patient's Digital Twin (DP) outlined in our initial report, some ambiguities are associated with the term. The following discussion highlights a few aspects of this debate.

In the first instance, among the Company's stakeholders, there is a sense in which a Patient's Digital Twin is considered an impossible task. In terms of representations of objects, there is, after all, a theoretical maximum degree of precision. Even though the term 'digital twin' is not yet a misnomer, it should not suggest a nearly exhaustive correspondence between the individual and the copy. Citations illustrate this struggle with what is not only a practical but also a logical limitation. The team has experienced that it should not view a digital twin as a virtual companion to accompany users or keep track of their activities. Traditionally, a digital twin was a concept in engineering where physical devices linked to digital models can reflect the state and operation of the physical devices dynamically (Raden 2020). During the internship, we have noticed that many of the interviews with the company stakeholders swung naturally towards applications that, while not yet digital twins, have characteristics that indicate they are. Such digital twins discuss mobile applications and wearable devices and sensors to collect physiological data. The report will cover this topic in the paragraph about the methodology. With Industry 4.0, the industrial sector has entered a new era. The term refers to the fourth industrial revolution, which digitalizes industrial processes. Various technologies like Cyber-Physical Systems (CPS) and the Internet of Things (IoT) are used in this area to establish an interconnection of different devices and gather data to improve the entire system in real-time. In today's healthcare industry, the principles of Industry 4.0 are applied to reduce

[3] Digital twin. By: Ungvarsky, Janine, Salem Press Encyclopedia of Science, 2019

setup costs, facilitate rapid learning, and increase flexibility. Devices are interconnected, and they can exchange data converted into useful information. As a result, the production line can self-adapt in response to changes caused by external factors. Physicians have access to their Patient's Digital Twins' current information within the Digital clinic ecosystem through mobile devices, IoT, and software applications.

In one industry case, the term' digital twin', widely advertised by a firm, does not provide a comprehensive understanding of a whole object, instead of focusing on a small number of variables that matter in defining specific types of diagnoses. The term "digital twin" may sometimes describe a particular method or approach rather than a specific artifact. It is noteworthy that the term 'digital twin' is used primarily in the manufacturing sector to refer to an approach to manufacturing and testing rather than discrete forms of high-quality, dynamic representations (Tao et al., 2018). The term appears as a name for an approach or a methodology rather than an artifact (Stojanovic and Milenovic 2018). Similarly, some of our stakeholders have stated that they do not distinguish between digital twins and other related technologies labeled differently but are consistent with the same approach. For example, one of our stakeholders described 'digital avatars' and 'virtual humans' as not being distinguishable from 'digital twins' as a basis for approaching digitalization in health.[4]

The Company's mission is to achieve its objectives by funding the development of an automated scanner and by partnering with stakeholders, like other hospitals in the US market. The scanner will create a complete picture of a patient's health by scanning the entire body without exposing them to radiation in less than fifteen minutes. Developing partnerships is essential in order to gain access to the market and to exploit the Digital clinic's mission: To provide accurate, deep, long-term, and anti-aging wellness solutions to patients at home through real-time data collection and continuous analysis, along with artificial intelligence interpolation to detect trends inpatient health as they emerge in the future. In order to create the first complete digital twin patient, we report the following results and benefits: earlier this year, Andreessen Horowitz led a $40 million Series B funding round to bring the Company out of stealth. In addition, Kaiser Foundation Hospitals participated in the funding round. Creating a virtual model of a patient's health from data such as vital signs, physical activity, and other observations has been a quest for device manufacturers and drug developers alike, seeking a clearer picture of a person's status. However, they have never obtained a comprehensive picture of the situation. The technological partnership aims to go straight to the source. With Kaiser Foundation Hospitals' backing, the Company's whole-body imaging platform can model physiological variables and potentially predispose patients to certain diseases. In 15 minutes, the scanner can survey the whole body, gathering data on genetics, medical histories, and other aspects of health. Through a magnetic resonance scanner and a computational method called parallel imaging, this partnership's hardware aims to be cheaper and ten times faster than conventional MRI. It was previously impossible to create a digital twin of a person's lifestyle, medical history, genetics, anatomy, chemistry over time with integrated tools that allow easy correlation between quantitative changes and risk factors, according to Q Bio CEO Jeffrey Kaditz. The analytics could also provide insight into a person's risk of disease, guide proactive care, and assist researchers seeking to understand conditions more fully, Kaditz said. The venture capital investors join previous investors such

[4] The use of digital twins in healthcare: socio-ethical benefits and socio-ethical risks Eugen Octav Popa*, Mireille van Hilten, Elsje Oosterkamp, and Marc-Jeroen Bogaardt

as Khosla Ventures, Founders Fund, Beast Ventures, Thirty5 Venturers, Sea Lane Venturers, and SciFi Venture Capital. [5]

[5] Q Bio unveils 'digital twin' whole-body imaging platform, with KaiserPermanente backing. By: Hale, Conor, FierceBiotech, 4/30/2021

Context

4P

The future medicine is Personalized, Participatory, Preventive, and Predictive.
This final report examines the Digital Twin studies planned for the medical field from the perspectives of Patient's Digital Twins, the pharmaceutical industry, hospitals, and wearables. The report concludes by making future predictions and suggestions for Digital Twins in healthcare. Today, no physician, clinic, or hospital can offer their patients 4P medicine solutions.
A digital twin is more than just a digital model. This difference, captured by the word 'living' in the definition above, implies that a digital twin connects to the real-life counterpart in a way a mere model is not (Kritzinger et al., 2018). Hence, the continuous adaptation of the twin to the real-life counterpart is made possible by a variety of technologies such as sensors, high-speed communication, cloud computing, and artificial intelligence (Raden 2020). Therefore, as mentioned in the introduction, the digital twin is not one technology but a technological cocktail.
We anticipate that the advent of digital twin technology in healthcare will have significant implications for the following fields: personalized and precision medicine (Harris 2020), the ability to build biologically detailed digital representations of a heart or a brain (van Houten 2018b), models for specific conditions such as brain aneurisms (Shugalo 2019), simulations for operations and other interventions incorporating the "omics": "metabolomes, proteomes, biomes, genomes, and their relationship to demographics, physical markers, and lifestyle overage" (Raden 2020), drug discovery using in silico (organ-on-a-chip) clinical trials (Shugalo 2019).[6]
Metabolomic is considered the screening for otherwise unsolved problems in medicine. Klinik Sankt Moritz uses it to improve the Patient's Digital Twin abilities, moving back the hands of the clock before any disaster and discovering, understanding, and improving sooner. Improving health to prevent and enhance the Patient's Digital Twin's physical and mental abilities through a DNA test is the key to sheltering the Patient's Digital Twin and its offspring.

In engineering, predictive maintenance services are anticipating early failures. In medicine, predictive maintenance refers to predicting and early diagnosing diseases before they occur by examining organs or symptoms. The application of engineering to the field of health includes, for example, restoring blood flow during a vascular bypass operation, remaking a cataract patient's lens after cataract surgery, or performing organ transplants as engineering activities.
Errors in medical devices, incorrect detection of medical findings, and incorrect interpretation can result in misdiagnosis, incorrect diagnoses leading to inappropriate treatment, and inappropriate treatments leading to adverse outcomes. Due to this, anticipating and preventing errors is crucial. A misdiagnosis and error in the treatment can lead to irreversible consequences in the patient's life and even death. For example, if the leg muscle infarction is not diagnosed or misdiagnosed in time, it can cause irreversible damage, such as an amputation or permanent disability. With digital twins, cancer diseases will be detected earlier and more accurately in the future. Cancer treatment is a hazardous and challenging experience for patients, relatives, and physicians alike. There are many different acute diseases, and different patients may respond differently to treatments. The importance of personalized medicine is evident when

[6] The use of digital twins in healthcare: socio-ethical benefits and socio-ethical risks Eugen Octav Popa , Mireille van Hilten, Elsje Oosterkamp and Marc-Jeroen Bogaardt

we remember Hippocrates' aphorism, "There is no disease, there is a patient." When we consider this aphorism, we understand the importance of personalized medicine. When we examine personalized medicine, we can talk about the personalization of treatment, especially personalized medicines based on data. Digital twins used for this purpose, built on computer-based, or in silico, models fed individual and population data. These studies aim to create Digital Twins of whole human bodies and to use personalized medicine, which has already begun but, as anticipated, will see its completion in the future. These studies will revolutionize the health sector and improve the success rates of treatment methods and advances in health.[7]

Healthcare in the digital age triggers and will continue to trigger a linear, evolutionary change, which means the technology comes to accelerate already-existing trends rather than create a remarkable paradigm shift. The digital twin has the nature of a technological cocktail, combining already existing technologies (see introduction). However, it is also since digitalization is not a new thing. From a personal point of view, the digital twin is an evolution, not a revolution. There are some personal doubts about whether it will be a game-changer. Quite a few things are happening already. However, it is extremely complex to pass through such a slow-but-steady process. Even though the term 'digital twin' may have been too broad to capture the future of the digital twin, we were generally unable to capture it. With a cross-sectoral approach, some of our stakeholders do not see themselves as members of a common transition towards the digital twin in their daily work. Many aspects of the future of the digital twin are in flux. In the first place, we see the generalization of existing applications. A few decades ago, computer simulations of the human body could only simulate some organs or certain processes. Shortly, more and more human data will be simulated and replicated. Therefore, the digital twin field is transitioning from a niche endeavor focused on health specifics or physiologic processes to becoming the industry standard. Secondly, it is becoming more and more quality conscious. Even though the benefits of digital twins, sometimes questioned but generally accepted, will continue to improve as a diagnosis and treatment tool. Despite this, stakeholders had an apparent disagreement about where improvement will occur. Those engaged in modeling tend to focus on the best models they will come across, while those engaged in data gathering devices (sensors) tend to concentrate on the best devices. Although implicitly or explicitly acknowledged, 'good data and good modeling' are interdependent. How will this new digital twin differ from the existing one? There is little controversy regarding the mathematical side of digital twin modeling: it will be a highly complex piece of software that eventually will include machine learning or some other form of artificial intelligence. Some disagreement exists regarding the practical aspects of data gathering. According to some, future digital twins will be a 'mild' form of the chip under the skin or an ingestible sensor, projected to become even smaller and more noninvasive soon. Digital twins are often described as a full picture of a person - the more detailed the picture, the more accurate the twin - where data is constantly and seamlessly flowing towards its digital counterpart. Two stakeholders report that as soon as this seamless flow of data establishes, the digital twin will serve as an accelerator for the current shift from treatment to prevention, meaning that the underlying goal of the data is to avoid contact with physicians rather than improve it. When necessary, doctors will pay closer attention to patients/ users during a digital consultation. Everyone would rather avoid visiting a doctor's office. The doctor's attention should focus on the right issues and people who need them. Therefore, an improved digital twin will improve treatment and serve as a better' filtering mechanism', which will result in a significantly reduced burden of disease. Digital twins, as expected to advance in conflicting directions, depend on the area they will be used.

[7] The Digital Twin Revolution in Healthcare Tolga Erol Training and Simulation Technologies HAVELSAN A.Ş. Ankara, Turkey terol@havelsan.com.tr

As argued, fields such as cardiology have the 'advantage' of spawning a greater need for data and real-time optimization. However, oncology has the advantage of gathering data much more easily than other fields since patients diagnosed with cancer are generally less concerned about privacy or comfort. A group member formulated this sharply by stating, "data protection is for people who are healthy." As a result, organ-level replicas and implants are potentially very broadly applicable - not normally limited to specific diseases or treatments. Ultimately, it will be difficult to predict where the digital twin will be most effective due to these competing advantages. We must also mention that not all stakeholders saw the advent of the digital twin as something inevitable. According to three of our stakeholders, the digital twin could not make any difference in the foreseeable future. In response to whether digital twins of patients become commercialized in the future, one of them replied clearly: No. It is partly due to the health system, which closely follows tradition. In addition, most medical doctors follow the traditional path as well. As such, personally anticipated, digital twins will be used in the future for a tiny group of diseases and patients, medical professionals, and hospitals, at least in the beginning. As a comparison, consider the following a more optimistic vision of the future of the digital twin, in which everyone will become a unique data set. A personal conviction is that we are indeed moving in this direction. A patient will have the ability to say, "OK, here are all my data elements accumulated throughout my life.". What is happening? What has changed? What can users do?"[8]

[8] The use of digital twins in healthcare: socio-ethical benefits and socio-ethical risks Eugen Octav Popa , Mireille van Hilten, Elsje Oosterkamp and Marc-Jeroen Bogaardt

Stakeholders

Market and competitors

Staff Zero Unit

Patient's Digital Twin

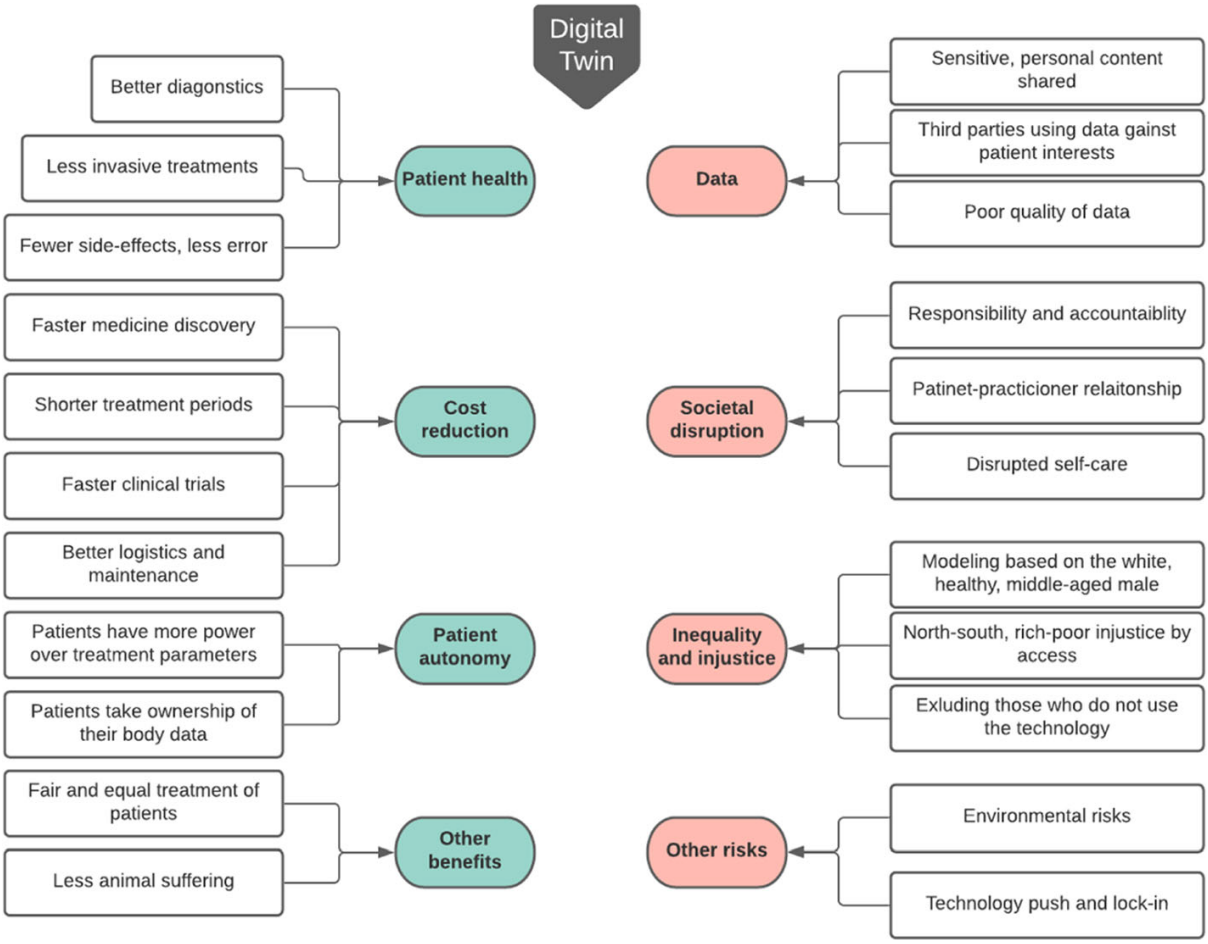
Physicians

Hospitals & Clinics

Med-Tech companies

Pharmaceutical companies Research centers

We define the digital twin as a living replica of a physical system (human or non-human). A digital twin combines various emerging technologies such as AI, the Internet of Things, big data, and robotics, each component bringing its socio-ethical issues to the resulting artifacts. The question thus arises of how stakeholders perceive them in the field. In this report, we present some of the results from a qualitative study to gain profound knowledge of the Company's environment and stakeholders. It revealed several essential areas where the digital twin can produce value (e.g., prevention and treatment of disease, cost reduction, patient autonomy, and freedom, equal treatment) but also several vital areas of risks (e.g., privacy and property of data, disruption of existing societal structures, inequality, and injustice).



Market and competitors

It is important to note that replicating equipment or system helps improve system productivity, optimize resource consumption, and ensure that the product handling is kept to a minimum, allowing large organizations to improve quality and productivity. Moreover, the application of digital twins also supports new business models and provides opportunities for SMBs to incorporate technological capabilities into their operations. Large and small enterprises alike will benefit from the benefits of a digital twin, with their demand expected to grow at a healthy CAGR in the next seven years. Recent advances in Artificial Intelligence (AI), Machine Learning (ML), and Internet of Things (IoT), along with automation in significant industries, have influenced manufacturers to incorporate digital twins into their production processes to cut down on costs and increase productivity. Furthermore, end-use industries are increasingly demanding digital twin portfolios that address specific requirements. The prominent market players respond by expanding their portfolios with solutions designed specifically for specific end-use industries; individualized digital twins influence end-users to establish digital twins across their value chain, promoting the market growth.[9]

In the global market, the estimated size for digital twins will grow 50% between 2020 and 2030, from $3,210.1 million in 2020 to $184,517.4 million by 2030. A new study by Grand View Research Inc. estimates that the global digital twin market size will reach USD 86.09 billion by 2028. The Compound Annual Growth Rate projection is 42.7% from 2021 to 2028.
Several years ago, a description of digital twins was: "ten most strategic emerging concepts for the coming years," projecting that the technology will generate more than $10.96 billion in spending by 2022 (Saracco 2018).
COVID-19 has accelerated the adoption of digital twins in specific industries. End-user industries, such as healthcare, agriculture, and government offices, have implemented digital twin technologies across several countries to work at minimum labor counts and stay within social distancing norms. In Italy, it has increased the investment in Industry 4.0 technology, like digitalization of working or purchases on digital technologies.
Different market reports have shown us conflicting opinions about COVID-19 impacts.

- Negatively impacted the digital twin market, as companies suffered from lower profits due to the shutdown of plants and offices. As a result, they reduced their spending on such expensive technologies and focused instead on mitigating their losses.
- Positive, the pandemic has served as an impetus to accelerate the adoption of digital twins to be better prepared for similar crises in the future.
- Optimistic, several confluent factors have led to the emergence of digital twin technology, including the strength of cloud-based systems, the emergence of 5G networks, improvements in 3-D rendering, and the remote work requirements of COVID-19.

The digital twin market will experience the fastest growth in the IoT segment in the coming years. As IoT consumption and sensor-powered development increase worldwide, digital twins are being used to simulate IoT-based Patient's Digital Twins.
The IoT in Healthcare Market report from Markets and Markets indicates that the global market for IoT in healthcare is expected to surpass USD 188.2 billion by 2025, at a Compound Annual Growth Rate (CAGR) of 21.0% during the forecast period.

[9] Digital Twin Market Size Worth $86.09 Billion by 2028 | CAGR: 42.7%:Grand View Research, Inc. By: PR Newswire, PR Newswire US,05/18/2021

The large enterprises market will dominate the digital twin market during this decade. A company with such an extensive portfolio has a wide range of assets. In addition, they are engaged in many processes and projects, for which they rely on digital twins to predict success, failure, and maintenance needs. As a result, companies can generate better customer offerings, increase profitability, and increase productivity using digital twins. Historically, the performance monitoring application segment has dominated the digital twin market.
However, data analytics, IoT, artificial intelligence (AI), and other advanced technologies are currently being incorporated into digital twins to track asset performance in real-time. The North American digital twin market is the largest due to its advanced IT infrastructure, improvements in technology, and adoption of Industry 4.0 practices.
Moreover, many companies offering such solutions can impact this market positively. Several factors contribute to the rising demand for this technology, including the Growing Adoption of IoT: More than 41 billion interactive devices will be functional by 2025. In order to ensure that the Internet of things (IoT) works at its optimum level, it is essential to optimize throughput for each component of the Patient's Digital Twin, made possible with the aid of digital twins. For example, a virtual model of a physical product can be created using the data generated by the connected sensors. However, using this technology, it will be possible to incorporate the data into an actual product. An increasing focus on intelligent maintenance is another critical factor driving the market for digital twins. The increasing focus of enterprises on intelligent asset maintenance is another critical factor driving the digital twin market. In order to simulate a product, a process, or a system, a digital twin can be employed, which allows companies to gain real-time insight into the operation of their product. They can thus determine if maintenance is required, which will help prevent unforeseen system failures. [10]

Nowadays, Med-Tech companies are on full speed ahead before regulations are in place. Some experts believe that digital twins will only gain importance as the metaverse takes shape, a collection of connected virtual worlds that are influencing-or even replacing-what takes place in the real world. As their most complete example, IoT and Digital Twins (DT) require a broad approach that includes expertise in sensing, hardware, networking, user interface, user experience, and data management. DT or a generic IoT environment can be viewed as a Human in the Loop, an ecosystem of elements (hardware and software). These can exchange data through the Internet and act and react automatically or semi-automatically according to the events, preferences, rules, or decisions of domain experts (users) who are at the center of the ecosystem. Humans and machines interact in an IoT system, and users are the ones who generate (or add to) the data, manage the IoT elements in the system, and unwittingly develop the IoT environment by engineering the interactions among the elements and their behavior. A user finds himself or herself in the center of a complex ecosystem that must be managed efficiently, effectively, satisfactorily, and with information.

This report introduces a new element in the ecosystem beyond sensors, applications, social media, recommendations, and other users: a team of digital twins that interact with humans (at the center of the system) to predict their futures and make suggestions to improve their fitness experience and overall wellness.
Building the long-lasting project of a digital clinic and setting on a blend of cutting-edge technologies, the KSM strategic plan has considered several partnership and co-branding strategies. The analysis implied a comprehensive stakeholder mapping with an Ia3 framework,

[10] How Digital Twins Are TransformingManufacturing, Medicine and More. , Time.com. 1/5/2022, pN.PAG-N.PAG. 1p.

constantly updated to analyze their priorities, what leads their decisions, and finding the correct value proposition and evidence to move the stakeholder's decisions

In particular, some notable healthcare organizations and Med-Tech Startups have been analyzed for market access purposes:

- Amazon Web Services and the National Football League created a digital athlete to understand football injuries better and treat them effectively.
- SmartFit allows monitoring and management of the fitness activity of a team of athletes using a team of DTs, each linked to a team member. With SmartFit, trainers will be able to monitor teams of athletes through the collection of a set of measurements describing the athlete's behavior over a period, generally a time. The measurements are gathered using physical sensors embedded in wearable devices (e.g., heartbeat, number of steps, physical activity, sleep) and through applications designed to keep track of aspects such as food intake or mood. As a result of observing each athlete's measurements and performance during training sessions, coaches and trainers should identify the behaviors that should be avoided or restricted. For this purpose, SmartFit allows coaches to design rules automatically triggered when specific situations occur. Providing a visual language that is familiar to non-professional sports team members, SmartFit's goal is to enable them to create rules within an easy-to-use environment. As a result of those rules, events related to athletes' habits are monitored, and a message automatically is sent out informing the athlete whose behavior needs to be corrected. Although the SmartFit interface is straightforward and efficient, many coaches and trainers had difficulty understanding the rules to de one, especially when the tasks were complex. To facilitate trainers' training rules creation, SmartFit has been enhanced with artificial intelligence capable of calculating prediction and suggestion suggestions that can help improve athletes' performance. SmartFit extends its capabilities with DT technology by exploiting them into a network of DTs, each linked to each athlete on the team. SmartFit sends new measurements received from the athlete to the DT, which predicts his or her condition based on those measurements and provides suggestions on how to improve it. Then, trainers can use those suggestions.
- Sim & cure is the first Company to market a patient-based simulation model that allows predicting the placement of medical devices (flow guiding, intravascular device, laser-cut stent) for aneurysm treatment. Sim & size simulates each size and device type based on the patient's unique anatomy to provide the necessary information before implant sizing selection. In 25 countries, more than 250 hospitals and more than 2000 operations were simulated and aimed to minimize the margin of error. The two main visions of the Company are personalized medicine, and the second is to develop a treatment plan by securing the treatment applied to the patient. In Sim & Cure's new method, 3D rotational angiography is used to create a 3D model of the aneurysm and surrounding blood vessels after the patient is prepared for surgery. Sim & cure's software imports the model of the artery and presents it to the surgeon, who chooses the points defining the ideal end position on the artery and the size of the implant placed. Using software developed by ANSYS, the physician can rotate and zoom the image to understand the relationship between implant and aneurysm fully. Color coding can be used to show the exact area where the implant touches the embolism (occlusion). A cross-sectional profile shows any gap between the implant and the artery. Each simulation takes only 10 to 25 seconds, depending on the device selected. The surgeon can easily select and simulate additional devices and sizes to determine the best results.
- The surgeon can complete the simulation process in less than five minutes, select the most suitable device, and initiate the operation. Thanks to the Digital Twin technology, the times when physical parts in the Patient's Digital twin need to be changed can be

detected early. Similarly, Philips created the "HeartModel," a personalized Digital Twin of the heart, which is an essential step towards the Patient's Digital Twin idea, starting with the question of whether it is possible to discover and treat ailments in the human body before they occur. Based on the unique images of the heart, HeartModel adapts the generic model to a personalized model. The Philips Heart Navigator tool, also developed by Philips, combines the Computed Tomography (CT) images obtained before the surgical procedure in a single image of a patient's heart anatomy with a layer of live X-ray information during surgery. The tool helps the surgeon select a suitable device by simplifying prior procedure planning. Provides real-time 3D insight to position the device during surgery. This device is a physical guide for the surgeon on how to proceed.

- Siemens Healthineers produces intelligent algorithms that generate digital organ models based on large amounts of data. In a research project, Cardiologist's algorithms for cardiac resynchronization therapy. They used this therapy in a research project at Heidelberg University; it is a treatment option for chronic congestive heart failure patients. In the study, cardiologists simulated the heart's electrical signals with the help of electrodes in a computer environment and created the Digital Twin with an artificial intelligence infrastructure. Models created with MR images and ECG measurements simulated the first and fully simulated heart. As a result, Digital Twin saves time making a definite diagnosis and performing various treatment trials.
- Dave Rhodes, senior vice president of digital twins at Unity Technologies, a video game and 3-D platform company, the technology has been in the works for a while. However, it is only now starting to gain popularity. They can represent real-world objects ranging in size from millimeters to miles. In medicine, pioneering digital twin technology is a way to plan surgical procedures and assess heart risks associated with various drugs. An article published in the journal Nature Medicine in November by seven medical researchers from around the U.S. argues that clinical studies should include "cancer patient digital twins" to precisely monitor a patient's health state and adjust treatment accordingly. "Digital twins are poised to revolutionize how cancer and a wide range of other complicated diseases are diagnosed, managed, and treated," the researchers wrote as part of their study.[11]

Staff Zero-Unit

The digital revolution does not add value but creates new business models. In other words, instead of hardware-based products, software-like services are sold, for example, instead of drugs, but health care services. Thanks to Digital Twin implementation, one physician, using artificial intelligence, can visit in remote up to 500 patients per day. One physician can manage up to 22,000 patients by seeing all patients every two months. This business model does require zero-unit staffing. After passing a language test, physicians can be hired anywhere globally with lower costs than Swiss Healthcare for the same training. Generally, the most significant value is generated directly from the end-user or customer.

With the creation of a Digital Twin, an asset management system begins, is viewed, and managed remotely. "Evaluating data to ensure that maintenance occurs at the right time, software and firmware are up to date, and inventories planned and optimized," Sandhu says. Any asset can store and retrieve additional documents and data. "With the Patient's Digital

[11] https://www.prnewswire.com/news-releases/global-digital-twin-markets-analysis-and-forecast-report-2021-2030-opportunities-with-logistics--transportation-industries-to-leverage-the-technology--convergence-of-it-and-ot-301433701.html

Twin module, data can be transmitted securely from your real device to the cloud. It is possible to explore at any available locations, via a tree structure, to view a broad range of asset-related information and documents." Data can be routed and forwarded to other applications or external dashboards with Live Connect: "With Live Connect, a secure, standardized, and easy-to-use live data connection is achieved from each sensor into the Asset Hub with an edge gateway device." In addition to displaying sensor status in the cloud, it is possible to connect real-time process data to monitoring applications. [12]

During the internship, we carried out a study case and its strategic plan to encourage in-company interdisciplinary teams to effectively implement the new application services and manufacturing. A variety is discussed and evaluated, concluding that companies can take the steps required to fast commercialize new medical technologies and biotherapeutics if they only apply the proper steps.

As well as drug discovery, manufacturing technology requires innovation and a set of methods, i.e., an engineering method. Unfortunately, the scope of engineering science in the pharmaceutical industry (often restricted to detail engineering, purchasing, and maintaining equipment) sans the sound methodological skills necessary for developing new processes with modern methods will not support societal needs. At the required scales, Innovative yet affordable medicines can be commercialized only with any economic and sustainable manufacturing system following the co-opetition. In the past three decades, industrial projects experiences and lessons have demonstrated several important recommendations for a successful industrialization process, including tasks and objectives for team education and training, strategic project management, and the availability of valuable tools. For example, manufacturing and engineering were pushed to the margins by merchandising internet platforms and having direct and permanent access to the end customer. In contrast, the manufacturer (or its unions and associations) does not provide such services. An alternative approach is a co-opetition (Coinage: Cooperation and Competition).[13]

Patient's Digital Twin

A review of the studies in the field of Patient's Digital Twins reveals that most of the studies aimed at developing Digital Twins of whole humans and focused on creating Digital Twins of some organs. However, we are not far from obtaining more information on integrated Digital Twins. The number of studies in this field is on the rise, and the interactions between organs will be visible[14].

Making a digital model of the human body has given rise to the concept of the "Patient's Digital Twin." It is the development of patient-specific models to support healthcare decisions. EC-funded research and development led to this concept. This report collaborated with the DISCIPULUS project, funded under the EU's Coordination and Support Action Plan. As part of the 7th EU Framework Program for Research and Development (2007-2013)[15], the project

[12] Taking the step-by-step approach to Digital Twins, Copyright of Plant & Works Engineering is the property of DFA Media

[13] Accelerating Biologics Manufacturing by Modeling or: Is Approval under the QbD and PAT Approaches Demanded by Authorities Acceptable without a Digital-Twin? Steffen Zobel-Roos, Axel Schmidt , Fabian Mestm cker, Mourad Mouellef, Maximilian Huter, Lukas Uhlenbrock, Martin Kornecki, Lara Lohmann, Reinhard Ditz and Jochen Strube

[14] 《医疗健康领域的数字孪生变革》翻译与简评_理论_科普_数字孪生_医疗器具_其他软件-仿真秀干货文章. https://www.fangzhenxiu.com/post/1740788

[15] Other areas of application | Zeppelin-NT am Bodensee. https://zeppelin-nt.de/en/special-missions/other-areas-of-application.html

aims at creating the roadmap for realizing the Patient's Digital Twin paradigm. Researchers from University College London, Germany, empirica Communication and Technology Research, United Kingdom, Sheffield, Italy, Istituto Ortopedico Rizzoli, Spain, and Universitat Pompeu Fabra, Spain, collaborated on the DISCIPULUS project. As a result, the Patient's Digital Twin roadmap report makes the following recommendations:
The field of silico medicine, also called computational medicine, consists of computer simulations and modeling to develop treatment plans, diagnoses, and manage diseases in the prevention, diagnosis, and treatment stages. Making a Patient's Digital Twin is a challenging process. Therefore, the biomedical, mathematics, bioengineering, and computer science fields should be integrated and interdisciplinary.
The Patient's Digital Twin needs complete data collection. So far, virtual patients have been implemented in a few projects. We define the concept of a virtual patient as an autonomous process. The implementation of this vision in practice involves two crucial points. First, due to the complex nature of human beings, the creation of the Digital Twin needs experienced people in the field. It is also essential that the collected data, critical in decision-making, is complete and suitable for analysis.

Physicians

During the internship, we gathered feedback from clients, physicians, and public health managers during their meetings. Most of them agree that institutional changes can carry some risks, however small they may appear at first glance as soon as a digital twin is involved in the diagnostic process, who is responsible for the diagnosis. What happens if the real-life physician overrides a digital twin's (AI-based) component? Moreover, what happens when making a diagnosis using data from the wrong digital twin? The solution for some stakeholders is to limit the 'reach' of the digital twin, for instance, by considering that no matter what the digital twin says, the physician is ultimately the one in charge. A digital twin will give a more comprehensive picture of different intervention possibilities. However, it can only be decided by a human physician whether to take some route rather than another. If we realize how much more intelligent computers already are and how slowly (organizational, national, and international) policies are progressing, these questions become increasingly urgent. Healthcare is essentially an institution of contact, in addition to the question of responsibility. People go to their doctors when they are sick. Doctors know us to some degree, and they exercise this social role based partly on their knowledge. We need to ask what the effects of disrupting these relationships are. Digitalization has real implications for practices. Traditionally, farmers interacted closely with veterinarians, who had much knowledge of their patients [shown as an example]. This role is no longer relevant since everything is digitally accessible online. Even though the veterinarian brings around a bag of pills now, excluding the many consulting processes is inevitable. However, while the contact in question is time-consuming, the increasing global population and the complexity of diagnostic procedures pressure the system to reduce the contact rather than increase it. The general practitioner is most affected by this pressure since he or she can unload some of the more uncomplicated cases to the digital twin. However, as previously mentioned, this practice will apply in more complex situations, such as detecting tumors through imaging. Even though the digital twin will not "replace the radiologist," but rather "support" her and provide increasingly accurate "insights," at the same time, "the radiologist who does not want to work with AI will have a harder time."

Hospitals & Clinics

During the Company's strategic planning phase, we have analyzed particular medical treatments to analyze the Company's portfolio of clients and marketing purposes. In addition to patients, we intend to work with hospitals, clinics, and individual physicians interested in adopting the digital clinic model based on digital twin patients and partnering and investing in its implementation and enhancement. In participatory medicine, it is possible, for example, to affect a patient's motor activity to oxygenate tissues for optimal healing, which leads to optimal aesthetic results while at the same time reducing the risk of internal bleeding. In addition to the postoperative follow-up, there is lifelong follow-up at a distance. Psychiatric specifical trail paths to the patient using the synchronous-sequential methodology for possible treatments, undertaken directly with the doctor or the clinical facility. For medical-legal, insurance, or other reasons, various psychological and psychiatric evaluation paths are communicated directly to the patient, the doctor, or the clinical structure.
During the internship, a personal commitment was to better understand healthcare scenarios at hospitals and clinics to prepare for collaborations to develop digital twin applications. Furthermore, as previously introduced, to design its strategic plan and manage its performance. As a result, we examined a Digital Twin study that Siemens Healthineers conducted to improve hospital processes in the radiology department of Mater Private Hospitals in Ireland due to high patient demand, increasing wait times and more.
Creating a Digital Twin with data from the radiology department was part of the study. First, the Digital Twin made various predictions and tested various scenarios. Then, using the information provided by the Digital Twin, the radiology department at the hospital was reorganized and planned accordingly.
Many hospital systems and resource management, including this study, can benefit from Digital Twins, for example, solving the lack of healthcare resources during the COVID-19 pandemic.
Based on additional data and recommendations from MPH:
Shorten patients' waiting times if MRI (Magnetic Resonance Imaging) and CT(Computed Tomography) take less time than without digital twin. It will be faster for patients if less time is spent on CT scanning and MRI scanning -- 28 minutes for CT and 34 minutes for MRI. If MRI runs 32% and BT 26% more, the increased equipment usage will not be left.
Reduce personnel costs by adding 50 minutes of work per day to MRI, resulting in € 9,500 per year.

Med-Tech companies
To build cross-marketing, co-branding, and several marketing strategies, we have analyzed possible partnerships with med-tech companies, software houses, and app publishers worldwide to create critical marketing strategies for the whole digital health sector. To create wider Digital Twins, we will need to expand and combine wearable technologies to track patients physically and mentally. For example, we will soon examine changes in musculoskeletal systems of people with mobility impairments and paralysis using wearable Digital Twin technologies. In addition to holding a degree in Science and Technology Communication and working as an intern in the marketing department, a growing personal interest was in implementing digital communication strategies to engage with new customers and users. For example, native advertising allows advertisers to make money from ads, or premium AdBlock prevents users from seeing ads, like many broadcasters and mobile communication do nowadays.
The followings are some examples of possible collaborations in the context of KNM's product co-branding and development:

- We focused on the startup accelerator General Electric Health Innovation Village, which supports 26 local startups in Helsinki working in health and medical fields in partnership with Startup Health, the world's largest digital health hub. Also, GE takes a cloud-based approach to health. Engineers in Helsinki observe patients and develop wireless devices that will not exceed bandwidth soon and can continuously transmit other information like heart rate, blood pressure, respiration, and more to the cloud. As a result of analyzing this information by software and creating Digital Twins for each person. The system is developing software that can alert doctors in unexpected crises.

- The Sooma startup makes wearable technology solutions for the healthcare industry that simulate the brain's electrical signals to treat depression, psychiatric disorders, and other neurological conditions. Depressive symptoms can be treated effectively with positive electrodes, beneficial to immediate brain activity. The devices are used for 30 minutes per session over two weeks, five days a week. According to studies, patients with depression exhibit lowered brain activity and impaired metabolism. In this manner, restoring normal brain functions and reducing depression symptoms—a monitored patient at home with the Sooma Software Suite. Expressly, the patient is provided with an application to enter his moods and feelings throughout the day. They were using a cloud to store all these data, accessed over the Internet. These simulations and data allow the doctor to monitor and modify the treatment process. Sooma's technology aims to substitute for pharmaceutical treatments for depression and reduce the side effects of prescription drugs by reducing their use.

- Myontec uses muscle activation technology and electromyography (EMG) to develop products to understand muscle behavior more precisely. The Company analyzes muscle activity, and therefore exercises responded to by the muscle, according to the body's general health, and transfers the data to a digital environment utilizing technology placed between the threads and makes more effective exercises based on those data. They calculate the threshold at which muscles perform best, increase training efficiency, and provide information about warming and cooling times to reduce the risk of muscle injury through special shorts they developed. Through the technology incorporated in the Myontec Mbody Pro product, one can determine how muscles behave under specific conditions based on the electrical activity they generate. This product uses sensor technology to record and analyze the muscle EMG, heart rate, heart rhythm, and heart rate. The software provides real-time data and post-exercise analysis, enabling users to optimize their techniques and prevent muscle imbalances and deviations.

- In San Diego, Unlearn.AI presented results from the Company's latest Alzheimer's disease model, which created the first machine-learning platform to populate Intelligent Control Arms in clinical studies. In addition, Unlearn.AI became the first to create Digital Twins to populate Intelligent Control Arms in clinical studies. The Company's platform provided Patient's Digital Twin records designed to supplement patient data in Alzheimer's disease clinical trials, according to results presented by company executives during a late-breaking session. The founder and CEO of Unlearn.AI, Charles K. Fisher, Ph.D., exclaimed: "We are excited by the results we presented today, (..) demonstrating its potential to drastically reduce the time spent running clinical trials for an area of major patient need such as Alzheimer's".

- Through its machine learning-based model that incorporates Digital Twins into Intelligent Control Arms of clinical studies, Unlearn's platform aims to alleviate those burdens and accelerate clinical trials to help develop new medicines. Digital twins are clinical records that describe what would have happened if a specific patient had received a placebo. Unlearn utilized data from its membership with Critical Path for Alzheimer's Disease (CPAD) to assemble a large and diverse sample of control data for its Alzheimer's disease model. The model logged the relationships between 50 clinical variables relevant to Alzheimer's disease, such as components of neurologic exams, over 18 months to track disease progression. Pfizer's former vice president and therapeutic area head, pain and neuroscience, medical affairs, Marina Brodsky, Ph.D., say clinical trials are challenging today, especially for debilitating diseases like Alzheimer's. Encouraged by these findings and sees great potential for Unlearn to change the design of clinical trials so that drugs can be provided to patients as soon as possible.

- Digital Twins are incorporated into Intelligent Control Arms through Unlearn's proprietary DiGenesisTM process to address clinical trial challenges. Unlearn makes Digital Twins perfectly matched to treatment patients by leveraging historical clinical trial data, machine learning models for specific diseases, and rigorous statistical analysis. In addition, a unique approach to automating control arms was created using machine learning and developed by Unlearn.AI - DiGenesisTM. Lowering the risk of trial failure and thereby increasing confidence in the outcome of clinical trials by dramatically reducing development time. To help ensure Unlearn's methods meet the highest scientific and regulatory standards, the Company works with biopharmaceuticals, medical device companies, and regulators. DiGenesisTM uses clinical trial datasets from thousands of patients, machine learning models customized to specific diseases, and rigorous data analysis to create digital records perfectly matched to patients in the research arm.[16]

Pharma companies & research centers

In addition to the digital twin process, which is currently under test in the pharmaceutical industry, supported by IoT, artificial intelligence, and advanced analysis, is intended to increase efficiency and flexibility in long production processes of pharmaceutical products. In the long run, the KSM & partner's strategic plans are to overcome medication production difficulties by using real-time data to create digital twins of physical processes. Digital Twin technology has been extensively studied in the pharmaceutical industry to analyze medicine prodNA, organs, cell behavior, and more. The pharmaceutical industry expects these developments to help optimize its personalized medicine and new medicine launch process.[17]

[16] Unlearn.AI Announces Results Generated from First-of-its-Kind Learning Platform to Accelerate Alzheimer's Drug Development By:Unlearn.AI, Business Wire (English), 12/08/2019

[17] Accelerating Biologics Manufacturing by Modeling or: Is Approval under the QbD and PAT Approaches Demanded by Authorities Acceptable without a Digital-Twin? Steffen Zobel-Roos, Axel Schmidt , Fabian Mestm cker, Mourad Mouellef, Maximilian Huter, Lukas Uhlenbrock, Martin Kornecki, Lara Lohmann, Reinhard Ditz and Jochen Strube

Performance Management

After taking part in six months internship, many aspects of the startup Company's setup were considered and understood as a starting point before working hands-on in the business. As a marketing manager intern, the personal attempt was to develop a business strategy that could develop a business plan by measuring the clinic's development and social performance with several tools.
Since most decisions were made on a day-to-day basis, quantitative measurements were not organized, so no overall long-term performance measurements were made to gauge the success of the Company. Instead, there will be one or more resolutions in the coming year to define Key Performance Indicators (KPIs), which we will use to measure our success against a set of measurable targets and objectives. For example, a financial KPI could be net profit (or the bottom line), revenues less certain expenses, or the current ratio (liquidity and cash availability). Performance measures intend to provide reliable and valid information on the Company's growth and project development. Our need was to respond to stakeholders' demand for accountability. For example, make budget requests, do internal budgeting, trigger in-depth examinations of performance problems and possible corrections. Also, motivation, contracting, evaluation, and supporting strategic planning were crucial to communicate better with the internal and external stakeholders, build trust, and improve the overall performance.
Improving accountability and increasing communication with the Company's stakeholders is crucial in developing marketing to reallocate resources and improve future performance. Informing stakeholders both promotes and allows them to evaluate and learn.
Digital twin as a decision-support tool in healthcare management can be leveraged to increase the Company's efficiency. Digital twin in healthcare is more complex than in manufacturing because of the physiology of everyone. However, this technology can collect data through sensors to represent a virtual patient even at the molecular level.
During the internship, it was possible to follow the startup partnership to develop a digital twin to support Elderly Healthcare System with real-time health monitoring at home. The patients represented the physical part, with some wearable sensors attached to them and medical equipment. The virtual part was designed to display each patient's physical condition and communicate each disease in real-time to the doctor.
KSM has leveraged a digital twin framework to address planning problems, such as online staff scheduling and the user's reduction in waiting time. It integrated a discrete-event simulation model, virtually representing the physical system, with IoT technologies, which collect data to update the model in real-time. By testing different scenarios, it is possible to find the optimal number of resources that increase the efficiency of the online system in terms of waiting time on each phase and the number of patients who enter and exit the system.
Digital twin often exploits mobile applications for Android or iOS. In healthcare, for example, the trend of heart monitoring through smartwatches and mobile Apps is increasing dramatically. KSM's development to monitor the heart rate of the patients and communicate in real-time, through a WhatsApp message, with the doctor if some values are not ok. These values are collected through wearable sensors, which transfer the data to the smartphone through Bluetooth Low Energy technology. Thus, mobile applications integrated with physical devices provided to the operators allow the efficient development of a digital twin for any healthcare process.
Digital sensors, digital twins, and software analytics are combined to bring science into asset maintenance. In the process of revolutionizing how the Company manages its assets and operates its businesses.
There are many kinds of digital twins or virtual models depending on the problem being solved. In the case of predictive healthcare monitoring, the key is to compare actual performance data

to historical performance data. With machine learning, the algorithms and the model become more precise based on experience. This added precision helps schedule therapies, interventions, and medical device replacements with greater accuracy, avoid downtime and help with workforce management. It also can reduce the number of spares and the cost of ensuring redundancy.

Digital twins or virtual models do not have to exist in isolation. It also is possible to connect digital twins and create a picture of the entire operation. The aggregation of twins creates system-level and business-level views. In addition, it introduces the possibility of workflow optimization, where analytics programs can suggest areas for workflow improvement and redesigns that have factory-wide and business-wide impacts.

Market access

The market access for pharmaceuticals and medical technologies master class, performance measurement and management control for health care services, foundations of management in health care organizations, and advanced economic evaluation of health care programs (modeling) has provided the appropriate knowledge during the internship. It was about bridging the Company with the stakeholders, detecting external opportunities and threats, while structuring teamwork across various company departments. At first, a personal mission was to get profound knowledge of the system and its stakeholders. As briefly reported in the overview, it implied a comprehensive stakeholder mapping with an Ia3 framework, constantly updated to analyze their priorities, what leads their decisions, and finding the correct value proposition and evidence to move the stakeholder's decisions. It will be a personal result achieved this following year. In 6 monthly internships, many aspects of the startup were considered and understood as a starting point before getting down to business. Most decisions were taken on a day-to-day agenda; therefore, quantifying measurements were not yet organized to gauge the Company's overall long-term performance. New Year's resolutions will define the Key performance indicators (KPIs) to measure the Company's success versus a set of targets, and objectives, such as financial KPIs, including net profit (or the bottom line, gross profit margin), revenues minus certain expenses, or the current ratio (liquidity and cash availability).
To build long-lasting projects of a digital clinic set on a blend of cutting-edge technologies, KPI's are not only a personal commitment. They are crucial to define a set of strategies, activities, and processes for developing a Startup, and the project of a hybrid clinic, half MedTech software house, and half health care organization, with the ability to identify potential partners and build long-lasting partnerships. During the internship, we designed strategies according to the Company's mission and vision. For example, to ensure products are made available and adequately priced, in a specific health system, through critical analysis and interpretation of different pieces of evidence, in order to bridge different stakeholders' requirements.
The Company and the stakeholders' perspectives were taken beyond the product per se for a broader, more comprehensive perspective and demonstrating the value produced by the partnership for all the involved partners in the business development chain. Market Access strategies have been declined to the specific context to support the ability of the Company's MedTech products and services to achieve a favorable recommendation for prescribing them through various health systems. Each step of the strategic plan leads towards achieving its marketing goal: having Physicians prescribing KSM's Digital Twin platform to their patients.
Industry 4.0 encompasses multiple evolving technology umbrellas, one of which is Cyber-Physical Systems (CPS). Pervasive sensor technologies, open and standardized communication protocols, and computational convenience have led to its development. CPS can be defined as a synergetic integration of the physical assets and their Digital Twin (DT), usually with feedback loops where the state of the physical assets affects the computations in the DT and vice versa. Those partnerships integrating CPS with production, logistics, maintenance, and other services in the current industrial practice hold the potential to transform today's healthcare organizations into Industry 4.0-based healthcare organizations. This can foster significant economic growth and high responsiveness to ever-changing operating conditions, leading to significant evolutions in the decision-making processes. Together with its "umbrella" strategy, the Company's milestones have been framed globally. Accordingly, with the policy scenario and population target, some stakeholders speak of an "enormous lag" between the R&D developments and policy.
One of our stakeholders mentioned a compelling case where stakeholders involved in R&D explicitly requested regulation from international legislative bodies since they recognized the

social and economic benefits of a clear framework for action. In general, we hear that the less legislation there is, the more freedom we have. However, in the case of KSM, everyone saw the benefits of regulation. The mission is to protect both the patients and ourselves. It is for the benefit of the entire field. By contrast, some stakeholders perceive the environment as being populated by too many regulations. Most countries "live in the analog world," which impacts their policy-making abilities regarding technologies that use, e.g., artificial intelligence: Most organizations that approve and support new research and development are still in the analog view of the world. In a digital environment, collecting and analyzing data is much faster, and creating the outcome is faster. However, there is the same question to explain to the regulators: how we came up with the outcome, how was the outcome created, and was it a reproducible set of steps. A new view of how to establish digital technologies is missing. What stands in the way of economic growth is the willingness of investors and policymakers to trust a development that remains uncertain. Healthcare will remain underfunded for a very long time. In some cases, the digital twin, which may be working with very large or very accurate data, might experience an image problem. Stakeholders outside the R&D process might be inclined to dismiss cutting-edge technologies as either highly costly (disregarding the cost-saving effects of improved treatment) or extremely improbable (thinking that the digital twin is all but science fiction).

Fundamentally, it was essential for one to adapt and be consistent when tailoring strategies for bridging the mission of the KSM Company with those of shareholders to achieve a common dominator for successful negotiations and the undertaking of the project.

Issues at stake

From the marketing strategy perspective, not many issues have been carried out compared to the more technical aspects of the Company's project development. From a marketing strategy perspective, most technical issues have been analyzed with a simple SWOT and Boston Matrix model to identify which technical threats and weaknesses were stars and cash cows. As previously mentioned, external opportunities, such as partnerships with other companies' R&D departments and research centers worldwide, were used to redesign the Digital Clinic's roadmap to strengthen its technical weakness related to specialized professionals and financial sustainability.

For example, some achievements of the capabilities specified for each Patient Digital Twin paradigm component are not possible without further advancements in AI techniques. Therefore, significant investments and resources allocation for this purpose has seen KSM's stakeholders, such as startup companies and universities, planning a cooperation strategy to access private and public funds.

We found these critical issues in several business cases. Therefore, the goal was to lead transformational management across the healthcare sector. We first focused on technical partnership, cross-communication campaigns, and co-branding strategy as part of the strategic and marketing plan to enter the digital twin's market. It is a roadmap to follow, and at every milestone, a tiny group of diseases and patients, medical professionals, and hospitals will be reached. At least initially, transitioning from a niche endeavor focused on an organ or physiologic process and managing it until it becomes the industry standard.

For example, in terms of technical issues, significant limitations need to be addressed in future research to bridge the gaps among different studies for enhancing digital healthcare management processes through integrative ICT and AI techniques. First, the capabilities of this paradigm would be sensitive to the conditions that the situational data is doubtable. Integrating machine learning and crowdsourcing techniques to empower the Digital Twin with the robust capability of data labeling is essential to achieve this capability in the Digital Twin. Second, the data integration component in the Digital Twin enables integrating the data from the first component to create knowledge graphs for a better understanding of urgent healthcare. However, the projection function in existing AI methods to reduce the dimensionality and redundancy of multimodal data is still in its infancy. Hence, future studies need to develop practical projection functions to improve data integration and analytics. The third component of the Digital Twin focuses on the coordination of actors for decision-making processes in urgent healthcare. Despite the advances of AI techniques such as AlphaZero and Monte-Carlo tree search, modeling and analyzing the decision-making processes of relief actors remain challenging. Future research can develop automated multi-agent models with deep learning capability to better understand actors' interactions in emergency responses. Finally, the Patient Digital Twin enables the examination of the dynamic networks of actors, tasks, information, resources, and multi-omics to improve the efficiency of digital healthcare management and urgent response. Integrating AI methods such as Bayesian networks can lead to learning the influence of an entity on its connected entities and quantifying their interactions to infer the synergetic operations. Future studies can improve this function of the Digital Twin to improve methods for predicting dynamic network processes in health care response and urgent response processes.[18]

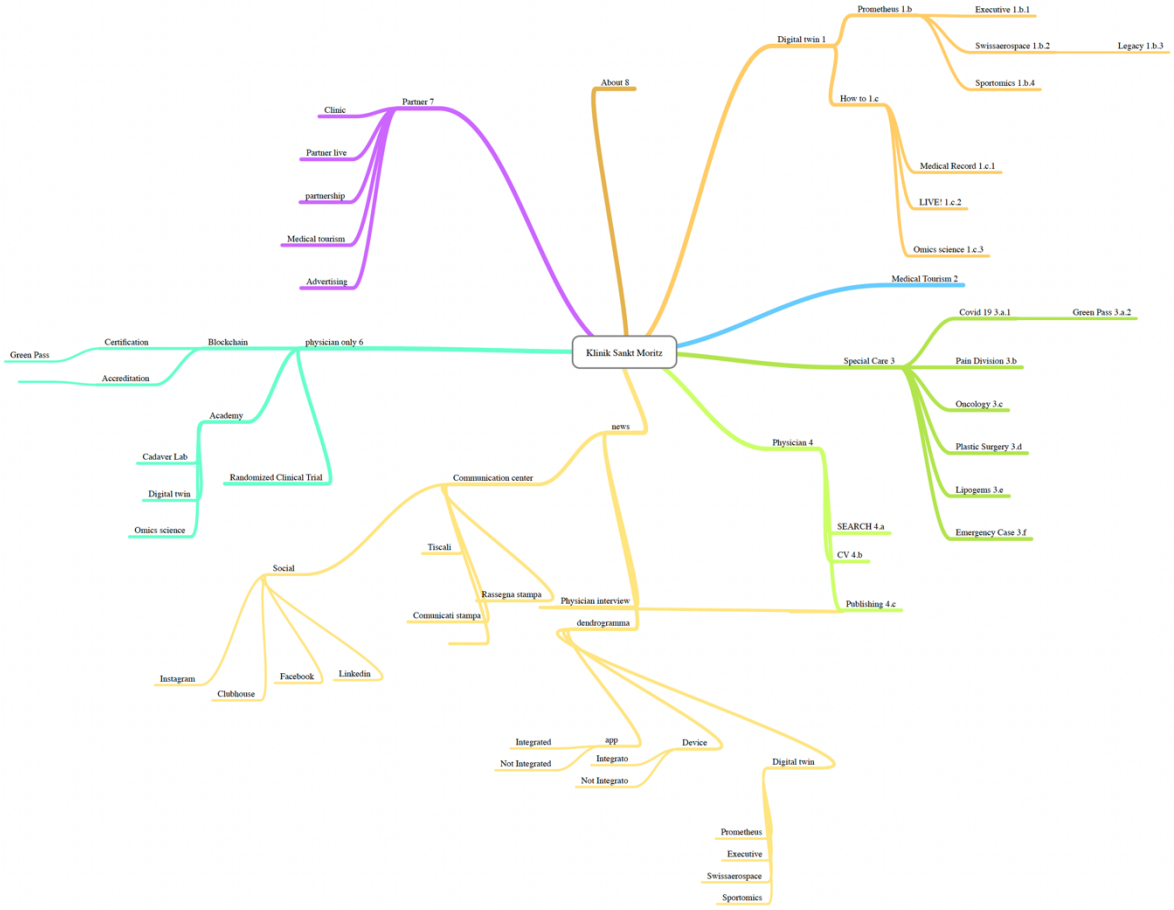
Creating digital replicas on an increasingly large scale raises privacy and cybersecurity concerns. The digital twins of many products are enabled by various sensors that track and

[18] Disaster City Digital Twin: A vision for integrating artificial and human intelligence for disaster management Chao Fana,*, Cheng Zhanga, Alex Yahjab, Ali Mostafavia

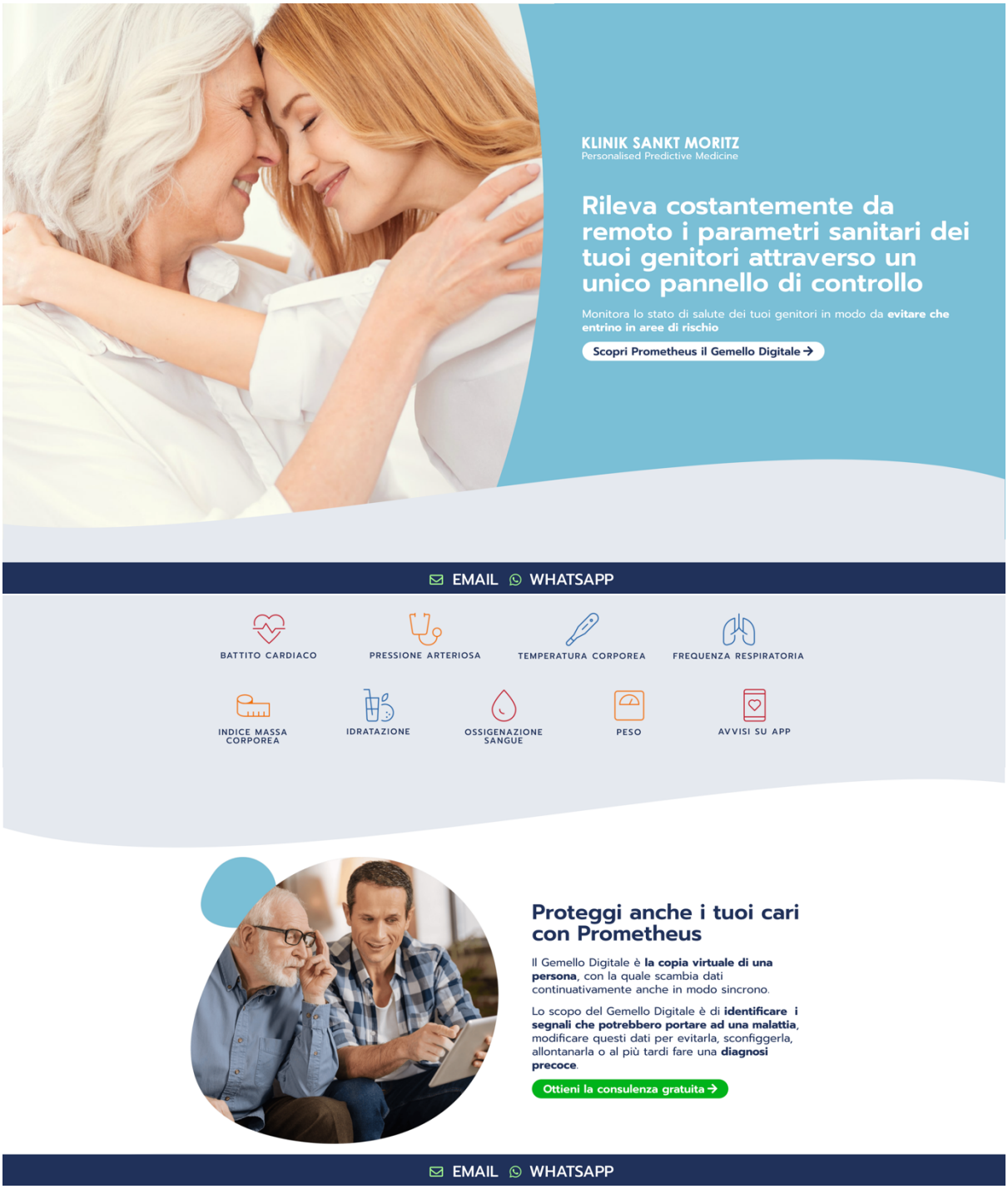
analyze biological data. Hackers with access to a digital twin may be able to gain frighteningly precise knowledge about a complex proprietary system, and workers in factories with digital twins may discover their every move is being monitored. Zhang, from Carnegie Mellon, stresses the need for regulation. "The government and business have to work together to solve this problem. You cannot just state, 'I am a responsible company. Give me your data,'" he says. Cybersecurity and User Privacy issues are being examined, and mobile data is being applied in a partnership with KSM, an international research institute. The Methodology section presents more information about these studies.

Results

Project Mindmap

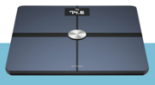


Stakeholders landing page, project overview, and FAQ



Monitoraggio intelligente

I prodotti inclusi nell'abbonamento a Prometheus



Bilancia bluetooth Body+ Withings

Fornisce **un quadro completo della tua composizione corporea** per aiutarti a fare scelte più intelligenti che possono avere un impatto significativo sul raggiungimento dei tuoi obiettivi di peso e fitness.

Borraccia bluetooth Hydratespark

L'acciaio inossidabile, l'isolamento sottovuoto mantiene le bevande fredde fino a 24 ore e il nostro sensore intelligente a LED si illumina **per ricordarti quando è ora di bere** e tiene traccia dell'assunzione di acqua sincronizzandosi tramite Bluetooth

Butterflife Vital Signs Monitor

Prodotto che, in modo semplice e veloce, ti permette di effettuare **un'accurata registrazione dei segnali fisiologici** dai quali il nostro algoritmo brevettato e certificato medical device di classe IIa (n.0068/QPZ-DM/184-2020) **calcola i tuoi parametri vitali**.

Soddisfatti o rimborsati

Grazie alla garanzia Soddisfatti o rimborsati, Klinik Sankt Moritz offre l'opportunità di annullare la sottoscrizione a Prometheus senza dover specificare il motivo entro il termine di 14 giorni dalla data di iscrizione.

Ottieni la consulenza gratuita →

I vantaggi di Prometheus

Il gemello digitale funziona per due ragioni: la prima,

EMAIL WHATSAPP

Tutti i tuoi parametri vitali in un unico posto

Klinik Sankt Moritz è la prima clinica che crea i gemelli digitali di pazienti sani, **rilevando costantemente parametri sanitari**. Lo studio dei dati che compongono il gemello digitale evita che la persona entri in aree di rischio per la sua salute.

Il gemello digitale diventa ciò che potremmo definire 'la cartella clinica 6.0': i dati che lo compongono, infatti, sono messi in correlazione e letti in parallelo in modo continuativo, offrendo una **visione più ampia e dinamica sullo stato di salute dei tuoi genitori** in qualsiasi momento.

Ottieni la consulenza gratuita →

Come funziona il servizio?

Il "gemello digitale" è un database crittografato e i dati vengono "graficati". I trigliceridi non saranno un numero ma una curva nel tempo. Curva che potrebbe essere accostata alla curva del peso.

La borraccia, la bilancia e il promemoria dei farmaci formano tre curve che permettono di capire se bevi abbastanza, se hai ritenzioni idriche o se prendi i farmaci mentre sei abbastanza idratato.

Questi dati sono accessibili in tutto o in parte a caregiver o figli se autorizzati dal nostro paziente.

Raccogli

Tutte le informazioni in un unico cruscotto

Monitora

- L'intelligenza artificiale **monitora 24 ore su 24, 7 giorni su 7**. In caso di possibile anomalia invia un preallarme al medico di Klinik Sankt Moritz.
- Il medico con la sua esperienza valuta il tipo di preallarme e decide cosa fare.

Migliora

Ogni giorno di fronte a questi dati un medico ha **una nuova intuizione**. Ogni giorno di fronte

EMAIL WHATSAPP

Con Prometheus vivrai la pratica della Medicina Digitale

✔ Metabolomica ✔ Microbioma ✔ Genomica

Prometheus Companion

Se richiedi un gemello digitale, avrai la possibilità di **pagare il secondo a metà prezzo**, così avrai la possibilità di monitorare entrambi i tuoi genitori.

Prometheus Companion potenzia i servizi Prometheus e aggiunge un gemello digitale per un'altra persona convivente.

Prometheus Companion **analizza il sonno con strumenti specifici di ultima generazione**. Il più grande screening mai realizzato al mondo sul rischio di apnee notturne.

Ottieni la consulenza gratuita →

Ottieni la consulenza gratuita

Per te uno sconto di 60€ il primo anno sull'offerta **Tiscali Ultrainternet Fibra**

Nome | Cognome

Telefono | Email

EMAIL WHATSAPP

Domande frequenti

+ **Prometheus è un servizio di telemedicina?**
+ **A chi si rivolge?**
+ **Che dati raccoglie Prometheus?**
+ **Quanto tempo impegnano le misurazioni giornaliere?**
+ **Chi valuta i miei dati?**
+ **Cosa avviene in caso di un sospetto diagnostico?**
+ **Il gemello digitale è utile in caso d'incidente?**
+ **Il gemello digitale è utile in caso di intervento chirurgico?**
+ **E' disponibile una soluzione per due familiari?**
+ **Come posso usare Prometheus per i miei genitori non più autosufficienti?**
+ **Posso viaggiare con i device di Prometheus su un volo commerciale?**
+ **Chi ha accesso ai dati sanitari?**
+ **I dati vengono commercializzati?**
+ **Con quali standard di sicurezza sono trattati i dati personali?**
+ **Dove è attivo il servizio?**
+ **Quali sono le modalità di pagamento?**
+ **Il costo di Prometheus è rimborsabile dal servizio sanitario o dall'assicurazione?**
+ **Prometheus è una spesa medica deducibile?**

KLINIK SANKT MORITZ
Personalised Predictive Medicine

EMAIL WHATSAPP

Viral communication


IL GEMELLO DIGITALE
PERMETTE DI TENERE I TUOI
GENITORI SEMPRE
SOTTO CONTROLLO
PROMETHEUS - IL PRIMO GEMELLO DIGITALE PER LA SALUTE

Cobranding


TISCALI
KSM KLINIK SANKT MORITZ AG
Il gemello digitale, la telemetria della tua salute
Oggi molti semplici oggetti di uso comune, come lo smartphone, raccolgono un'enorme quantità di dati sanitari.
Quei dati contengono indicazioni importanti sulla tua salute presente e futura.
Klinik Sankt Moritz, la prima clinica interamente digitale, ha creato Prometheus, il primo gemello digitale che li utilizza per migliorare e proteggere la tua salute.
€ 524 attivazione + 38 al mese (spedizioni incluse)
Scopri di più
Il gemello digitale, una soluzione rivoluzionaria anche per la medicina
Il gemello digitale è la rappresentazione virtuale di una persona fisica.
La persona ed il suo gemello digitale scambiano continuamente dati che descrivono l'andamento della sua salute. L'analisi dei dati che costituiscono il gemello

Methodology

An advanced economic evaluation of health care programs (modeling) master class has become a personal betting, most likely a personal commitment despite the internship being focused on the strategic side of marketing. Personal interest was shown towards more advanced studies and applications of the Company's technological development. Research conducted with a couple of partners was aimed to develop digital twin technology for health care management via mobile applications. Some of the issues were mentioned earlier. Most of these data are still under trial. Therefore, just a brief citation of what the work was about and what methods were applied to conduct this research on Cybersecurity and User Privacy protection will occur.
Briefly: Using mobile phone data generated in mobile communication networks, we could improve the current health screening model and, in general, improve our ability to monitor health remotely. Despite their anonymization, we can still trace their users from mobile phone traces. This case depends on high trace dimensionality.
A consequence of this vulnerability is that if it is used outside the telecommunications network, it would be incompatible with the recent privacy legislation, hindering its adoption for health monitoring.
The Digital Twin Patient model (DTP) was seen how effectively synthesized the individual healthcare monitoring from aggregate data from mobile phones. The idea of just having access to user-aggregated information goes along with the current data protection and privacy regulations. In a two-step framework, the team first introduced two main architectures that efficiently mitigate the first-order Markov model constraint and generate realistic daily home care demand networks by enriching the state information. Then, we showed the company stakeholders that while the proposed models increased in complexity, they improved in a one-day health monitoring accuracy score. This report does not disclose important details about this method and its application to the sampling algorithm. Nevertheless, it can be said that were only used aggregated user histograms from a mobile provider to map each user's realistic healthcare monitoring service. Different methods were needed to improve the current framework and extend it in several directions.
To begin with, we needed to implement Differential Privacy in the current approach to ensure that user reidentification was not possible to provide formal privacy protection. Second, we extrapolated the model to future scenarios. Finally, we used additional data sources and supplementary mobile phone data to capture service effectiveness and socio-demographic data. Moreover, the implementation of a mobile agent-based simulation platform will measure the performance of the Digital Twin Patients model in its different scenarios related to the external environment and type of healthcare intervention.[19]

[19] Synthesising digital twin travellers: Individual travel demand from aggregated mobile phone data Cuauhtemoc Anda a,*, Sergio A. Ordonez Medina a, Kay W. Axhausen

Conclusion

Throughout the internship, the goal was to gain a deeper understanding of the unique technology implementation and develop the business model that goes with it. One of the primary responsibilities of the internship was to collect literature and feedback from stakeholders. Furthermore, we investigated how patients perceive Patient's Digital Twin technology, together with the concept of the digital clinic in general. The business proposals gathered from business partners and investors have given us an idea of how we can market the idea of a Patient's Digital Twin to make it a commercial reality. As part of the daily roundtables with the co-founders of Klinik Sankt Moritz, we collected, analyzed, and presented numerous documents of this nature. I watched the building of a digital clinic as a critical component of defining a project's vision and mission. This final thesis has introduced these concepts at MIHMEP 22 and reported. The goals of the internship are to focus on Engineering and Technical Issues of a Mobile Clinic with a Digital Twin Patient, followed by simplifying this complex organization into a marketable structure based on milestones, which are used for monitoring the Company's Performance predicting market changes. After receiving a to-do list at the beginning of the internship, my first step towards redesigning the marketing strategy development process in the Company was to declutter the various items found on it. As a result, we defined the first and most essential aspect of implementing effective marketing strategies in a digital clinic based on digital twin technology. It was necessary to conduct several analyses to understand the market dynamics, including the policies and the global players involved. We discuss numerous aspects of advanced predictive modeling, including the impact on stakeholders, global scenarios, costs, and financial factors. We also discuss how to access the market.

An essential part of this final report is an exploration of the challenges and opportunities encountered during the internship and presenting insights gained from MIHMEP into an innovative project. We anticipate that detailed studies will be made about the Digital Twin technology from different perspectives in the future and the health fields mentioned in this study. Additionally, studies can be conducted for more specific applications in the health field which are not currently being explored.

Working in the MIHMEP workgroups has been fundamental to gaining some extra experiences and developing skills later applied to the internship. During the study case process, we devised a strategic plan to encourage in-company interdisciplinary teams to implement the new approach to implementing the service and manufacturing process for the Med-tech industry. We examine several options and evaluate them in the light of the findings, finally concluding that companies can confidently implement the necessary steps to successfully commercialize new classes of medical technologies and biotherapeutics if they know how to go about it.

A master class in the advanced economic evaluation of health care programs (modeling) has become a personal challenge to grasp all its applications and make the best use of tools for the economic evaluation of healthcare systems. Most likely a personal commitment, despite the internship being focused on the strategic areas of health care marketing. As a result, I became interested in more advanced studies and applications of the Company's technological development.

The market access for pharmaceuticals and medical technologies master class, performance measurement and management control for health care services, foundations of management in health care organizations, and advanced economic evaluation of health care programs (modeling) have prepared me to undertake this internship with the required knowledge.

The project's objective was to bridge the Company with the stakeholders, detect external opportunities and threats, and build seamless teamwork among various departments within the organization. First, a primary objective was to learn about the system and its actors from a deep

understanding. The overview indicated a comprehensive stakeholder mapping with an Ia3 framework, constantly updated to analyze stakeholder priorities, what motivates their decisions and finding the appropriate value proposition and evidence to facilitate stakeholder decision making.

Comparing study cases introduced during MIHMEP masterclasses with standard business operations run in daily business. However, unlike what we learned from the literature, decisions were being made based on day-to-day agendas; thus, there were no organized measures for measuring the Company's overall performance over the long term. Therefore, I have decided to the Company what we have learned in the MIHMEP courses.

I will achieve a personal goal this following year, and it will be a personal accomplishment. After the six-month internship programs, many aspects of the business were considered and understood as a starting point before getting down to business.