Fundación Innovación Bankinter

FTF Future Trends Forum

27 English Version

Digital Health

- The Avatar is a three dimension representation of the patients´health.

P. 20

- There is no cognitive machine that can do the job a medical professional does.

P. 30

- In 2100, the World Population Will Reach 11.2 Billion People, and They Will All Require Health Care.

P. 38

- Spain is in a position to lead Digital Health, especially when it comes to health care for the elderly.

P. 42

Digital Health

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William Haseltine

Prologue

The digital revolution affects all aspects of our lives, how we shop, how we bank, how we learn, how we travel. The digital revolution is changing all aspects of our health. Digital avatars will help us understand how our lifestyle, exercise, diet, sleep, affects our health. Big data will help us understand how the many measures of our body, our genome, our metabolism, our past history, predict our future health.

Digitalization of health care services has the potential to assure that we access the highest quality of services at the lowest price. Real time, comprehensive, transparent data allows healthcare providers to optimize outcomes and assure accountability at all levels of service. Payers will understand how to purchase services with the greatest value. Big data interpretation allows fundamental and clinical researchers to make new discoveries and speed the development of new treatments.

The summary of our discussions of digital health presented here illuminates all this and more. This volume is an excellent primer for those who wish to understand where the revolution in digital will lead.

William A. Haseltine PhD has an active career in both Science and Business. He was a professor at Harvard Medical School and Harvard School of Public Health from 1976-1993 where he was Founder and the Chair of two academic research departments. He is well known for his pioneering work on cancer, HIV/AIDS and genomics. He has authored more than 200 manuscripts in peer-reviewed journals and is the author of several books. He is the Founder of Human Genome Sciences, Inc and served as the Chairman and CEO of the Company until 2004. He is also the Founder of several other successful biotechnology companies. Companies he has founded account for five drugs currently on the market including Benlysta and ABTRAX (Human Genome Sciences,Inc), Velcade (Proscript/Leucocyte,Inc), and Provenge (Dendreon,Inc).William Haseltine is currently Chairman and President of ACCESS Health International, Inc (www.accessh.org) that supports access to affordable, high quality health services in low, middle and high income countries, and Chairman Haseltine Foundation for Science and the Arts that fosters a dialog between sciences and the arts. He is an advisor to several governments, biotechnology and pharmaceutical companies.He is a member of the Advisory Board of the IE University, Madrid, the Advisory Council for the Koch Institute of MIT and the Life Sciences Foundation, a member of the Advisory Boards of the Ragon Institute , The Rockefeller University Council, and The FXB Center for Health and Human Rights at the Harvard School of Public health. He is a Lifetime Governor of the New York Academy of Sciences and a member of the Board of AID for AIDS International. He is an honorary member of the Board of Trustees of the Brookings Institution, a member of the Council on Foreign Relations, He is a member of the Advisory Board of the Metropolitan Opera, New York, a member of the Chairman's Council of the Metropolitan Museum, New York, a Member of the International Council of the Guggenheim Museum, The International Council of The Tate Modern, a Member of Board of Directors of the Young Concert Artists, Inc. and the Youth Orchestra of the Americas, The American Friends of the Budapest Orchestra, and the China Arts Foundation.

ICON

Esther Dyson

Prologue

Digital health and behavior.

Digital health relies on at least two kinds of data: Big data, so that you can associate various experiences, genotypes, phenotypes or other data with later conditions, or treatments with cures. And small data, so that you can treat people as individuals, understanding their individual cirumstances and attitudes... and health parameters.

This should lead to huge gains in accuracy: We will become much better at understanding the causes of diseases, especially avoidable ones, and much better at persuading people to take the right measures to stay healthy or return to health.

So much of our health care costs, both social and economic, result from mostly avoidable conditions such as diabetes (bad food and lack of exercise), lung cancer (smoking), heart problems (food, lack of exercise, stress), substance abuse (stress, troubled childhoods), and the like. Indeed, there's a complex interaction between physical, environmental and emotional stresses that makes so many people unhealthy.

Likewise, fostering «good» behavior is not just a question of telling people how to live better. They need to learn how to live better, by better understanding and paying attention to their own emotions and reactions to the world around them, by being reminded of what they truly value, and by being helped to interact with the people around them. Although digital tools by temselves are not enough – we need people, too! – they can help in all of these tasks, especially if they use the «small data» that allow an AI back-end to understand the situation and mental framework of each individual. Just as advertisers learn which customers buy for status and which for comfort or for price, so will digital health purveyors know the best way to persuade their patients to exercise, eat healthily or get to bed on time.

Additionally, using big data, we can compare the costs of keeping people healthy to the costs of «repairing» them later. Even without considering the costs of human suffering and lost productivity, it is generally much cheaper in the long run to keep people healthy. Let's hope that governments, society and investors start to pay attention to this point!

Esther Dyson has devoted her career to health. She has created plenty of companies and start-ups related with new technologies and health sector.She is the executive founder of the Way to Wellville, a 10-year project to cultivate health and demonstrate the social and financial returns of doing so. The purpose is to use the experience and models of five small US communities to influence policies and practice at large. The interventions include pre- and post-natal support for at-risk mothers, increased access to affordable and healthy food, and a variety of "pre-medical" prevention programs delivered by trained coaches.

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Chris Meyer

Digitalizing Health

1.0.

Introduction

Digital transformation is a reality that has connections to financial entities, institutional organizations, industry, modes of transportation, public services, the commercial sector, and social networks. Our daily lives revolve around technological devices, and the data that is exchanged and analyzed 24/7 and 365 days of the year to provide us with useful information and help us make decisions about our lives.

These modernization efforts are also attempting to disrupt the healthcare industry where digitization would be the tool to help us reach the eternal promise of the patient becoming the focal point around which all health services of the future will revolve.

There have been important advances made in health systems in the latter part of the last century, which, in many cases guaranteed universal access, increased life expectancy, and improved healthy and preventative habits. However, in the very near future we will be facing challenges on a global scale that will need to be resolved with new tools.

The Challenge of Preventing Chronic Diseases: a Vital Investment

60% of deaths worldwide are due to chronic diseases, and they account for 75% of healthcare costs. Around 388 million people will die in the next 10 years due to a chronic illness, and Spain will be an aging country in 2050, as surmised in a report from the World Health Organization (WHO) "Preventing chronic diseases: a vital investment".

In light of the current state of health care, it is necessary to improve the efficiency and quality of healthcare services. Therefore, investments in health care should be focused on improving the outcome of people's health.

Innovation in Health Care is an Opportunity to Change Processes

The digital transformation of health is an attempt to promote a new paradigm through which technological innovation can improve how healthcare systems function, where the patient manages their own health with a new model of interaction – between doctor and patient, and between the patient and the system.
The health systems will have to redirect the focus on prevention by encouraging a change in patient behavior through healthy habits and promoting well-being. Therefore, it is important to center the debate on how health care will be addressed in the future, how it will be provided, and how patients will be taken care of.
Without a doubt this is an open innovation where there should be a meeting of the minds with many different types of individuals, from all fields, that will allow us to find new and revolutionary solutions. It is also a disruptive innovation that changes the way things are done in order to be able to respond to the new needs of a rapidly changing society that constantly needs new ideas.

Turning Health into a Long Term Asset Instead of Short Term Expense

Furthermore, governments, institutions, public and private healthcare providers should take a strategic approach and go beyond political tactics, because we need a plan of action that can speed up the benefits that digital health can provide so that this new paradigm proves to truly be a solution to the problems in our healthcare systems.
The fundamental problem lies in the difficulty of increasing productivity of healthcare professionals in face of increasing demand. Digital health can facilitate redesigning processes that will be able to offer more and better quality attention that is sustainable, and to more people.
In December of 2016, the Bankinter Innovation Foundation hosted the Future Trends Forum where 32 experts gathered in Madrid in order to analyze the development and impact of digital health.
Throughout this report, we will analyze how all healthcare representatives can benefit from digital health. The focus will be on improving patients' quality of life while keeping with the new management and finance model that can reduce healthcare spending and optimize investment in health on a global scale.
We will also identify challenges that will need to be faced in order to establish digital health universally. We will evaluate new business and finance opportunities that this new model offers, and we will propose several action plans developed by the think tank that participated in the Future Trends Forum hosted by the Bankinter Innovation Foundation. These plans could expedite the benefits of digital health.

FTF summary. December 2016.

Digital health is not an end in of itself, but rather a tool that can satisfy some of the pressing needs that threaten the healthcare systems.

Creative Destruction of Health Care

1.1.

Dr. Julio Mayol proposed "Creative Destruction." "Let's destroy, in creative terms, the healthcare services model in order to rebuild it and make it even better. The ethics behind healthcare services not only depend on good intentions, but also on the quality of the results."

Eight years since the last financial, economic, and social crisis erupted, the debate over the future of healthcare systems continues to rage on. The causes for the declining state are investigated, and there is a search for culprits within technology and chronicity, without finding any definitive solutions.

In Europe, healthcare systems have typically evolved from two models: **Bismarck**, a healthcare system introduced in 1883 that was financed by mandatory public contributions, and **Beveridge**, which emerged in 1943 and was financed by public taxes.

Julio Mayol states that "both business models have been and continue to be governed by an ethical framework derived by Kant's categorical imperative: given the good intentions behind providing the services, the benevolence is independent from the result obtained. That is to say, the social agreement is about the means, not the ends. "

This model has been successful for the second half of the twentieth century, when medicine strengthened its scientific foundations and the growing knowledge was making it more effective, but also less safe. However, in the twenty-first century this system experienced a deep financial crisis sparked by various factors:

- Increased population
- Increased life expectancy
- Chronic state of diseases
- Rising price of technology

Upon reviewing the causes we find that they are inherent to the very same model, which can basically be summarized into two types:

Let's destroy, in creative terms, the healthcare services model in order to rebuild it and make it even better. The ethics behind healthcare services not only depend on good intentions, but also on the quality of the results.

Julio Mayol
Chief Medical and Innovation Office
at Hospital Clínico de Madrid.

The **"Cost Disease"** described by the economist **William Baumol** that, when applied to healthcare services, is explained as how there is a constant salary increase in the health sector that, contrary to other sectors, does not correspond to increased productivity.

Disconnect between results and costs in health as described by the economist and professor from Harvard University, **Michael Porter**, who broaches the concept of value within the framework of the healthcare system in his article What is value in Health Care?

Michael Porter states that all health representatives should be involved so that the system can work, and governments should be responsible for measuring the quality and results of healthcare systems. **Julio Mayol** argues that, as a result of the aforementioned, all current healthcare systems share the following three characteristics:

- **Difficult to manage yet controllable**: a disconnect between costs and outcomes.
- **Unpredictable evolution**: The desired result has not been defined.
- **Unsustainable**: In order to get more results with the same infrastructure, there will never be enough in terms of what is needed.

Until now, the solutions that have been proposed and implemented have been: to provide fewer services, or of lesser quality, or raise prices, resort to voluntary services, outsource healthcare management or services, or increase productivity by means of technology. However, these measures have not been able to efficiently solve the issues of our times.

From Innovation to Transformation of Health Care

The healthcare industry is enormously complex and few acknowledge that the current model of service provision is no longer valid and needs an overhaul if we are going to achieve a value-based healthcare system.
Technological innovation without transforming the system will not result in actual benefits. It should be executed based on three core concepts:

- Innovation of the business model
- Technological Innovation
- Social Innovation

Social innovation can be the starting point of this transformation where all health representatives should understand and accept that the ethics behind providing healthcare services not only depends on good intentions but also on the quality of the results obtained.
In regards to innovating the healthcare management model, the first step is to change the financial structure so that it corresponds to the complete cycle of care and the outcome for individuals as well as entire populations. Quality and sustainable healthcare requires creative destruction that only innovation can provide. In each one of the angles of the innovation triangle – the social, business, and technological model – there are infinite opportunities for progress.

"If we don't change how we work and how we view problems, it will be impossible to employ a new business model or new technology". **Julio Mayol**

Sir Muir Gray Outlines the Five Major Problems of the Healthcare Systems

There is no question that in the last 50 years there have been extraordinary improvements in health thanks to the advances in science, capital investment, and the development of healthcare systems. However, Sir Muir Gray, a Scottish physician and former director of Clinical Knowledge Process and Safety for the British National Health Service (NHS), states that current developed societies face the same five main problems related to healthcare systems:

01. Unwarranted variation in results and quality.
02. Harm to patients.
03. Unequal access to services due to misuse of resources.
04. Waste of resources without maximizing value.
05. Failure to prevent diseases that are preventable.

All of the processes carried out must allow the organization to function, as well as provide the anticipated tangible results.

William Haseltine
President of ACCESS Health International.

Conection and Feedback in Digital Health.
Conference by William Haseltine

Real Time Information Systems for Transforming Institutions

The systematic restructuring of healthcare thanks to digital technology is the answer to receiving high quality and affordable healthcare services. **William Haseltine** wanted to share with the attendees for the Future Trends Forum an example of transforming healthcare that he has studied in detail over the last few years and that he thinks could be a rather inspirational example.

It addresses the transformation model achieved by the New York University Langone center and its hospital, which for a long time endured a tarnished reputation and its economic viability had begun to plummet.
The drive for change started by hiring a new CEO for the entire center; the university, hospital, and research center, who supports the development and establishment of a centralized information system to operate as a sole institution from an informative point of view.

The clarity of information was the starting point for all strategic processes in transforming the institution.

The CEO had a very explicit strategic goal and clear information was the foundation. In collaboration with the IT department, a unified information system was developed that compiles and measures in real time all actions that take place in the center.
A system that allows sharing information from several different sources offers management a very complete set of controls that allow decisions to be made quickly, efficiently, and accurately. It allows us to see the number of people that are in the emergency room at any given moment, the average wait time, and the kind of attention they received.
The information system alone will not bring about the necessary changes that will lead to transformation, but certainly without it there would be no transformation at all. Therefore, the consolidation of information is the strategic goal that provides the foundation for the healthcare transformation.

Human Engineering of Processes as a Key Element

A concept that was repeatedly emphasized throughout the forum of experts was the value of human engineering of processes in digital health.
For **William Haseltine**, it is very important to collaborate with people of all levels; nurses, security guards, maintenance, billing, procurement, surgeons, assistants, in order to ensure that all processes are included so as to present information, understand it, and use it the best

way possible. All of the processes carried out must allow the organization to function, as well as provide the anticipated tangible results.

Digital Health Should Put an End to Silos of Information in Institutions

However, the digitization of healthcare comes with "collateral damage" that we need to be aware of when we talk about transformation and innovation based on information and its digitization.
We generally believe that this digitization occurs with an application in order to solve a problem in a department. However, each one of these solutions is isolated to its silo of information, without offering context for integration with other silos, making it too inconsistent for a strong information model that can provide responses of profound importance.
Actual digitization must be rooted in comprehensive information systems, in real time, and capable of measuring all activities ranging from auxiliary to those dealing in research, administrative, or economic.
Throughout the following summaries we will expound upon the trends that define digital health where the goal is for healthcare systems to provide high quality services, with universal and equal access, while being as cost efficient as possible.

Avatars emerge because people are incapable of visualizing and behaving accordingly.

Russel Howard
Head of Commercial Strategy
for Genomics, Genome.

Digital Avatar.
Conference by Russel Howard

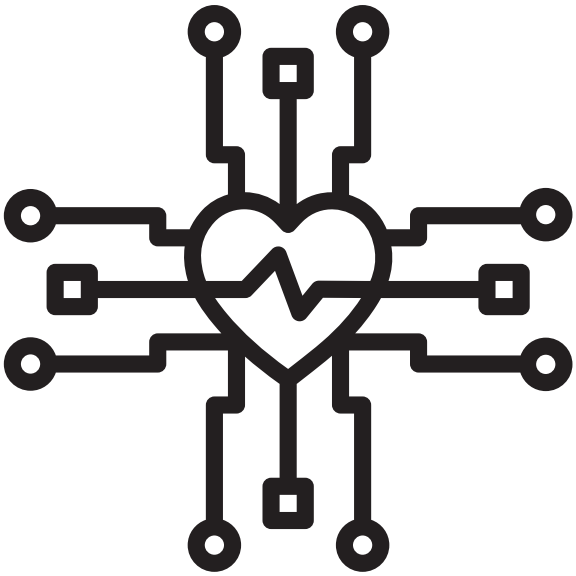
Digital Avatar

1.2.

Russel Howard kicked off the debate at the Future Trends Forum by sharing a vision of a very disruptive future with the image of a digital avatar as a motivator in changing patient behavior.
Russel Howard believes that "this type of tools emerge because people are incapable of visualizing and behaving accordingly." He also believes "it will be a motivational tool that allows us to make projections about our health in a few years and be able to make decisions and behavioral changes along the way in order to improve our well being – it's a profound motivational force."

A large part of health information is digitized, which allows us to compile enormous amount of data, access global servers, and compare patient information, sort of a dynamic repository of information that is constantly being updated.

The massive advance as far as these databases facilitates doctors in their diagnostic process, their ability to measure, analyze, compare patients, and produce medical reports that are more accurate and personalized, that will, in turn, lead to the best available therapy or treatment of the time.



The Doctors of the Future Won't Be Limited to a 15 Minute Consultation

The doctors of the future will be assisted by a computer in order to reach a more accurate diagnosis, so as to better attend to the patients' health, which is where lies the economic value of investing in digital health.
The doctor of the future won't just tell you what disease you have and the treatment options that are available to you. The doctor of the future will offer you a perspective of yourself, your world, your environment, and your future – a kind of an index of probabilities of what will happen with your body and how you can choose a path or another in order to continue with your wellness.

The Avatar Generation in Healthcare

Russel Howard made a prediction that the first "avatar generation" would appear in the next few years. This generation will have their own personal holographic avatar that will be available 24/7, will know their genes, their behavior, and past habits, and based on this information it will offer an plan of action for moving forward.

What is an avatar?

An avatar is a graphic representation that is associated with a user to serve as their identification. Avatars can be a picture, artistic drawing, or a three dimensional representation. With the advent of the digital revolution, its use has spread to a large number of fields including medicine. Currently, the digital avatar is being used in medical education such as for training models using augmented reality in order to explain anatomy to students with a three-dimensional human body.
A good example for its usefulness within the context of health is the projection of the effects of tobacco in a patient who is a smoker, which allows us to visualize their body within 5 years and analyze the consequences to their health in the near future if they continue to smoke.
The challenge is keeping in mind the quantity of information that exists regarding pathological conditions and the consequences. How can we motivate people to adopt good habits?
The digital avatar in health allows us to plan a path and observe the body of a patient in alternate scenarios.

Genetic information for preventative medicine

1.3.

One of the main challenges being faced by those struggling with implementing digital health is the diversity of the population. Each one of us has our own particular medical profile, but the system has to treat us similarly, to standardize treatments in order to make them more efficient.
In spite of human diversity, everyone deserves to be treated as an individual from a medical point of view, with the goal of offering the most accurate diagnosis and treatment options that are the best fit for each particular case.

Will Technology Be Able to Automatically Predict Diseases?

Thanks to scientific advances, the human genome can be completely sequenced: there are six million letters that describe all the differences between two people, apart from race or the location of the individual.
By studying the genome of a person, we can identify at birth whether they have genetic variants that will increase their chances of developing a disease. In this specific case, people have the opportunity to recognize and identify this risk and take appropriate measures.

Digital health will allow us to use systems that will inspire us to improve our own health and to reduce the burden on healthcare professionals.

Josep Kvedar
Vice President of
Connected Health.

Individual Behavior: motivating healthcare.
Conference by Joseph Kvedar

In the case of women who carry mutations of the gene BRCA1 and BRCA2 (these mutations increase the possibility of developing cancer) they can consider undergoing preventative surgery in order to drastically reduce their chances of developing breast or uterine cancer in the future. It is an extreme example but increasingly more common in clinical practice.
For this group of patients, it could be vital to invest in a genetic diagnosis of these characteristics in order to develop preventative plans that would allow them to undergo clinical tests before their regularly scheduled checkups, and thus attempt to prevent or reverse the onset of the disease.
Russel Howard is convinced that this technology is an opportunity for predictive medicine since it allows us to assess the risk of developing an illness in the near future.

The Individual Behavior of the Patient

1.4.

Joseph Kvedar opened the round table discussion on individual behavior of patients. Kvedar believes that digital health offers a new and broader range of opportunities for treating patients. "Digital health will allow us to use systems that will inspire us to improve our own health and to reduce the burden on healthcare professionals".

Digital health allows you to have your health in the palm of your hand, and to create a health model from one to many.

We are used to health care involving shifts, but digital health has radically changed it so that now health care is more personal and in the palm in your hand.
This means that the patient can be reached when they most need it, in which parameters about the patient can be monitored by means of wearable technology, and valuable data can be gathered that will serve to create messages to motivate patients to improve their health.

Normally the relationship between healthcare professionals and patients has been one where the provider has control over the visits to the medical office and determines what information is needed to make medical decisions. Doctors were used to controlling the message that they relayed to their patients.
However, this new era of digital health has broken with tradition and offers new possibilities. But how are we going to convince healthcare providers to accept change?
If we analyze the supply and demand curve in regards to health care, it can be deduced that the true problem lies in that doctors are overwhelmed with work, they have to see more patients in less time and carry a heavy administrative workload.
There are several approaches to this problem:

› Increase the supply, but it is impossible because doctors cannot be trained quickly enough to satisfy the demand.

Walgreens encourages their customers with digital health strategies

Another example is the case of Walgreens, the largest chain of pharmacies in the United States, that has implemented digital health for interacting with customers. This company has a mobile application that tracks certain parameters of their customers who are rewarded points that can be used for making purchases at one of their stores. After four years of progress, Walgreens has published a study that shows the results that have impacted over 6500 people who have used the application to improve their habits. Some of the highlights of the study are:

› **11% improvement** in consistently adhering to treatment for hypertension
› **5% improvement** in adhering to diabetic treatment
› **5% improvements** in treatments with statins (medication for reducing cholesterol)

› Meet the demand, and digital health has much to offer in terms of doing this and thus be able to change the model of delivering care.

Joseph Kvedar states "70% of the demand consist of decisions a person makes regarding a life style, which is where digital health could have a big impact in creating a model of one to many."
Digital health offers an opportunity to inspire people to take care of themselves so that they are not a burden for healthcare providers; as well as change the way in which health care is provided so that there are not so many models.
A good example is using data monitoring that is gathered from different wearables (bracelets that monitor physical activity) in order to encourage changing individual behavior.
It is important to know which is the best way to connect with patients in order to inspire them to make long term changes to their behavior, and so that healthcare providers can reach more people with their messages.

Digital therapy vs Traditional Therapy

Joseph Kvedar has been able to establish the possibility of digital therapy over traditional therapy with a group of patients with type 2 diabetes, which accounts for 80-90% of all cases of diabetes. The number of those afflicted with this condition is increasing at an accelerated rate worldwide.
With his team, he developed a test pilot in which the challenge was to change the patients' behavior in regards to their illness, without human intervention. An analytical program was designed and set up on a platform with four types of relatively simple data:

01. How motivated are you to change your habits today?
02. Wearables (provide constant data by monitoring activity)
03. Location
04. Weather

Each day the patients would receive a personalized sms based on this data, and after 6 months these patients improved without human intervention. The group

If we dedicate more resources for training people at a local level to create healthier habits, we will end up spending less money on healthcare that is ultimately less effective.

Esther Dyson
Executive Founder of
Way to Wellville.

Individual Behavior: the influence of the community.
Conference by Esther Dyson

of patients improved their results in diabetes that was equivalent to the results of those that are regularly prescribed standard treatment at a doctor's office. This experience proved that the use of digital therapy could be just as effective as traditional therapy.
What role do doctors have in this segment that is 70% life style-related?
The proposal is for a future where doctors will not be in the lead of health care, and perhaps some of the aforementioned tools can be used to encourage patients to change their behavior and improve their health.
Joseph Kvedar is convinced that if doctors are optimistic in terms of the benefits that digital health can offer, a reasonable outcome can be found in the future.

Health as a Social Asset

1.5.

Esther Dyson, a well-known angel investor, is the executive founder of The Way to Wellville, a project that attempts to show the power of investing in health care starting at prevention. During her presentation at the forum, she explained the idea of prevention over treating health issues as a cost-saving strategy for healthcare systems.
"It may not be the appropriate clinical trial, but The Way to Wellville is the beginning of something transformational for health," she said as she described her project that consisted of years of working with five small communities in the United States.
"We believe that this is an example of something that can work, and our goal is that others will be inspired by what we are doing and will say 'I can do it too."
Esther Dyson put forth the following thought: "And if instead of spending money on cures, we spend money on mental health, nutrition, or exercise?" With this question as the basis for her speech, she expounded the benefits that digital health can provide in measuring people's behavior by gathering data in real time.

Creating Health and Not Just Curing Diseases

Esther Dyson believes that big data as a tool for prediction in health will solve major problems. "Not only is technological development necessary, but we must also inspire patients, we must cultivate the optimal environment for these kinds of projects to flourish, and thus allow health to grow."
We must begin to measure the health of the community and deliver health services to these metrics, and dig-

ital health can help achieve this. Various elements were used in the community in the Way to Wellville: tracking data, plan of analysis, and local health trainers who had been trained to give meaning to the system.

Understanding people's psychology can be very important in offering adequate medical attention. The data gathered from the various devices can be very useful for the individual if we also add specific knowledge about what motivates a person, then we can encourage a person to change their habits.
Without a doubt digital health allows us to analyze the impact that innovations have on a population, and to decide whether these new processes are effective. We can also measure the behavior of the population and make the appropriate decisions to improve the process.

Empowering the Patient

1.6.

People Who, is a platform that allows people who struggle with an illness improve how their condition is managed as well as connect virtually and anonymously with other patients.
Tomás García, the CEO of this platform, wanted to share with the experts at the forum the value digital health offers toward empowering the patient. Tomás stated that the introduction of digital health has democratized access to information by allowing society to take charge of their own disease.
It addresses how to change the way in which people live with a disease. People can be more and better informed, take control of their health, as well as be involved in improving their own health. They are being given freedom and, in turn, a truly profound responsibility.
During his presentation, Tomás García pointed out data from the 2015 European e-patient report, carried out by People Who, that analyzes people's perspectives when they find themselves outside of the healthcare circuit, removed from the medical setting, such as the case of this platform.

Regardless of the disease, patients have similar concerns. As a starting point there are twenty different illnesses, and within the platform group discussions are created based on these concerns.
By analyzing the report on the type of users in the platform, People Who pointed out that 59% of the platform users were only observers and wanted to see what people were talking about, 2% were leaders in the conversations, and 14% socialized.
Tomás García states that this is a response to the need to "understand what is happening to people. When they know they can speak anonymously they open up more regarding what is happening to them. If we truly want to encourage them to get better and change, we must first listen to what worries them, because we are not only speaking in medical terms but also what is happening with their social life."

People Want to Understand Their Disease Better and Share

Tomás shared three important thoughts about the impact of digital health on patients:

- A patient is a normal person who has discovered they have a new job even though no one warned them. They have to start all over and figure out how to manage it.
- If we truly want to motivate people, the first thing to do is to understand what is important from their point of view, and that people get the sense that they are solving their problems so that they will want to be involved.
- Digital health has a mission, to try to build a bridge between healthy people and sick people so they can share information.

Individual Behaviour and ecosystems.
Conference by Tomás García

If we truly want to encourage them to get better and change, we must first listen to what worries them, because we are not only speaking in medical terms but also what is happening with their social life.

Tomás García
CEO & Managing Director
at People Who Global.

Weapons for the Digital Health Revolution

2.0.

Big Data

2.1.

A term that might as well have come from a sci-fi movie ten years ago, big data technology has become a reality with its explosive appearance in our lives. Information and data have become oil of the twenty-first century.
Practically without realizing it, we are constantly generating information about ourselves, which is also being tracked in real time by different devices that have conveniently become a part of daily life.
Data has become a fundamental element in the global economy because by analyzing it, new business opportunities for traditional sectors emerge such as transportation, industrial manufacturing, or health care. Analyzing data can improve research, drive innovation, and influence the productivity of companies or institutions.
Esteban Moro, researcher and expert in big data, participated in the 2014 Future Trends Forum (FTF) dedicated to "Big Data and Human Performance," and he believes that there are three areas where this new tool can be applied:

Our health will improve thanks to the capture of medical data and its analysis, which goes beyond logical conclusions that are reached on the basis of experience.

› To improve existing solutions for problems.
› To resolve problems that have no solution.
› To find problems we didn't know existed.

Without a doubt, medicine is a field that presents enormous potential for big data where valuable information can be generated for developing new processes based on strategies of predictive analysis.
However, we need to keep in mind that in order to gather such an overwhelming amount of existing data in health care, it is essential to support establishing digital health, and to push for a more effective and optimal healthcare system.
Digital health entails three technological concepts that will revolutionize health worldwide: Big Data, Artificial Intelligence, and Machine Learning.
To be specific, big data will make it possible to analyze large archives of medical data and obtain valuable information for planning tasks and generating alerts that support strategic administrative decisions and policies.
From the clinical point of view, artificial intelligence and machine learning will better support medical professionals in making a more precise diagnosis and being able to offer more adequate treatments for their patients.
By using big data, digital health guarantees to gather all data on individuals, populations, and processes, and apply this learning to develop a cognitive machine in order to consistently optimize and improve results in health care.

How much data does it manage in terms of health over the course of a person's life?

Francisco Curbera believes the amount of data generated by an individual during a lifetime could be determined by the following:

› **Clinical data:** 1TB, 10% of the results come from health care.
› **Genomic data:** 6TB, accounts for 30%
› **Other data:** 60% pertains to heterogeneous data: social media, data from smartphones, fingerprints.

Digital health will help provide access to high quality healthcare services to the community. It will also allow us to measure and carry out a detailed follow-up of quality medical care, thereby improving the overall health of the community while making much more efficient use of healthcare resources.

Francisco Curbera
Director of Foundational Technologies at IBM Watson Health Foundation.

Big Data and AI in Digital Health.
Conference by Francisco Curbera

New Weapons for the Next Healthcare Revolution: IBM Watson Health

All of this information as a whole is one of the key features of IBM Watson Health, a technological platform of open cognitive computation dedicated to improving what doctors, researchers, and insurance companies can do. It acquires new information from healthcare data that is generated, thereby building valuable knowledge so as to offer personalized solutions in health.
Francisco Curbera believes that digital health will help provide access to high quality healthcare services to the community. It will also allow us to measure and carry out a detailed follow-up of quality medical care, thereby improving the overall health of the community while making much more efficient use of healthcare resources.
Obviously, all of these new interventions require resources, but the opportunities could produce more benefits (in economic terms) than the cost of investing in this new technology.

The Promise of Digital Health: P4 Medicine

Julio Mayol, participant in the FTF for digital health, believes that data will bring us to the promised future of achieving medicine that is personalized, predictive, preventative, and participatory, called P4 Medicine. Although I personally think we should to add a fifth "P:" Public (for everyone).

Julio Mayol also believes that the results from using big data in health will not be immediate nor always beneficial. The complexity is enormous, and he identifies some of the challenges in regards to it being put to use:

1. Extracting knowledge from heterogeneous and complex sources.
2. Understanding unstructured clinical notes in their correct context.
3. Adequately manage a large quantity of clinical data, and mine useful information in order to generate biomarkers.

4. Analyzing the various levels of complexity that range from genomic to social data.
5. Capturing data about patient behavior through different sensors, with the subsequent social impact and effect on communication.
6. Avoiding privacy issues that can pose a risk for individuals.

Artificial Intelligence

2.2.

Michal Rosen- Zvi, was in charge of presenting the main advantages of establishing artificial intelligence so as to understand diseases and complex diagnoses.
She began her talk by relating an experience that involved treating AIDS. It took place in 2006, during a meeting of a team of experts that made up part of a European project, in which they were searching for a way to recommend the best treatment for an AIDS patient. AIDS is a virus that is constantly mutating, and understanding which treatment is best is a challenge for research.
The method of analysis for determining what therapy was best at the time was very expensive: samples of the virus were tested in a laboratory with all of the available medications. According to the results, a personalized recommendation for the best treatment option was made for that specific person.
From IBM, Michal Rosen- Zvi and her team encouraged the members of the project to learn from the patients, and to record all of that information in large archives that are currently distributed throughout different systems in Europe, with the goal of being able to find out what the best treatment for each AIDS patient would be.
In 2008, two and a half years later, there already was a technology based on machine learning, which had learned from all the patient data that, at the time, was in the thousands.
Currently, the division of IBM Health has accumulated data from 66,000 patients in different parts of Europe: Italy, Germany, Belgium, and Luxemburg.
Thanks to the machine learning technology, nowadays information on patients is gathered, the genome is analyzed, and together with the "cocktail" of medications available from the market, a free online recommendation system is created so patients can consult it. "Not only is it available as of today and doctors can and do use it, but we also test it against the same doctors in order to verify its precision," said Michal Rosen- Zvi.
In fact, a proof of concept was carried out where 10 clinical experts gathered and the following question was posed to them:
Given this specific patient where we know what treatment they received, what the follow-up was, can this information tell us whether the treatment given to this patient will be a success or a failure?

Currently, there is no cognitive machine that can do the job a medical professional does.

Michal Rosen- Zvi
Director of Health
Informatics at IBM Research
worldwide.

Big Data and AI in Digital Health.
Conference by Michal Rosen-Zvi

The same question was posed to a cognitive machine developed by IBM, and most of the time the system was more accurate than the experts. However, it is important to understand that cognitive machines in the future will play a supporting role of virtual assistants for diagnostic medicine, and at no point would they replace the professionals.

Machine Learning

2.3.

Thanks to technological innovation and research, we are witnessing a significant advance in diagnostic medicine due to techniques such as machine learning; a branch of artificial intelligence in which the goal is for machines to "learn" from human intelligence.
The role that the machine learning techniques have in health care is to concentrate knowledge in a large computer (cognitive machine) that, through applications, will be able to help medical professionals diagnose diseases based on archives of information and biomedical data that is collected and classified from around the world.

The Goal of Cognitive Machines is to Analyze Data of Various Categories and to Obtain Useful Information for Experts.

"Due to machine learning, we can learn new instructions for existing medications, personalize treatments, or obtain information about new diseases that we didn't even know existed before now, and all thanks to the accurate collection and analysis of data." **Michal Rosen- Zvi**.

The Ability to Continue Learning is What Will Drive the Development of New Cognitive Technologies.

Within the cognitive scope, the challenge will be multimodality, that is, these machines' ability to learn from structured and genomic data, or to learn from contextual data and analyze and decipher what people are saying.
Michal Rosen-Zvi's talk triggered a debate regarding how

capable artificial intelligence is at analyzing all scientific knowledge that is generated on a daily basis in specialized publications (magazines, journals, articles), books, and conferences.
Chris Meyer posed a thought, to which **Francisco Curbera** added: "it is very difficult for these doctors to be up to date in terms of these types of publications. It is important to know what type of publications are relevant to the individual, to their disease, and to society, and to glean any useful information for the doctors.
The machines have to be able to determine what, out of

What is Machine Learning?

Machine learning is understood as the development of any programs that are able to apply behaviors in a machine on the basis of information that is unstructured and is delivered by means of examples. The machine uses algorithms to generate patterns of categories, to classify this information according to these patterns, and to organize an adequate response.

It is important to know what type of publications are relevant to the individual, to their disease, and to society, and to glean any useful information for the doctors.

Chris Meyer
CEO of Nerve LLC.

all of that scientific knowledge that is generated day to day, is relevant and how it can be incorporated into clinical practice so as to improve results.
Mamar Gelaye pointed out the need for all technological innovations that develop in the next few years to be guided by a clinic.
During her presentation, Michal Rosen- Zvi referenced the oncologist, Siddharhta Mukherjee, who authored the book "The Emperor of All Maladies," and won the Pulitzer Prize in 2011. His book is considered a biography of cancer, where Doctor Mukherjee conducted an exhaustive and well documented journalistic investigation about the politics of cancer.

In this book, there is an analogy made between the concept of the disease and a battle because "very often we think of it as a fight against the disease and we want to use all of our weapons, and much of it has to do with the interaction between people, and there are tools in our arsenal that we can and should be using."
Without a doubt, we must take advantage of technology to promote collaborative networks within heterogeneous areas of knowledge in order to connect with the appropriate institutions that compile all of these records, analyze them, and reach viable interventions in order to better the lives of people from the point of view of healthcare.

Data Protection in Digital Health

2.4.

In spite of the endless opportunities that digital health offers, we cannot ignore how innovative technology clashes with the concept of privacy and control of the information that each and every one of us generates in regards to our consumption and our health habits.

Are We Willing to Allow Access to Our Personal and Health Data?

Currently, existing laws in regards to data protection do not allow using personal data. Therefore, one of the biggest challenges for society is obtaining a valid regulatory guide for how to use big data in health care.
According to Michal Rosen- Zvi, doctors who have taken the Hippocratic oath must always offer the best care to

"Using health data for research is the least of our concerns; the risk is that information can also be used for commercial and political ends". **Sarah Chan**

their patients. "That means providing the best care by any method or technology possible."
We must learn from a retrospective study of patients' data, it is very good way to better understand patients and to offer personalized care.
Technological progress is an unstoppable wave that demands a legal framework that favors individuals and guarantees the security of patients' data that circulates within the healthcare circuit.

How Can Patient Data be Protected so as to Avoid Possible Cyberattacks?

Information should be strictly protected, and storing it in the cloud (virtual online space) may be a very efficient solution for managing healthcare data. The technology Blockchain can help secure health data by identifying who and how the data is accessed, and making sure that only authorized individuals can access them.
The healthcare sector has increased investment in cybersecurity. Therefore, digitization of the healthcare sector is directing spending by companies and institutions on cybersecurity solutions in order to protect and avoid possible security breaches.
This data was gathered in the 2017 Thales Data Threat Report, Healthcare Edition, where it was revealed that 76% of healthcare organizations around the world will increase spending on cybersecurity in 2017. It rose by 81% in the United States, where digitization has made more progress.
Does the right to privacy impede the development of digital health? Michal Rosen-Zvi believes that patient advocacy groups and governments, as well as healthcare providers, are making an enormous effort to find a way to share information so that it benefits the patient. However, these processes are very costly, and the system of incentives should be the right one.

"Data Saves Lives," Sarah Chan

In February, 2017, the 11th International Seminar on the Universal Declaration on Bioethics and UNESCO Human Rights: "Analysis of Big Data and Health," where Sarah Chan, a specialist from the Usher Institute at the University of Edinburgh, discussed her experiences working with big data in health sciences in Europe.
Chan emphatically maintained that "data saves lives" and that the value of big data for peoples' health is undeniable. "Knowing how many times you open the refrigerator can help make medical decisions."
However, Chan likewise warns that "managing all of that information entails a social commitment, because what each person does with their information affects others and it is an ethical issue. It is important to know how to manage the benefits that research can have, for what and for whom it is being researched, and who controls it."

All parties involved in the healthcare system need to be in agreement in order to manage establishing big data technology.

Mamar Gelaye
CEO at Omnyx.

Vicky Seyfert Margolis
CEO & Founder at
My Own Med, Inc.

Innovation in Digital Health

3.0.

Health digitization is a new paradigm of disruptive innovation that entails changing how some processes have been done until now so as to better respond to the needs of a rapidly changing society.
This change will come marked by new global health trends, as well as new business models that fit into this innovational paradigm. With such a disruptive technology, it will become necessary to develop new regulatory policies so we can guarantee the implementation of digital health while protecting the patients.

Joseph Kvedar

Prologue

Digital Health as a Tool for Behavior Change. *A provider perspective*

The disconnect between increasing service demand and provider supply is exacerbated by our professional insistence that we can only deliver one-to-one service within an institutional setting. To understand how digital health innovation impacts patient behavior, we need to recognize the underlying causes and effects of patients' actions related to their habitual lifestyle choices. Digital health tools – mirroring the same machine-learning algorithms used in retail and advertising – may change this perspective by inspiring self-care and creating an infrastructure that supports one-to-many care models. For example, wearable devices can successfully track miles trekked, flights of stairs climbed, and heart rate fluctuations while providing valuable insight into what motivates us to improve our health. These wearable monitors create feedback loops that encourage individual awareness about health status and track real-time health progress. Machine analysis of these data enable individual phenotypic profiles. Personalized and inspirational automated health messages based on these profiles can promote behavior change without direct human intervention. Through this type of approach we can offer targeted health improvement programs to highly segmented populations. Actionable data creates meaningful behavioral change so our wearables don't end up wearing us.

Joseph Kvedar, MD, is creating a new model of healthcare delivery, developing innovative strategies to move care from the hospital or doctor's office into the day-to-day lives of patients.He is the author of The Internet of Healthy Things, describing how everyday objects will capture and use real-time biometric data to ultimately change behavior to improve our health. Under Dr. Kvedar's leadership, Partners Connected Health has launched a number of innovative mobile health programs, virtual care initiatives and clinical research programs for the more than 1.5 million patients served at Partners HealthCare-affiliated hospitals.He has authored over 100 publications in the field of connected health; Dr. Kvedar serves as a strategic advisor at Mavericks Capital, Puretech Ventures and Qualcomm Life, and is a mentor at Blueprint Health and Harvard Innovation Lab, where he also serves as a judge for i-lab's President's Challenge for Entrepreneurship.

Global Crosscurrents.
Conference by William Haseltine

Global Trends that Affect Digital Health

3.1.

Health systems are currently at a juncture that compels a transformation that will allow them to adapt not only to new needs, but also to a new demographic model that could make them unsustainable in the near future.
In 2015, the report "Revision of World Population Prospects" by the United Nations warned that in the next couple of decades, the world population will grow to over 10 billion. Our planet currently has about 7.3 billion inhabitants, which will increase to 8.5 billion in 2030, and 9.7 billion in 2050, according to calculations from the UN.
William Haseltine, an expert who participated in the FTF forum on Digital Health, presented his report, "Opportunities for Investment in Health and Wellness," (published by his Foundation Access Health International) in which he describes a series of factors that are complicating the outlook for global health care:
The world population is aging and the birth rate is below the replacement rate, which prompts some questions regarding how to cope with the economic consequences of these demographic changes.

The number of elderly people in middle income countries, including China, India, Indonesia, Mexico, and Latin America, is rapidly increasing. Elderly patients utilize more healthcare services than younger patients.
Life expectancy has also increased significantly in the United States and China.

The future population's increased demand for healthcare services poses a business opportunity for companies.

The bottom line is that the demand for healthcare services for the young and elderly will grow in the years to come, and any companies that can meet that demand intelligently will thrive and find large markets.
All of the aforementioned changes force us to consider healthcare models, both public and private, where technology will be the axis on which the new healthcare services of the future should be based.

In 2100, the World Population Will Reach 11.2 Billion People, and They Will All Require Health Care.

TRENDS

Singapore

Singapore is a clear example of a country where the digital transformation is truly becoming a reality for people there.
They offer a high-quality system, and yet the government only spends 1.2-1.3% of the GDP on it, which is surprising compared to 11% in the United States, or 7.8% average of other countries.
The results in Singapore are spectacular, and scientifically it is a proof of concept.
During the forum, expert Jeremy Lim referenced his book, "Myth or Magic," where he explains that Singapore has become a living lab that is constantly innovating. It is an incubator for co-creation and production of different models for developing a complete transformation of society. Companies such as Doc Doc, Medifee, Hello Doc and AMS Health, Flatiron or Lifetech Medical Systems, are changing the panorama in the provision of services, clinical practice, and in the perception that patients are ultimately responsible for their health.

The new paradigm of digitization should be the rooted into all levels of the healthcare system represented by patients as the central focus of this new model, healthcare professionals, industry, as well as the other social agents that intervene in the round of healthcare services.
William Haseltine points out that the biggest innovation should originate from the country's government. However, not all healthcare representatives share the same understanding of this strategy: "a population's health is the cornerstone for a healthy economy."
A large percentage of government spending worldwide is allocated to health care, which, in many cases, surpasses spending on infrastructure, social services, and even military. In the United States, it is considered a threat to the economy and the country's political stability.
Therefore, the equation would be: how to successfully transform the systems, how the systems can provide high quality healthcare services at an affordable price while also remaining sustainable, and serving as the pillars for economic development by providing value to the society?
However, there are some success cases such as Singapore and Estonia that have developed more efficient healthcare systems that can serve as an inspiration to the world.

"The Health of Your Population is the Health of Your Economy,"
William Haseltine

Can these models be applied universally?

William Haseltine stated that the size of a country, or its economic conditions, should not be a barrier to digital transformation.
However, this transformation is only possible with the unconditional support of the government and political parties. They should view the transformation as a necessary and strategic change for the country, a vision in favor of the population's health versus political and economic goals of different interest groups.

New Business Models

3.2.

Healthcare systems around the world need to reform the basic services model, which presents vast opportunities for the creation of new businesses in health care.
The countries need to improve access to affordable services and high quality products. The system should provide medical services that are closer for people of all ages, at home, and in the community. The healthcare systems should emphasize well-being and minimize the long-lasting impact of chronic diseases.
Those that seek to start a business in the health and well-being of the future should develop their business to address the local markets.
At the Future Trends Forum, Gautam Jaggi began his speech with a purpose: illustrate to the audience an incentive for implementing digital health by displaying the

Illustrate to the audience an incentive for implementing digital health by displaying the world health map in order to analyze the percentage of GDP spent on healthcare.

Gautam Jaggi
Director at EY.

Business develpment and funding: health´s cost.
Conference by Gautam Jaggi

world health map in order to analyze the percentage of GDP spent on healthcare. The figures confirmed that the governments are spending $1 out of every $10 of the global GDP on health care.

Rising healthcare expenditure as a percentage of GDP is not sustainable.

Despite the diversity of each region in the world healthcare map, there is a common factor; rising healthcare spending is exceeding the GDP growth rate, and this course is unsustainable. Within the next couple of decades, we are going to spend 47 trillion dollars on chronic diseases.
If we look to the future... will it get worse? 75% of healthcare costs go toward treating chronic diseases, and if we add the component of an aging population, we can predict that the world will be spending 47 billion on chronic diseases in the next couple of decades, which is the challenge that digital health should target.
What do we know about chronic diseases in terms of healthcare spending? A chronic disease develops over a long period of time, and there is a strong behavioral component. However, this behavioral change should be a long term change, over the next two or three decades, in order to obtain results.

Opportunities in Health 3.2.1.

We have to think about who the consumer is in health care, who provides it, and who pays for it. At this point, Gautam Jaggi described a concept used by behavioral economists, the hyperbolic discounting: a term related to people's behavior and consumption. It is a phenomenon that occurs when we think about the future: any reward that we have to wait for is much less valuable than that which we can obtain right now.
This concept is evident in health care by the doctors; traditionally they have been motivated, rewarded, and

Health Digitization is the Key to High Quality Health Care at an Affordable Price.

TENDENCIAS

Estonia

It is not necessary to fly so far over the global healthcare map to find similar examples of transformation, such as the case with Estonia. With 1.3 million inhabitants, it is a nation with an advanced economy and a high standard of living, as well as a technology paradise where all government services, including health care, is digitized.
In 1991, after breaking away from the Soviet Union, and in order to connect to the western world, Estonia decided to wager on technology to transform its government and society. They integrated all government services based on a common technological infrastructure by involving all political representatives, society, and the private sector.
Thanks to this system, Estonians have developed a close relationship with digital public services. In terms of health, this has translated into a virtual portal between the patient and the healthcare administration.
In this system, patients can visualize their entire medical history, their medications, and prescriptions. It is a portal for medical professionals and healthcare providers, connected by a common core of information that allows for the exchange of data.
Furthermore, the system is built upon the premise of trust and transparency, which gives Estonians the perception of necessary security in which their data is not used for anything else other than the common good, and to improve the system.

Being a physician does not necessarily mean you are the right person to lead a company. You need to have business sense.

focused on curing diseases, rather than in prevention and maintaining well-being in patients.
Guatam Jaggi believes that another determining factor is how to change governments' mode of operation that links their political strategies to electoral budgetary cycles in which only short term results are possible. "They are aware that perhaps this technology could save them a lot of money in the long run, but for their budgetary cycle, the costs are very high and there are no incentives for change.

How can we change the mentality to convert health into a long-term asset?

We need to understand human psychology and produce incentives that take these things into account. If we look at the long term behavioral change, it has to be motivated by the field of experimental economics in order to adapt to the ever-changing conditions.
Guatam Jaggi described the case of a client in the insurance sector, whose goal was to break into a future market that does not currently exist; as related in the report EY: the Future of Health Insurance. Until recently, the health insurance business and risk has been static, where risk is quantified and then you become insured. The EY adviser suggested that instead of thinking only in terms of quantifying and underwriting the risk, you could also influence the risk and lower it dynamically.
The proposal for the insurer was to carry out long term contracts by offering incentives (vouchers for a gym, dieticians, physical therapists...) and technological tools for taking care of your health and improving it over the long term.
In terms of financing, digital health forces us to include all parties, and share risks and benefits so as to think about long term results. Guatam Jaggi said that health care should be an asset on the balance sheet and not an expense on an income statement.

Investment in Digital Health 3.2.2.

Tamar Lifshitz believes startups should be taking advantage of the wide variety of business models that digital health offers.

Startups should be taking advantage of the wide variety of business models that digital health offers.

Tamar Lifshitz
Co-Founder and General Manager
of Elevator MED.

Startups in Digital Health.
Conference by Tamar Lifshitz

"First and foremost, you must have a great idea, second; a complete and multi-disciplined team, and third; to understand the regulations. We work in a highly-regulated environment, but being a visionary is also important because there are criteria for short and long term valuation."
In health, the idea of value and business planning is very complex. In the healthcare market, various agents intervene with varying degrees of influence, and we must be intimately aware of their interests and determinants.
All entrepreneurs in the health industry need to be aware of this ecosystem. Tamar Lifshitz believes that startups should keep the following factors in mind in order to be successful:

- **Complex Model**: a very complicated business where the product, the value chain and marketing strategies should be at the core of the startup. Furthermore, they should also have a vision of a future with a connected health care that is data-driven.
- **Product Value**: the product should be based on big data, and be testable so as to obtain initial information, accumulate data, and evaluate the outcome.
- **Multi-disciplined Team**: the work team should be developed from a comprehensive perspective that combines doctors, business quality, and technologists.
- **Roadmap**: it is absolutely crucial to have a plan for developing the company, to create KPIs, and to identify the mechanisms that drive financial rounds.

We currently find ourselves experiencing friction since change in inevitable, but the system (governments, providers, industry, and doctors) are not adapting to it. Tamar Lifshitz is absolutely convinced that Spain is in a position to lead this change, especially when it comes to health care for the elderly.

Social Impact Bonds 3.2.3.

From the point of view of financing, George Overholser wanted to add to the conversation at the Future Forum a new value in the equation of business development with capital risk: Social Impact Bond.
It pertains to one of the methods of "pay for success," a new form of investing for governments. The social impact bonds are a tool of innovative financing for social programs where payment is tied to the impact that the programs achieve.
Upon measuring the results, the financers of these social programs know what they get for their money, which enables discovering and adopting high impact and cost effective programs more efficiently.
This financing model has been successfully implemented in some projects developed by the NGO, Third Sector Capital Partners, directed by George Overholser.
One such case was a project developed with the federal government of the state of Massachusetts in the United States in order to reduce the incarceration rate of juveniles. "The contract was pay for success, and they would pay us if we reduced the prison stay of these kids."

NGOs are prepared to spend taxpayers' money much more effectively and, more importantly, find a way for the people to get the help they need.

George Overholser
CEO & Co-Founder of Third Sector Capital Partners.

Business Development and Finance.
Conference by George Overholser

How to pay for this 5-year social program in order to reduce recidivism?

18 million dollars was invested by different philanthropic organizations and banks. This budget was managed by an ONG so as to conduct the intervention over 5 years with the stipulation that if the project worked, the government would return the initial investment. Therefore, there is a return on investment, not only for the banks but also for the philanthropists, by "recycling" the money and fostering the program's sustainability.
This idea started to spread throughout the United States in order to manage the many federal expenditures. Historically, it was illegal to tie payment to results. George Overholster said he had to make an enormous effort at the federal level to change the laws and make pay for success happen.

Regulatory Policies

3.3.

Vicky Seyfert Margolis participated in the 17th Future Trends Forum on Digital Health, and she injected her particular dose of reality in regards to the new ecosystem that digital health conforms to in an environment of regulatory policies. She deems that the current regulation is not in sync with the changes that digital health is producing.
"We have to know who the participants are, who will be affected by this revolution, and how we can be proactive when it comes to promoting regulations at the same pace as the advance of technology."
Vicky Seyfert Margolis outlined a series of components in this new ecosystem:

- Pharmaceutical and biotech industry.
- Patients, whose influence is a determining factor in the development of regulatory policies.

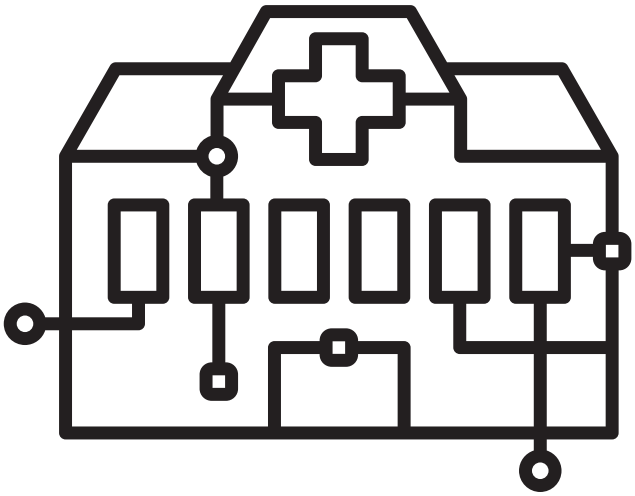
The Industry

The biomedical, pharmaceutical, and biotech industry has struggled in the last few years of austerity and cutbacks in prices related to medications, thereby putting them in an unprecedented situation.
The pharmaceutical industry should position itself either in favor or against affordable health care. Drug makers are being asked to provide information that not only pertains to safety, indicated use, and effectiveness, but also about the clinical and economic value of their medications.
Vicky Seyfert Margolis believes the key to this transition should be based on Real World Evidence, which refers to the data used to make decisions about medications

The current regulation is not in sync with the changes that digital health is producing.

Vicky Seyfert Margolis
CEO & Founder at My Own Med, Inc.

Policy Reactions: A dose of reality.
Conference by Vicky Seyfert Margolis



or medical procedures gathered outside of randomized controlled trials.
Furthermore, investing in studies that demonstrate the real value of medication can offer a lot of benefits for the pharmaceutical industry. Searching for evidence with RWE is the right tool for justifying the use of resources, listening to patients' actual voices, and facilitating the collaboration between the pharmaceutical industry and the public sector.

Patients vs Consumers

Changes in the ecosystem of health care is giving patients a bigger role in making medical decisions and in restructuring the industry's expectations.
Digital health allows compiling large amounts of data and analyzing it. However, the current infrastructure of data collection is based on the economic perspective, that is, to maximize profits at the cost of analyzing the patient's health history in order to improve them.
The challenge to making digital health innovation a reality is the regulatory organizations such as the FDA (Food and Drug Administration) in the United States, or the EMA (Europeans Medicines Agency) in Europe, where both have a crucial role in the progress of digital health innovations.
The FDA faces a complicated scenario of facilitating innovations while protecting patients, and it has developed a guide (Mobile Medical Applications _ Guidance for Industry and Food and Drug Administration Staff) that describes the perspective adapted by the FDA for the set of rules for mobile apps.
For their part, the EMA has created the EU Clinical Trials Register that allows, for the first time, public access to information about clinical trials with medication authorized in 27 member states of the European Union, Iceland, Liechtenstein, and Norway.
Vicky Seyfert Margolis is convinced that there are a lot of data in these agencies that can retrospectively help us develop new medical interventions. Digital health will allow creating a cycle of connectivity to align regulations with the existing technology.
"We have to align our regulations and reasoning to include not only patients, health care professionals, and the payers, but the pharmaceutical industry and the in-

novators of medical products as well, because they are essential in achieving this result."
Vicky Seyfert Margolis concluded her presentation by pointing out the need to develop a law where the technology of electronic medical records should not block information, that is, "knowingly" interfere with the ability to authorize people to access, exchange, or use electronic medical records.

Joint Action Plan

Stakeholder	Individual Health	Socio Economic Impact	Digital Health
Public healthcare organizations	Joint initiative regulatory policy for digital health that enables developing an innovation ecosystem.		Minimum policies of interoperability.
		Pay tied to the interoperability: mandatory interoperability and transparency.	
Pacientes a large community that is engaged with the healthcare professionals, and willing to collaborate with research in order to improve their pathology.	They should be involved in developing tools in order to be able to be at the forefront of access to digital health (dynamic informed consent) for clinics and other healthcare providers. Patients want to provide data anonymously in order to help research but they are concerned about the misappropriate use of their information.		Patient education in digital health so they can be a part of the digital revolution.
Healthcare professionals	Drive a strong leadership.		Human engineering of processes: all actors in the healthcare community should understand the management process of information in real-time: what it is for, and how to get tangible results from it. Social and economic responsibilities from all of the activities related to patient interaction with the physician and the system.
Inversores the common goal is to improve health by means of digitization, but there are two types; those that do not look for return (philanthropists) and those that look for a guaranteed return, and they have different impacts.		Investment with philanthropic capital and partnership in capital risk (pre- and post-financing).	Government support for financing.
Pharmaceutical and healthcare industry	The culture and metrics need to be changed in order to build trust and provide transparency. Data is the business of digital health.	To develop and protect a new way of execution with different metrics and goals.	Develop a portfolio of trial business models for certain projects in order to learn from the experience and to develop rigorous processes to scale out the models.

Chris Meyer
CEO of Nerve LLC.

Digital Health

4.0.

Chris Meyer was the moderator for the debate at the 27th Future Trends Forum dedicated to analyzing the digital health trend where 32 experts of various backgrounds (academia, industry, doctors, investors, managers) debated for two days about the impact of the digital revolution in global health.
During several rounds of shared debate, the experts analyzed the benefits and obstacles to digital health, and they identified all parties involved (patients, health professionals, public services, investors, industry) in accelerating digital health, and the actions each one should take so as to generate tangible benefits in the near future and sustainable wealth for the economy of Spanish society, and for the rest of the world.

Gautam Jaggi

Prologue

Digital health: benefits and barriers

Digital health promises to fundamentally change health care. Already, mobile health is empowering patients with more information and control over their health decisions. Sophisticated analytics are allowing payers and providers to focus on prevention and disease management.

Now, imagine what may be possible in the near future. Artificial intelligence could diagnose and prescribe — improving accuracy and reducing care variability. Perhaps we may even have personalized health avatars to better inform our behaviors and choices. Unbundling sensors from today's mobile phones could make mobile health frictionless and always-on. Bringing the real-world, real-time data from these sensors into analytics could allow providers and patients to connect dots between behaviors and health outcomes.

Achieving this vision will require overcoming challenges. Mainstream adoption of mobile health remains elusive — payers often do not pay, and providers remain skeptical in the absence of scientific data on efficacy. The next generation of sensors — less invasive and with more accurate and useful data — could finally take us to the tipping point. Digital health has led to an explosion in the amount of data — exacerbating the fragmentation of health data. To address this challenge, we will need partnerships to share data and work on analytical techniques, industry standards and platforms to integrate it.

Gautam Jaggi is Director at EY, a global leader in assurance, tax, transaction and advisory services, where he's been working for about 20 years. More deeply, he has been focused on thought leadership in the disruptive innovation space.At the same time, he leads EY's thought leadership on the Future of Work, Behavioral Economics and Health 2.0. statistical analysis. He started as Research Associate at the Peterson Institute for International Economics. During his career he has accomplish a deep health industry knowledge and broad experience in other sectors.

Benefits

4.1.

As a way to kick off the discussion, the organizers of the Future Trends Forum identified eight benefits of digital health, which were subsequently contextualized and improved upon by the experts, who even listed them by importance in the following fields:

01. Patient

- **Empowerment**: patients will be able to manage and proactively improve their health
- **Patient Satisfaction**: we will be able to offer higher quality care to more people
- **Improve the Minimum Standard of Care**: it will be possible to standardize health care at a global level by closing the gap of inequality and ensuring a healthy life style.
- **Remote Access**: health in the palm of your hand will be a reality through various apps and wearables that are available in the market.
- **Individual Well Being**: it will encourage the patient's individual well-being.
- **Health Awareness**: it will allow people to be more aware of their state of health and it will motivate them to modify their behavior for the better.
- **Resilience**: it will inspire people to be resilient, that is, the human ability to positively adapt to adverse situations in regards to their health.

02. Medical Attention

- **Prevention**: patients will be encouraged to take care of their health by means of motivational strategies.
- **Consistent Health Care**: the real-time analysis offers more information that can help improve treatments for patients.
- **Personalized Health Care**: offering individualized care and treatment for each disease.
- **Mobility**: digital health provides care regardless of where the patient is.

- **Detection**: it allows early detection of diseases.
- **Diagnostic**: artificial intelligence will be a revolutionary tool for improving diagnoses.
- **Medical Errors**: it will reduce the rate of medical mistakes so as to improve patient safety.

03. Healthcare System

- **Healthcare Costs**: it will reduce healthcare costs worldwide.
- **Research and Development**: digital health is going to be a very valuable tool for R+D.
- **Increased Value**: there will be more value for the money invested in public health.
- **Precise Database**: it will allow us to more accurately analyze our situation in real-time.
- **Compliance**: it will facilitate compliance with existing regulations.
- **Financing Feedback**: we will be better able to acquire useful information for investors in terms of ROI, and make investment contingent on public health, with financial benefits.
- **Political Stability**: The health of a country's people is proportional to the sustainable growth of its economy, as well as the foundation for developing a stable political system.

Obstacles

4.2.

The forum participants gathered into four groups of discussion; public healthcare organizations, patients, healthcare professionals, investors, and the pharmaceutical and healthcare industry, in order to identify what the main obstacles that each one of these groups faces in being able to implement digital health.

Public Healthcare Organizations

- **Political Obstacles**: there is an unresolved conflict of interest, and the adminstrators' vision determines whether goals are reached.
- **Private Institutions**: they have no incentive to innovate since it is a risk they don't want to take on.
- **Lack of Standards**: we need to develop a universal legal framework at a European level that coordinates with the digital transformation of the system.

Patients

- **Privacy**: there is a fear of inappropriate use of patient data.
- **Fragmented System**: there is no interoperability with patient information regarding their clinical trials, diagnosis, and treatment guidelines.
- **Excess Information**: patients cannot identify what information is valuable for them, they need to be "educated" in order to interpret and identify what is the right information.

Healthcare Professionals

- **Information Silos**: the design of healthcare information systems is based on silos which results in a major communication issue between departments.
- **Leadership**: we need leaders who have a clear strategic vision for implementing digital health.
- **Culture**: professionals are used to doing exclusively what they have been trained to do, and the educational system promotes continuity/status quo over innovation. The culture around professionals needs to change.

Investors

- **Regulatory Uncertainty**: the lack of regulations that guarantee investment is a clear concern.
- **Data Access**: access to the large databases is not standardized and, in some cases, there is a price to access them.
- **Long Investment Forecast**: it is not clear whether investment in technology will yield better results.

Pharmaceutical and Healthcare Industry

- **Reduced Revenue**: if we don't implement digital health correctly, the revenue in this sector will plummet. Incentives for the industry have to be very clear.
- **Collaboration**: in order for it to be possible, there needs to be collaboration between different agents of the industry in this new scenario.
- **Business Model Risk**: the potential return on investment for the industry is not very clear. New business models of recompensation need to be developed.

After a group discussion, the experts at the forum defined what the main obstacles to implementing digital health are, and what steps need to be made to overcome them.

Main Obstacles

The obstacles considered to be critical to the speedy benefits of digital health were:

Data

From the point of view of data, technology should achieve system interoperability by developing standards that break down existing information silos. The patients could be at the forefront of this endeavor by demanding improved access to information about their medical records and their disease.

Investment

From the point of view of investors, the consensus is clear: new hybrid models of financing are needed, such

as social impact bonds or public procurement of innovation (PPI) in order to encourage innovation.
There should also be a relationship between public and private investment. Furthermore, regulatory organizations should share their data publicly; hence, investors would have more information for making decisions, and they would ease any uncertainty in regards to the return on investment of their projects.

Culture and Incentives

From a cultural point of view, the resistance to change is a significant factor in transforming healthcare organizations. There are no incentives for promoting a change. Furthermore, a policy of outcomes needs to be defined based on pay for value and the patients' well-being.
The responsibility of this collective is to incorporate digital health as soon as possible so as to allow the healthcare system to measure the value it offers patients.

This strategy for change should be very dynamic in order to establish digital health and overcome this obstacle.

Leadership

The leaders should be trained to measure and analyze results in health, and they should also allow innovation to develop from the bottom up by creating checkpoints to ensure there are tangible results. A system crisis is an opportunity to take charge of the transformation and to be more competent.

Political and Regulatory Uncertainty

An interdisciplinary committee is needed wherever any system actors are integrated so as to develop political strategies and regulatory frameworks that favor implementing digital health, and so that these strategies are also coordinated by local leaders who customize the strategies to the casuistry of each region.
Furthermore, we also need to reposition the value chain in order to enable and encourage innovation, and so that value is aligned with the interests of the parties involved.

Richard Kivel
Senior Manager Bridgewater.

Conclusion

5.0.

The digital transformation of health is changing our lives at a dizzying rate which keeps us from visualizing the real impact it has on our society. We are facing important challenges in the near future that we must resolve with new tools, and technology can help us create a new global health roadmap.

At the Future Trends Forum, members were invited to analyze the digital health trend so as to determine the value of this new tool for solving problems of the current healthcare systems, such as the opportunity it offers to put the patient at the core around which all healthcare services revolve in the future.

Digital health provides enormous solutions for healthcare systems by means of comprehensive management through information systems in real-time, capable of tracking and measuring all activity whether it is through assistance, research, or administrative, or economic in nature, thereby reducing costs and improving effectiveness.

From the patient's point of view, personalized attention will be a reality by means of avatars that will allow us to be aware of our health and the changes we can make in order to improve our well-being.

Furthermore, advances in the field of genetic research will allow analyzing the risk of suffering from a disease in the near future. Therefore, preventative plans could be developed (preventative medicine) to carry out clinical tests before regular checkups, and try to prevent or slow down the onset of a disease.

Without a doubt these advances will enable changing our behavior in regards to our health, to empower us as patients, and improve health at a world-wide level.

From a more technological point of view, digital health entails three concepts that will revolutionize world health: Big Data, Artificial Intelligence, and Machine Learning.

Specifically, big data enables us to analyze large archives of healthcare information and obtain valuable data to plan tasks, and generate alerts that can support strategic decisions for administration and policies.

From the clinical point of view, artificial intelligence and machine learning would enable medical professional to reach a more accurate diagnosis and be able to offer treatment that is more appropriate for their patients.

In spite of the important benefits that digital health is going to provide, there have been some significant obstacles to completely implementing it, such as data management and protection, the public/private financing needed to develop it, all parties in the field of health care needing to adapt to change, and the necessary regulatory changes.

Certainly, the convergence of these different technologies will make digital health the driving force for change towards new healthcare models and for the relationship between patients and healthcare professionals. It will also enable public access to healthcare information, thereby creating new opportunities for promoting health and optimizing investment in health on a global scale.

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