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***Threat or Opportunity: the Role of Innovation in the
Pharmacy of the Future***

RELATORE

Prof. Guido Fienga

CANDIDATO

Luca Zandara

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Abstract

The importance of everyone's health has been evidenced more than ever during the Covid-19 pandemic, revealing once more the cruciality and the needfulness of pharmacy as a medical presence on the territory. However, despite the increased significance of that entity, the sector as a whole suffered from an economic impact of the pandemic (especially in the case of more traditional drugstores), manifesting the urgency of a leap. This thesis will provide evidence of the changes that this fundamental entity already faced, that is living and that will have in the very next future, comparing the differences between Italian and American progress pace, with a brilliant Italian exception. The fuel that feeds those changes is innovation; an aspect that cannot be offset if it is aimed to run a business efficiently, and according to that, it is impossible to conceptualize a pharmacy in the same way we used to do a decade ago. It will be assessed why a radical change is needed and how a possible threat, represented by online stores, could be converted into a greedy opportunity, with both already available solutions, and those that the future would reserve to us. Product innovation will transform a simple drugstore into a powerful pharmacy based on services. It could be ensured thanks to the technological progress and technological innovation in sectors as pharmacogenomics (with a precious contribution of Netgenomics) and blockchain, able to renovate the entire industry and get over the painful slip of Theranos. Even if it revealed itself as a washout, Theranos provided a glimpse of the future, and the certitude that a promising idea in that sector could reach conspicuous financing. Furthermore it will be pointed out the considerable interest that that topic reached in the recent past, driving investors and companies to conspicuous endowments: Theranos reached over 1.4 billion in financing while the biggest hi-tech companies such as Amazon, Apple, Google, Microsoft are committed in the sector. In conclusion, an environmental analysis will point out the urgency of the change, also from a non-economic view.

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The context

How fast is the world we are living now? Our life in the last 15 years faced a heaps amount of changes that affected our daily routine. Radical changes if we have to be precise. It is not necessary to recall the enormous technological development we had in the very immediate past. Everyone knows well how fast things are changing around us, so well that often takes it as assumed and normal, while it is everything but ordinary.

The 21st century represents the actual shift from the industrial revolution to the new economic domination of information technology¹; a new era that profoundly changed the economy and the interaction between people. However, 2020 was not pleased about its own role as a “normal” year distinct by digitalization. It wanted something more than that. So it decided to add a variable; the worst it could ever be chosen: a worldwide pandemic. Every sudden and dramatic change, other than trials, leaves us something; something that will always remain marked in our minds.

If I had to summarize what people understood during the pandemic, it was the importance of health in our existence, the cruciality of technology and how comfortable it can be to have home services². Hospitals showed how tough it could be helping and saving lives to millions of people simultaneously, and showed in some sense how far public health, if any, is distant from citizens. Everyone in the world understood that the system has to be updated to be efficient.

The solution, despite the appearance of being rugged and remote, is probably in front of our eyes. It is a place that did not have the importance it should have had in the last decade and innovated at a slower pace compared with other sectors: drugstores.

From the word itself, it is easy to understand how reductive this concept is: “ a store where you find drugs”. Probably the word does not say everything, does not give space enough for a vision of a new drugstore that does not limit its own activity in selling drugs, but wants to do something more. Some Pharmacies³, are already understanding the epochal change they need to do in order to be able to put themselves in the middle of a way, that connects patients and public health. As we understood during the pandemic, technology will help in doing the big step and will be the key to opening a brand new market.

¹ <https://www.igi-global.com/dictionary/ethical-values-and-responsibilities-of-directors-in-the-digital-era/7612>

² such as delivery, and video call

³ which is definitely a better name if compared to drugstores

However, innovating for drugstores is not just a suggesting idea, but the way that will allow them not to lose the market against new fierce competitors.

WHY DO DRUGSTORES NEED TO INNOVATE ?

Although the health market is growing at an uncommonly fast rate, it is not clear that drugstores will maintain the same importance that they actually have. At least drugstores as are now intended. Everyone in 2020 understood the importance of health. Already in March, when the pandemic did not start yet in U.S three most important Drugstores chains registered an average of 10% more people visiting their store⁴. In Italy, also in its capital city, it was almost impossible to buy disinfectant gel in any pharmacy by the middle of February. Pandemic: an extremely tough moment for people, but an enormous opportunity for pharmacies, someone could say. Well, that is only partly true. In Italy, Iqvia⁵ has estimated a decrease of 1,7% of the whole sector that comprehends all the product sold inside pharmacies if 2020 is compared with 2019. The drop is even more profound in the first 11 weeks of 2021, when the decrease, if compared with 2020 was about 8% in sales. How is it possible to register such a deep decrease in a moment when pharmacies should have been at the center of the focus ?

The answer dwells on the actual stage of the development of Italian drugstores and their own nature. According to Federfarma⁶, 59% of drugstores are owned by a single pharmacist⁷, while 41% by communities of pharmacists. Also, the “old” view of a pharmacy that does not need actual entrepreneurial grounds or ideas behind in order to be run in an efficient way ⁸, profoundly contributes to a lack of substantial development and innovation.

⁴ Placer.ai. (April 2, 2020). Impact of coronavirus (COVID-19) on visits to selected pharmacies and drugstores in the United States in the first three weeks of March 2020
<https://www.statista.com/statistics/1110596/impact-of-coronavirus-on-visits-leading-pharmacies-and-drugstores-in-the-us/>

⁵ IQVIA is a world leader in data processing and analysis in the healthcare sector

⁶ “Federfarma, La farmacia italiana 2018/2019”
Available at: https://www.federfarma.it/Documenti/farmacia_italiana2018_19.aspx

⁷ that in many cases does not have economic power to innovate their own pharmacy

⁸ Somarè, S. (2021) “Farmacie di Proprietà, catene e network: distanti eppure vicine.” Farmacia News
<https://www.farmacianews.it/farmacie-di-propriet%C3%A0,e%20calibrare%20la%20propria%20proposta.#:~:text=Tra%20le%20catene%20di%20propriet%C3%A0,e%20calibrare%20la%20propria%20proposta.>

The digital era in which we are actually living does not grant much space in the market for those who do not invest in innovation, or who do not understand changes in the market quickly. Even a solid and strictly regulated market as the Italian pharmacies are did suffer the rapid change we are living. However, the issue does not only involve Italian drugstores.

The healthcare sector as a whole is facing a huge change, and in every change gaps tend to stretch: who first understand where the market is going, will gain a substantial margin over competitors, which may find hard to stitch up.

The healthcare market is expected to grow at a compound annual growth rate of 7.9% from 2020 to 2027⁹, showing how attractive the sector would be, and even more suddenly be the growth in digital health.

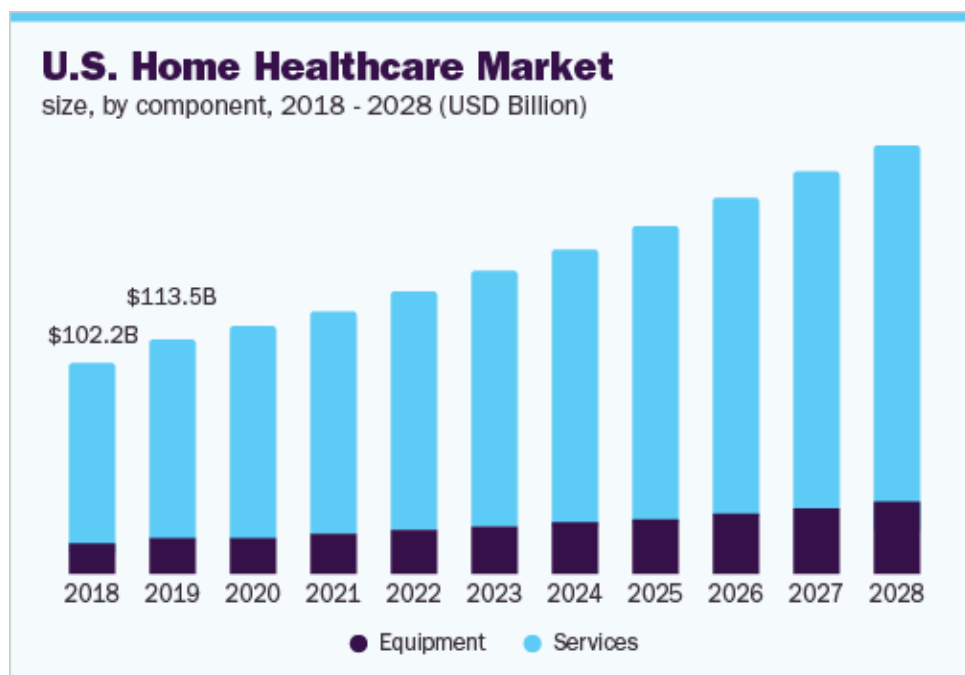


Table 0

Home Healthcare Market Size, Share & Trends Analysis Report By Component (Equipment, Services), By Region (North America, APAC, Europe), And Segment Forecasts, 2021 - 2028; (Sep 2021)

Available at: <https://www.grandviewresearch.com/industry-analysis/home-healthcare-industry>

⁹ Home Healthcare Market Size, Share & Trends Analysis Report By Component (Equipment, Services), By Region (North America, APAC, Europe), And Segment Forecasts, 2021 - 2028; (Sep 2021)

Available at: <https://www.grandviewresearch.com/industry-analysis/home-healthcare-industry>

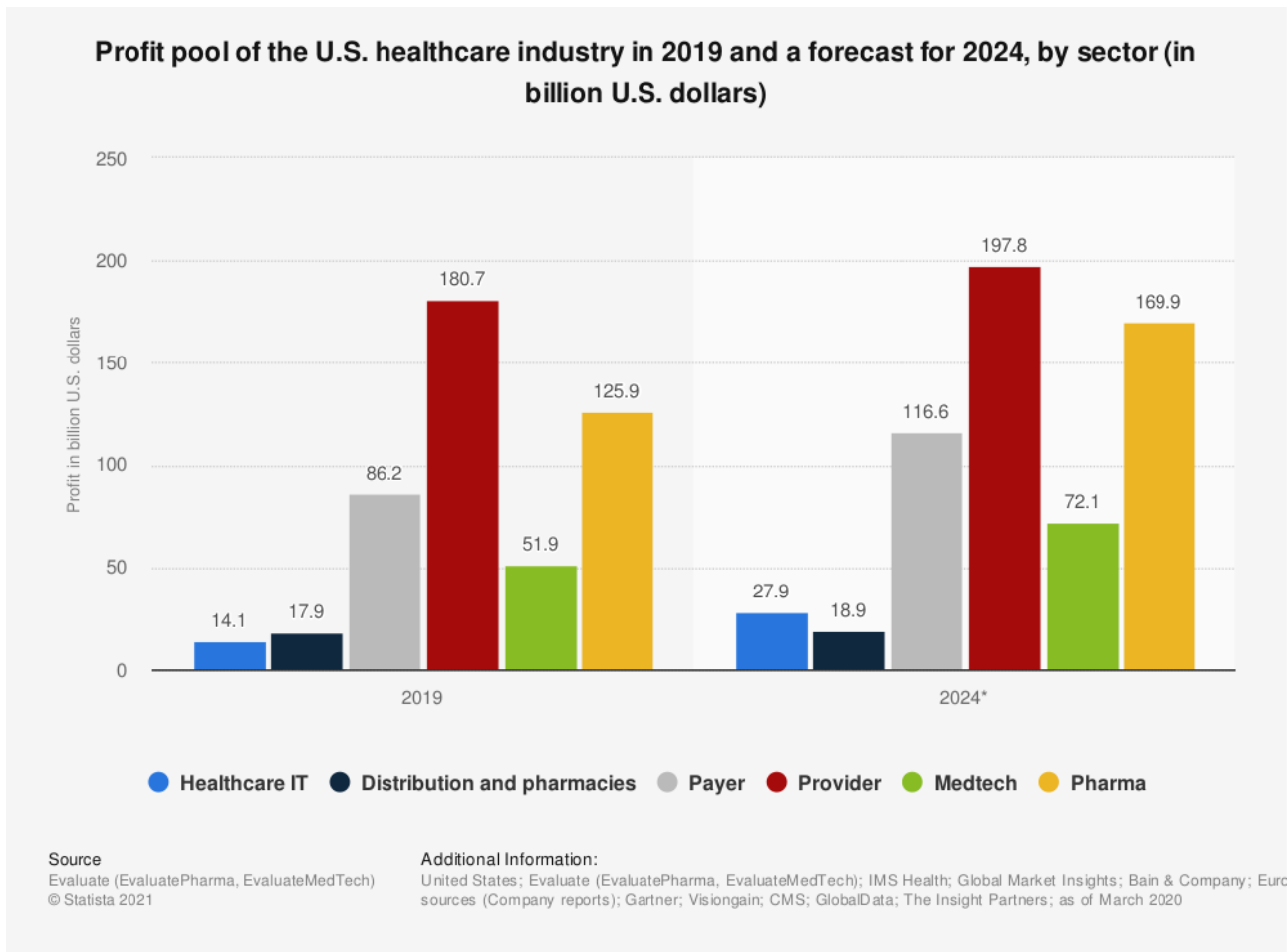


Table 1

*U.S. healthcare industry 5-year outlook by sector 2019-2024 | Statista. (2021)
from <https://www.statista.com/statistics/1117974/healthcare-industry-profit-growth-by-sector/>*

Also from investors point of view, it had a sharp rise in last 10 years ¹⁰, and that explains why tech giants are starting to invest in the sector.

The most attractive sub-sector of health care, as well as the one that is growing at the fastest rate, also in terms of financing, is represented by digital health.

¹⁰ Across the last decade, digital health has grown from a blip on the radar of investors to a robust sector receiving nearly one in ten venture dollars invested in the United States. In 2019, 359 US digital health startups raised \$7.4B from 627 investors. Six companies had IPOs resulting in a combined market value of \$17 Billion. With a liquidity overhang of over \$30 billion, investors will be eager to see more public offerings for digital health companies.

In 2019, digital health celebrated six IPOs as venture investment edged off record highs | Rock Health. (2020). Retrieved 22 September 2021, from <https://rockhealth.com/insights/in-2019-digital-health-celebrated-six-ipos-as-venture-investment-edged-off-record-highs/>

Greg Licholai, M. (2021). Digital Healthcare Growth Drivers In 2020. Retrieved 22 September 2021, from <https://www.forbes.com/sites/greglicholai/2020/01/14/digital-healthcare-growth-drivers-in-2020/?sh=669e080511dc>

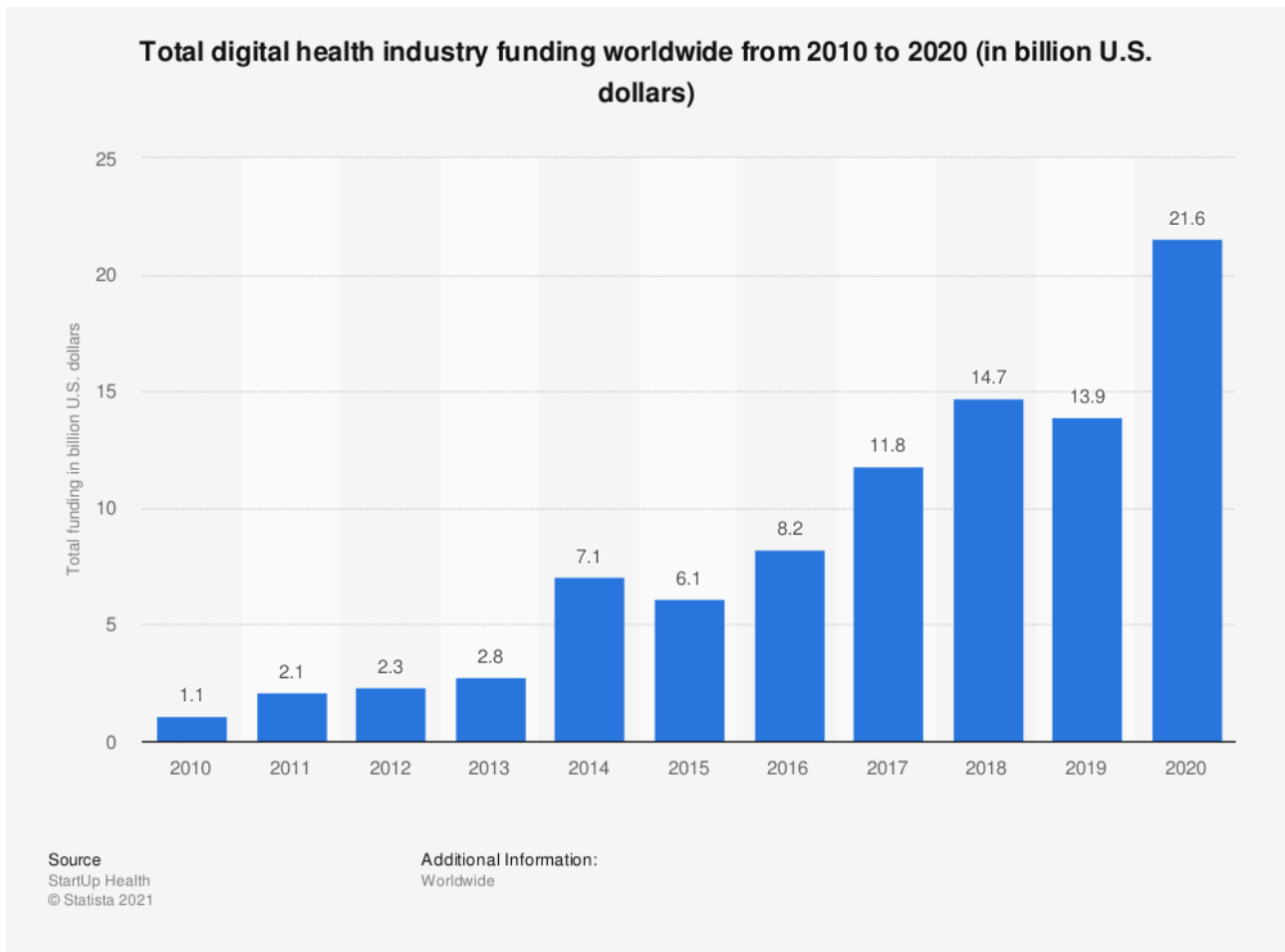


Table 2

Digital health funding globally 2010-2020 | Statista. (2021).

from <https://www.statista.com/statistics/388858/investor-funding-in-digital-health-industry/>

Digital health can be defined as a broad, multidisciplinary concept that comprehends different categories as mHealth¹¹, Health IT, wearable devices, telehealth and telemedicine, and personalized medicine¹². The interest around digital health is justified by the disruptive impact that it will have on the entire sector, and the relative opportunities created by it. If traditional drugstores would ignore this fundamental branch of healthcare they would lose a potential opportunity of growth, but also lose a considerable part of their market share in favor of more innovative companies, pleased to sustain technological innovation. In particular, the global market size of digital health will register a forecasted value of 639 billion dollars, more than six times its size in 2019.

¹¹ also defined called mobile health

¹² <https://www.fda.gov/medical-devices/digital-health-center-excellence/what-digital-health>

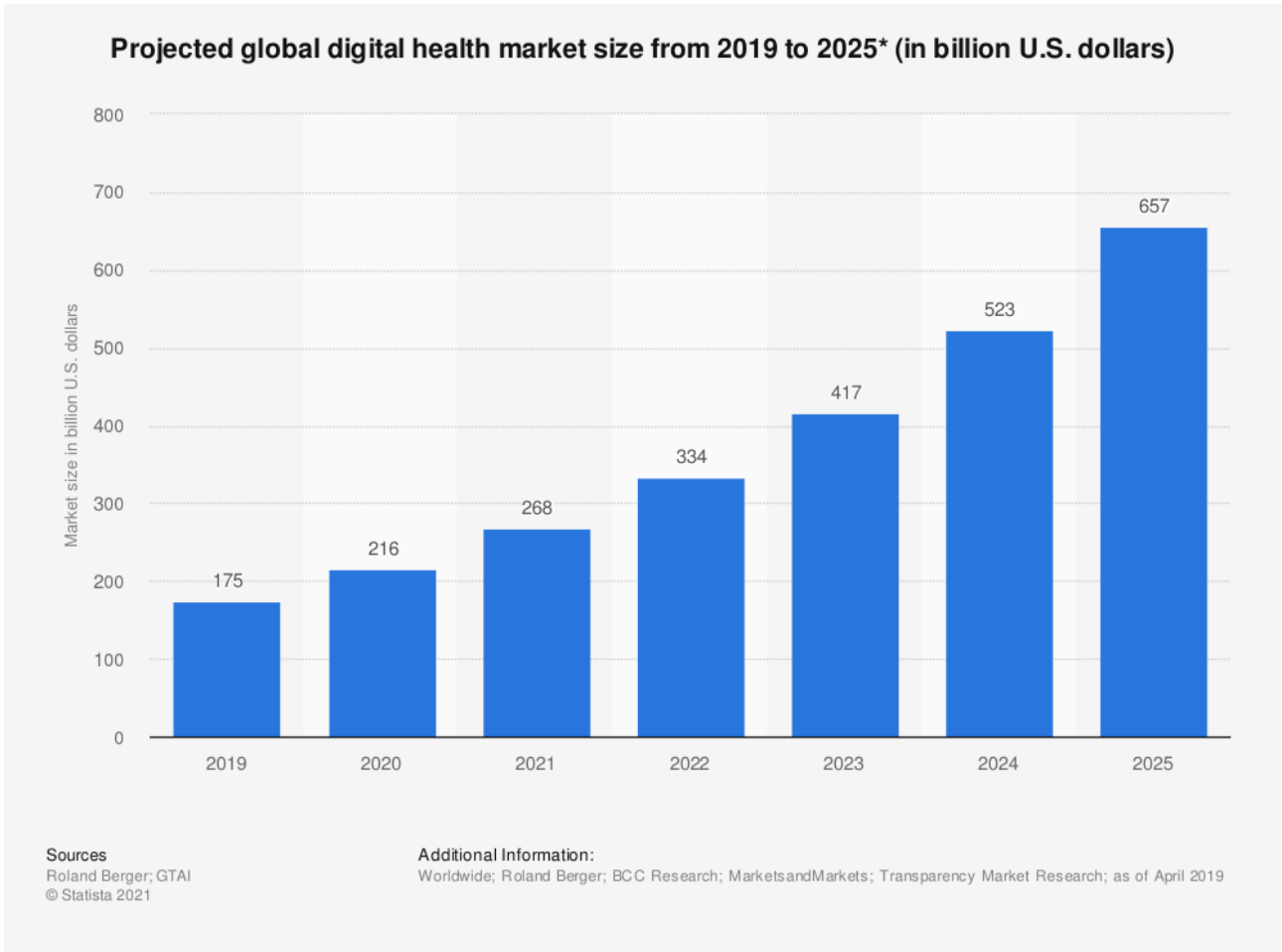


Table 3

*Global digital health market forecast 2025 | Statista. (2021).
from <https://www.statista.com/statistics/1092869/global-digital-health-market-size-forecast/>*

Being able to integrate and start addressing to this topic is essential and fundamental for drugstores, in order not to risk their privileged position of intermediary between patients and medicine.

TRADITIONAL PHARMACY KILLER

The role of bridging the gap between patients and medicines is starting to be challenged by technological process, and new alternatives to the canonical drugstore. The primary reason is that even if customers and patients do not vary their own needs in time, it actually changes the way their needs can be accomplished. The traditional conception of a pharmacy based merely on sales of drugs, supported by a standard dose of advice and recommendations would not be enough.

First of all, pharmacy has always been a familiar place where to have healthcare advices without having to go to the hospital, or in a clinic. Pharmacists there always have the tools to help patients in curing not severe aches¹³, illness or injuries, and most of all addressing a safe therapy, informing about possible drugs adverse reactions and actions to be avoided¹⁴. Also, in managing chronic pathologies, they provide constant support. In a single phrase, their role is to bridge the distance between physician and patients. However, this role has started to be challenged since the internet became popular and widely used, leading to the creation of e-health.

People found on internet the potential of an answer to most of the questions and necessities, in just a few seconds. The phenomenon in healthcare is relevant since about 5% of all Google searches are health-related¹⁵, receiving more than one billion health questions every day¹⁶.

The first direct outcome is an exponential increase in the phenomena of self-medication¹⁷.

¹³ such as headaches, stomachaches etc

¹⁴ such as alcohol consumption or heavy machinery operation

¹⁵ Google is a trusted resource for people worldwide to get answers to health-related questions and find providers

<https://blog.google/products/search/health-info-knowledge-graph/>

¹⁶ Drees. J. (March 2019) . “Google receives more than 1 billion health questions every day”. Becker’s Hospital Review

<https://www.beckershospitalreview.com/healthcare-information-technology/google-receives-more-than-1-billion-health-questions-every-day.html>

¹⁷ the taking of drugs, herbs or home remedies on one's own initiative, or on the advice of another person, without consulting a doctor

Bennadi D. Self-medication: A current challenge. *J Basic Clin Pharm.* 2013;5(1):19-23. doi:10.4103/0976-0105.128253

Despite the possible inaccuracy of online information, and the hypothetical no-feasibility of those on individuals, people sort of rely on them because of two fundamental factors: the total freeness of such information, and the easiness to find them. How can a pharmacy compete with that?

The simple advice provided by pharmacists is no longer enough to justify spending and people leaving their homes for a service they can have for free online.

Moreover, as every physical store, the primary threat for traditional drug stores is definitely the technological progress, and more specifically the online market. Historically drugstores, as the name itself well clarifies, have always based their business on the mere selling of drugs.

However, over the years, online stores have completely changed consumers' behavior and consequently the seller's one. If possible the occurred pandemic has fastened that habit.

The pharmaceutical sector, in some sense, is one of the last sectors that is joining the online trend, but that now starts to be relevant especially in the U.S, where the market of online sales related to drugs, health and beauty products overcame 50000 million dollars in 2019¹⁸, even before the occurrence of the pandemic.

¹⁸ US Census Bureau. (January 28, 2021). U.S. online shop and mail-order sales of drugs, health and beauty products from 2003 to 2019 (in million U.S. dollars) [Graph]. In *Statista*. Retrieved June 05, 2021, from <https://www.statista.com/statistics/185452/us-online-shops-and-mail-order-houses-sales-figures-for-pharmaceuticals/>

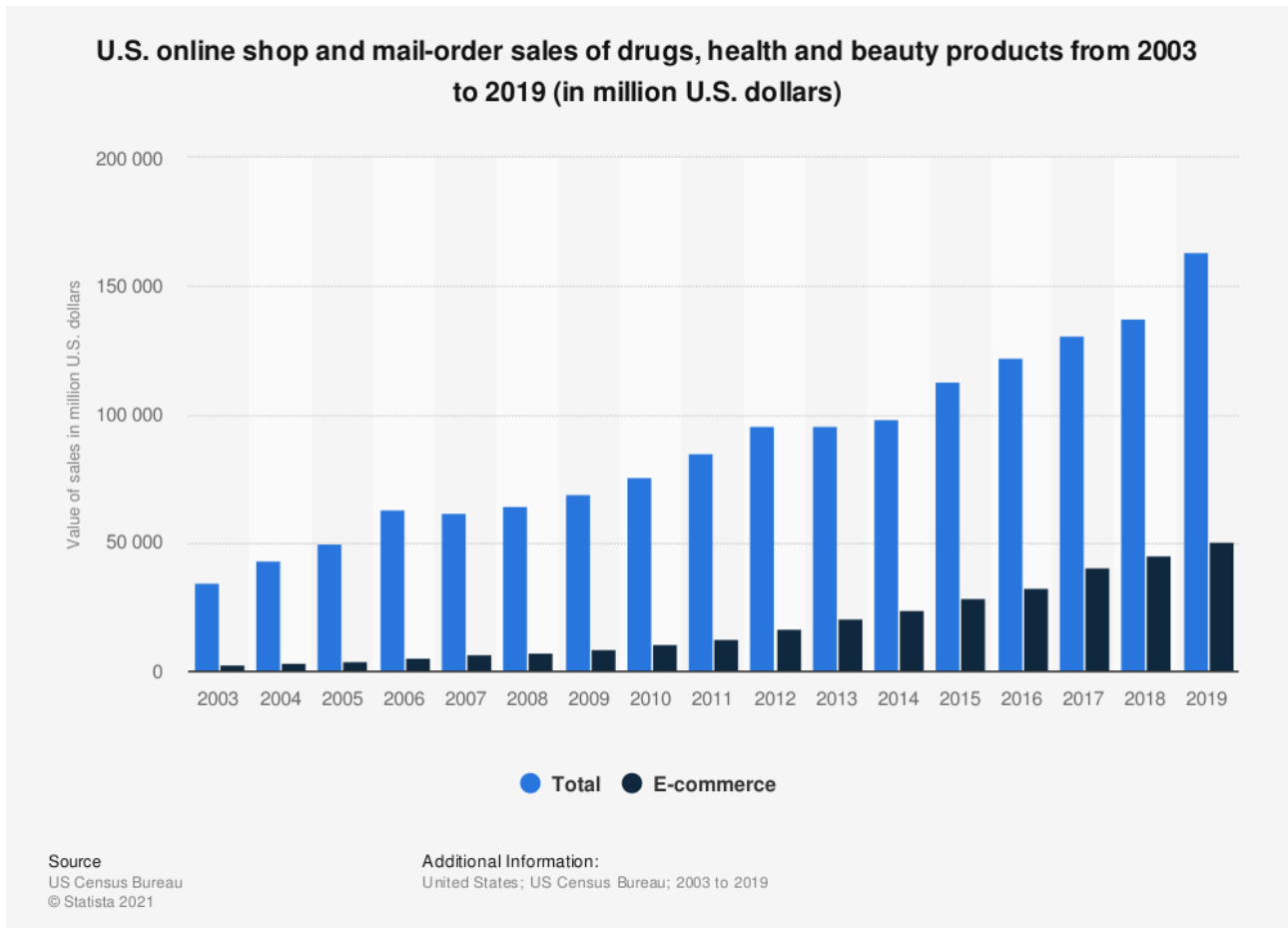


Table 4

U.S. online shop and mail-order sales of drugs, health and beauty aids 2019 | Statista. (2021). from <https://www.statista.com/statistics/185452/us-online-shops-and-mail-order-houses-sales-figures-for-pharmaceuticals/>

Nonetheless, many customers are still more devoted to in-store shopping, even if the penetration rate of online pharmacy is continuously growing over time, especially in more wealthy countries. In the following graph there will be taken into consideration the average of G7 countries¹⁹.

¹⁹ <https://www.statista.com/outlook/dmo/digital-health/ehealth/online-pharmacy/g7?currency=EUR#key-market-indicators>

Online Pharmacy - Penetration Rate G7 (percent)

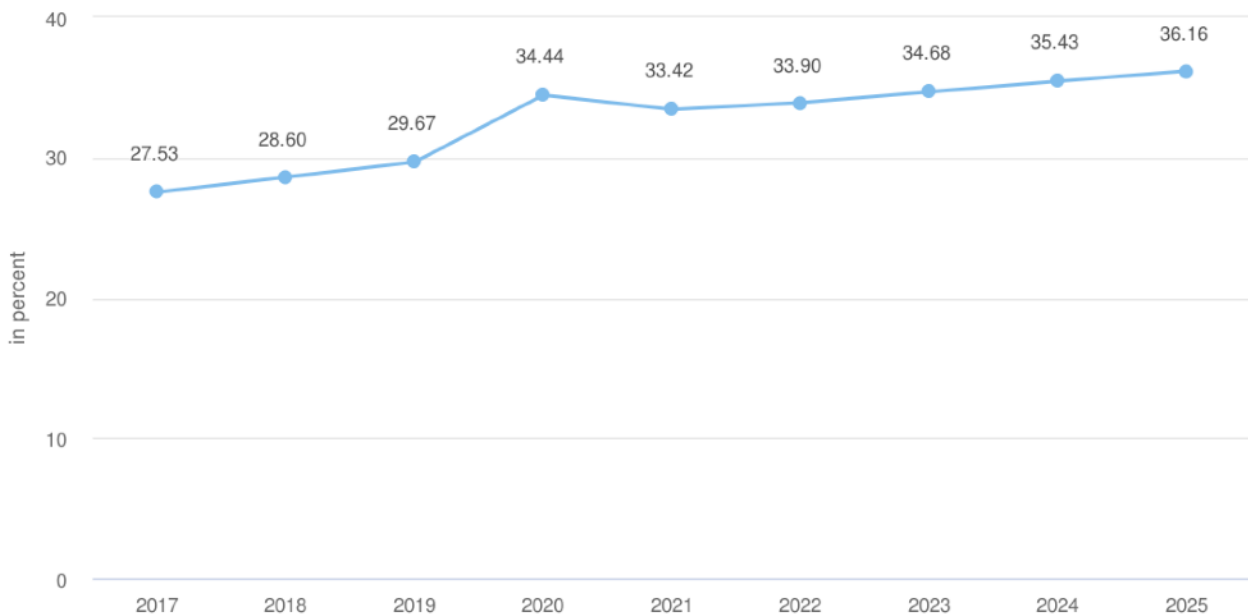


Table 5

<https://www.statista.com/outlook/dmo/digital-health/ehealth/online-pharmacy/g7?currency=EUR#key-market-indicators>

According to a survey presented by Statista²⁰ relative to shopping preferences when buying healthcare products, the reason that prevents customers from buying online, 65% of people prefer buying offline because of the immediacy, 20% because of prescription from the doctor and only 16% because of the advices that they could receive from pharmacists. For 14%, differently, the discriminant factor was a better payment option in offline stores.

Those data are extremely interesting because they show clearly how the pains that prevent people from buying online are very similar to those registered some years ago with other sectors. The barriers that make people still prefer physical stores are very similar, and in some sense are being edged by improved services in the websites, better assistance and faster and efficient delivery.

What most differs across different sectors, is the time necessary for an online transition that is inversely proportional to the confidence and the cruciality of the items bought.

²⁰ <https://www.statista.com/study/69183/otc-and-pharmaceuticals-in-the-us/>

Although comparing two completely different sectors could be seen, at a first look, to be out of scope, selling drugs or books is to be considered a similar concept. Both products are tangible and in some sense it could be necessary assistance during the shop. The significant difference is that book readers are a couple of years ahead, most of all in terms of consumer confidence. According to data from the last few years, this last obstacle is likely to be overcome by consumers.

The process, for bookstores, started in 2005 and led to the closure of many local bookstores and also big bookstore chains.

Book store sales in the United States from 1992 to 2020 (in billion U.S. dollars)

Book store sales in the U.S. 1992-2020

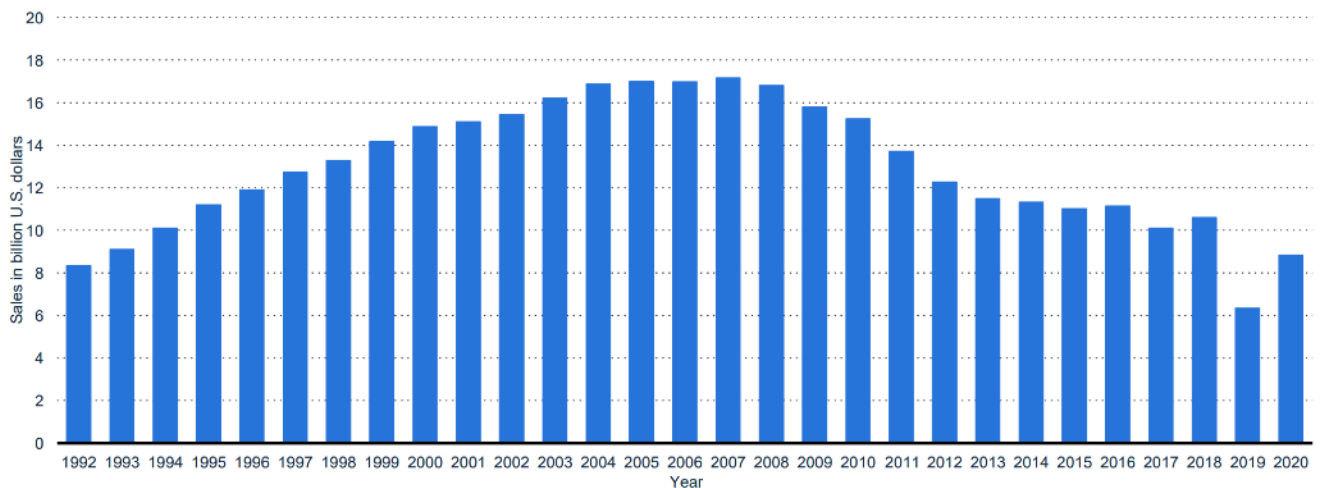


Table 6

*U.S. book store sales 2020 | Statista. (2021)
from <https://www.statista.com/statistics/197710/annual-book-store-sales-in-the-us-since-1992/>*

Who survived this crisis has been deeply resized, as we can see from Barnes & Noble graph below.

Barnes & Noble net sales in fiscal years 2012 to 2019, by commerce segment (in million U.S. dollars)

Barnes & Noble sales 2012-2019, by commerce segment

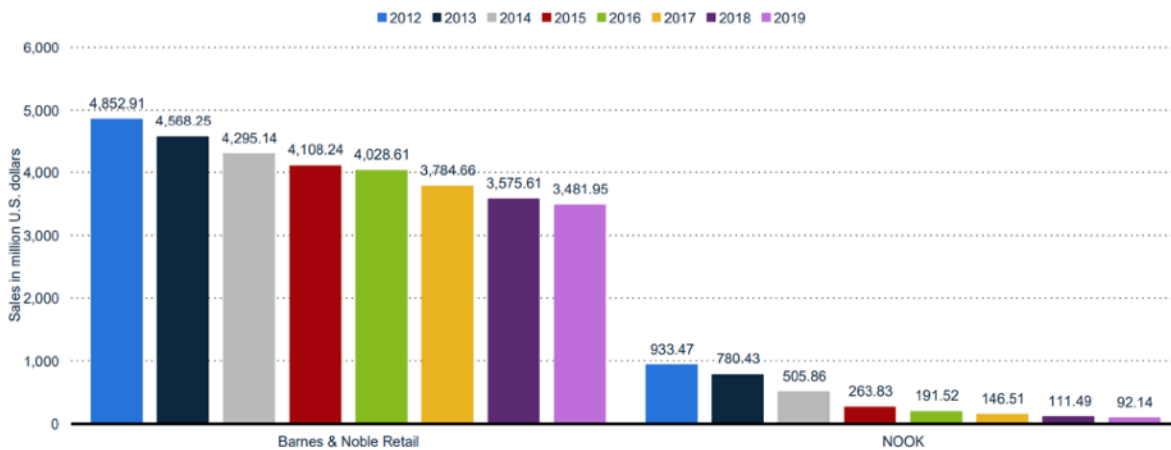


Table 7

*Barnes & Noble: sales by commerce segment 2019 | Statista. (2021)
from <https://www.statista.com/statistics/199008/barnes-und-noble-net-sales-by-commerce-segment/>*

Moreover, it has to be considered the competitive disadvantage of brick-and-mortar stores when fighting in the market against online based stores, when selling online. The rationale behind the disadvantage resides in the different nature of online and offline, leading to a different structure and, most of all, different costs. A native e-commerce has a consistent amount of expenses that, differently from an offline native, has not to sustain: cost of the actual physical store, employees, lower working capital²¹ and relative lower financing required, and a lower storage cost. The sum of those factors leads to a massive difference in terms of cost, guaranteeing to online store a crucial advantage to be exploited both In terms of profitability, or lower price.

The same concept can be applied to Pharmacies, that even if selling online will have costs far higher than online-based competitors. At the same time, the biggest company in the world, that already changed the rules of commerce, has started to enter in the sector calling its division “Amazon Pharmacy”. The market of drugs, and especially OTCs, will be every year more online.

²¹ since online payment are most of time immediate

Conversely, issues such as “Pharmacists’ advice ” are far from being implemented in a successful way in online shops, if compared to offline’s. However, as we analyzed in the previous paragraph the customer is, unfortunately, giving always less importance to this factor. Also, a wiser implementation of an e-health system and telemedicine will allow avoiding this problem. For brick-and-mortar shops there’s the need, or better the urgency to find a way to make it convenient and rational for customers to buy in shops, in order to be still able to run the business efficiently.

It has never been so clear that pharmacies need to change since they will not be able to rely uniquely on the mere sale of drugs. They need to be aware of the risk that not investing in the future and in a profound change could have dramatic consequences; faster than they can imagine.

WHAT CAN PHARMACIES DO? THE ROLE OF INNOVATION

So what can drugstores do in order to contrast this unstoppable trend?

Basically nothing, it does not make any sense to try to contrast the future. Technological development and innovation have to be seen as an opportunity, not as an enemy.

Pharmacies have the urgency to diversify from standard drugstores and exploit the advantages of a physical store that no online store can achieve, at least in a short amount of time.

Pharmacies in history have never been considered as standard shops; they are the vital connection point between public health and citizens; it is incorrect to reduce this relationship to the mere sale of drugs.

Renewing pharmacies can be possible through innovation: technological and ones in terms of organization, product and services offered. The fundamental idea is to attract a more significant number of customers inside them and retain them through the creation of customer loyalty.

Creating a loyal client base implies a first vital stage to be accomplished regarding the nature of the pharmacy itself that needs to be updated to time, shifting from the traditional drugstore seen so far, to a pharmacy based on services, able to offer a holistic approach. For instance, it is fundamental to understand the role of pharmacies in the society, that is living a constant and continuous change, but that at the same time rely on the fundamental principle: helping people improve their lives, making it healthier.

Services could be both devoted to assistance and prevention or services in their purest form.

Assistance services are more in line with the traditional vision of pharmacies, and they are already available in the majority of medium-large ones. However, those services can be improved according to the outstanding opportunities offered by technological improvements. In this sense, drugstores will have to differentiate their assistance from the aseptic and generic's ones, providing a detailed, precise, and accurate help created ad personam. As I will discuss in following chapters, technology makes pharmacist able to know the customers much deeper than before: DNA analysis, fast and reliable blood tests, integrated into an interoperable digital clinical record will make possible analyzing data from patients and customizing advices and therapies, being able to offer a prompt service even online, with dedicated apps. Also, pharmacists will be able to create new data thanks to innovative machineries and traditional ones, implemented in pharmacies and affiliated clinics. The huge amount of data coming from those analyses and wearables would have the opportunity to be stored in pharmacies in order to improve and patients' therapies and life. In this way, it could be

possible to create a new service and market, based on prevention and customized analysis, to enforce the assistant one. Implementing innovative technology and digitalization into drugstores will make them more young-generation friendly and more interested and inclined to visit or buy into a pharmacy (physical or online one) products or services.

Prevention, as just mentioned, will be a crucial trend to be thorough and analyzed. This vast market comprehends several different services and opportunities to be provided to clients.

“Clients” is the keyword that evidences the paradigm shift of the future pharmacy, which will sight to displace the word patients. Limiting the business only to a niche market ²² cannot be considered a wise choice.

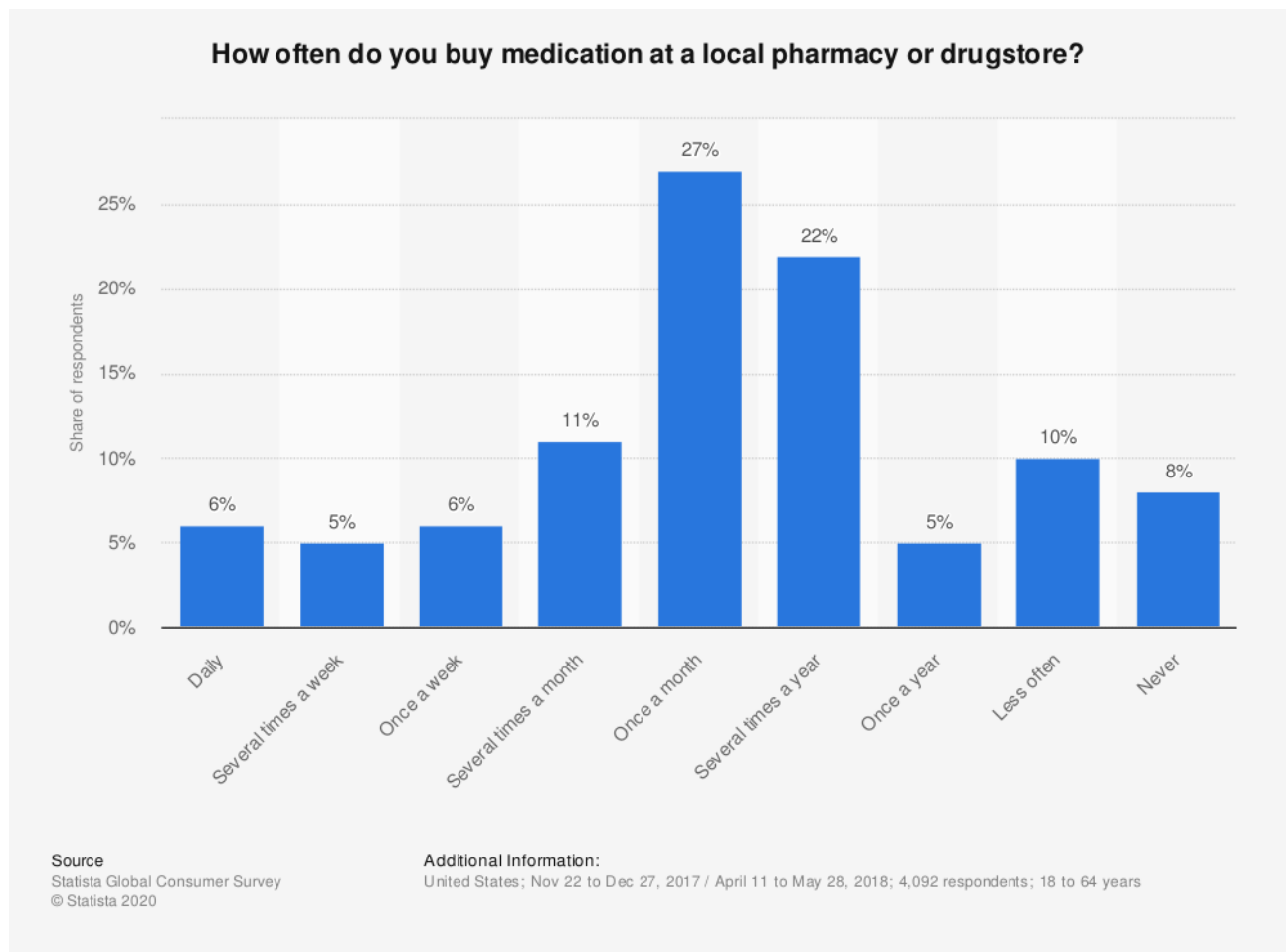


Table 8

Frequency of medication purchase in the U.S. 2018 Consumer | Statista. (2021).
 from <https://www.statista.com/forecasts/805803/frequency-of-medication-purchase-at-a-pharmacy-or-drugstore-in-the-us>

²² represented by people already suffering for an illness/injury/pathology

As it can be seen from the graph above, 45% of people are not to be considered patients, but clients, since they buy drugs in local stores less than once a month, and in particular 18% less than once a year. Including this extremely relevant part of the market could be vital in expanding pharmacies and raising revenues by a relevant margin. The real issue is reaching and engaging the remaining part of the market, by targeting and positioning.

Not considering the 8% that refers to people that do not buy in local pharmacies²³, it remains to consider a 37% of the potential market that does not buy drugs with a regular base.

The only way to attract this enormous slice is to offer something different, in order to convince who is healthy to go into a pharmacy. Prevention services will attempt that.

Those services could vary from checks-up (in store, or in affiliated clinics), to personalized diets²⁴ and health insurances.

The first category is represented by all the services relatives to monitoring client's health constantly, with periodic checks-up studied and defined with specialists. Many simple analysis will be implemented in-store, while for more complex and sophisticated exams pharmacy will address clients to affiliated clinics. What will differ from the past, and from the already available services will be the implementation of them. Pharmacists will have a "new" role of health consultant, or care concierge. In this sense, they will suggest patients with are useful analysis to do, relying on data such as age, previous pathologies and family's clinical history. In this way clients would never have to worry anymore about scheduling, planning and searching were to do coming from exams and check-ups, since it will be your trusted pharmacist to suggest that for you. All the data coming from those analyses could be stored in pharmacy cloud services under strong encryption, and hopefully managed with blockchain technology as it will be analyzed in following chapters.

The second category of products will comprehend all the services inherent to the lifestyle, offering a bunch of opportunities devoted to living healthier every day. Some examples will be the creation of personalized diets that better fit everyone: from a sportsman, to a pregnant woman or who just desires to lose weight. According to data will be also possible to find the necessary vitamins, that are difficult to implement just with a diet, and need to be integrated. In a little more distant future it would be possible to customize also medicines, and doses to perfectly fit every single person.

²³ and realistically that use to buy in online drugstores instead a local one.

²⁴ thanks to the amount of data stored in digital medical records

In the next paragraphs I will also show how such an implementation could be feasible thanks to DNA tests, and other data sources.

The third category will offer services fundamental to loyal clients: for the customer there will be the opportunity to buy different packages options, with monthly/ yearly subscription that will comprehend the selected services of the brand new pharmacy. For instance ,it will be possible for an athlete to buy a year-long diet assistance, that comprises integration with vitamins, blood analysis twice a year, and a certificate of fitness once a year; for a chronic patient, differently, it could be useful to get a package that could comprehend hallmarks such as a 24/7 assistance online with telemedicine services, a bunch of exams that could be helpful to monitor the progress of the illness or treatment. Those packages could be created by pharmacies themselves, or it could be sold third parties one, the so called health insurance.

Health insurances represent a vast market, especially in the U.S, where over 65% of the population pays an average of 5470\$ per year²⁵ for a private health insurance.

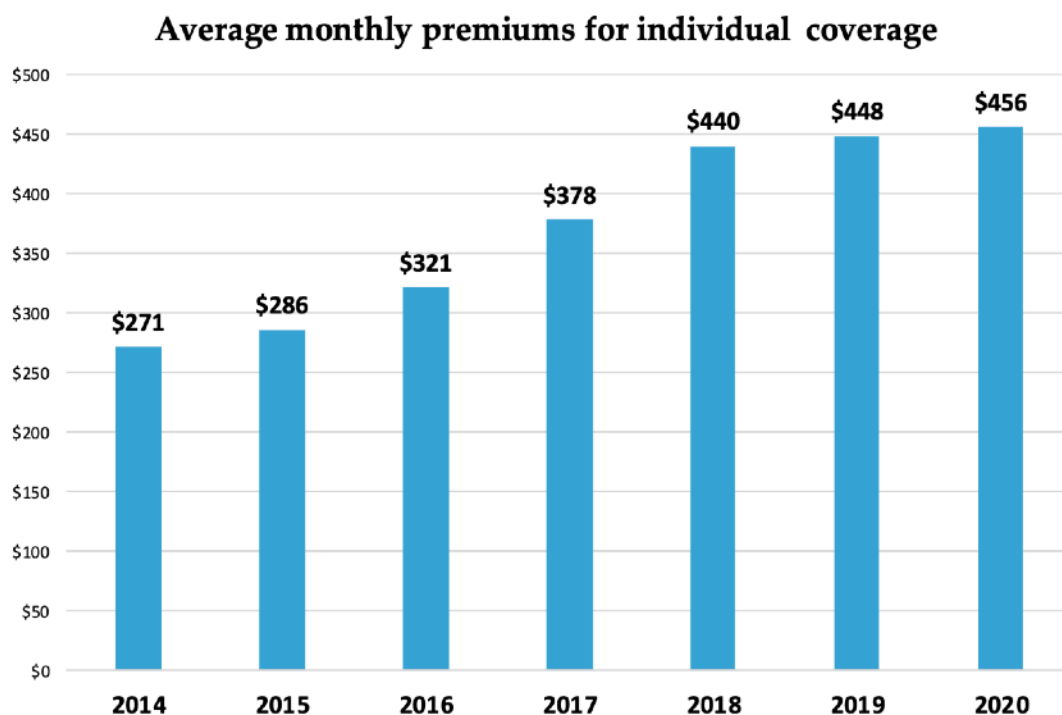


Table 9

https://news.ehealthinsurance.com/_ir/68/20205_eHealth_2020_ACA_Index_Report_Unsubsidized_Consumers.pdf

²⁵ https://news.ehealthinsurance.com/_ir/68/20205_eHealth_2020_ACA_Index_Report_Unsubsidized_Consumers.pdf

<https://www.valuepenguin.com/average-cost-of-health-insurance#average>

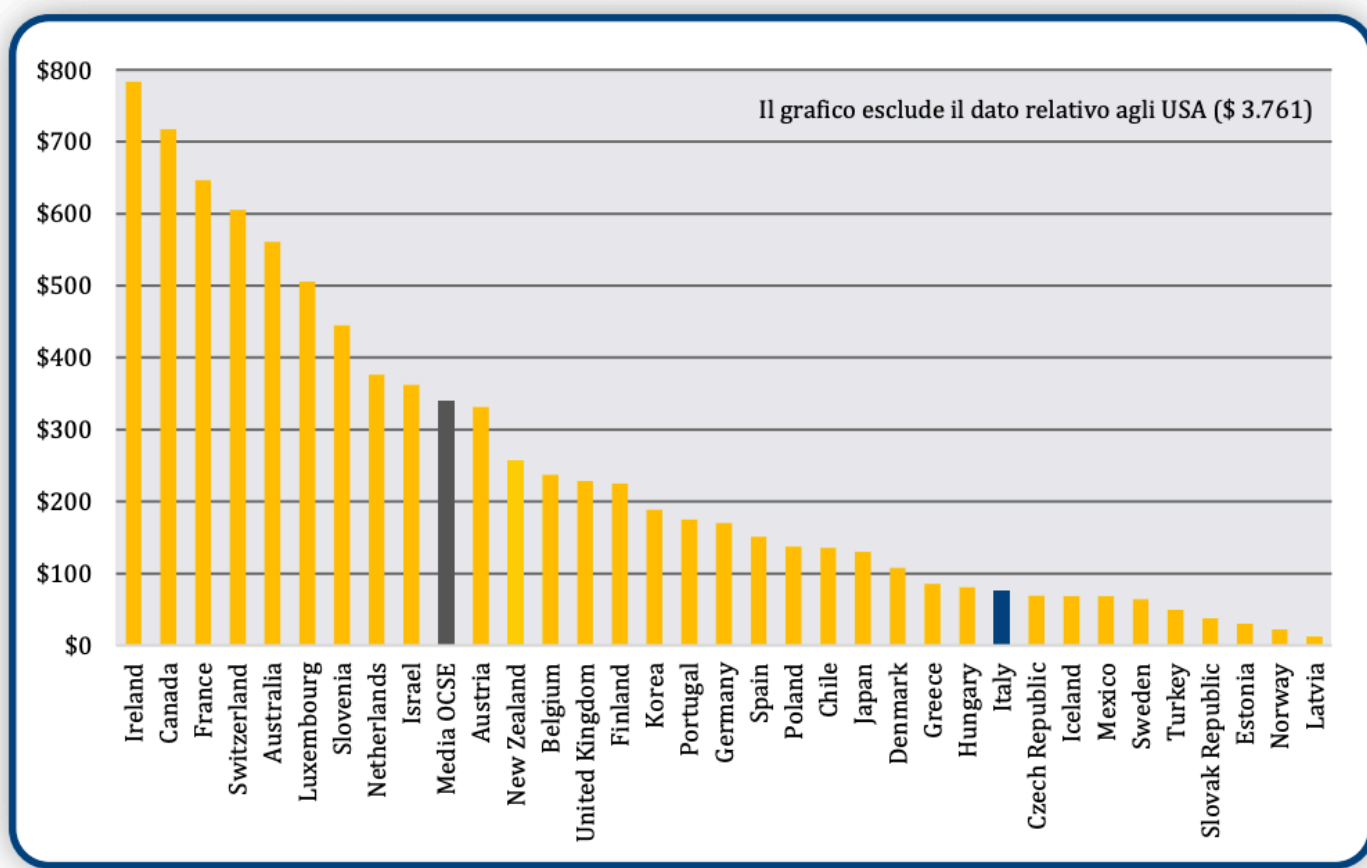


Table 10

Nino Cartabellotta, Roberto Luceri, Elena Cottafava, Marco Mosti, Fondazione GIMBE. *La sanità integrativa*. Bologna, January 2019
www.gimbe.org/sanita-integrativa

As it can be seen from the graph above, Italy has an average private intermediated expense in healthcare of 76\$²⁶.

According to CENSIS²⁷, 19,6 million people (around 32% of the Italian population) spend out of pocket for essential services prescribed by the doctor, despite public health comprehensive coverage²⁸, with an average expense of 1.437 euro for family. The substantial discrepancy between intermediate expense, and out of pocket one, revealed the immense opportunity of growth for those services in the future. In particular there is the proof that the addressable market is vast, while the

²⁶ Nino Cartabellotta, Roberto Luceri, Elena Cottafava, Marco Mosti, Fondazione GIMBE. *La sanità integrativa*. Bologna, January 2019
www.gimbe.org/sanita-integrativa

²⁷ Centro Studi Investimenti Sociali

²⁸ <https://www.censis.it/welfare-e-salute/sanit%C3%A0-196-milioni-di-italiani-costretti-pagare-di-tasca-propria-ottenere>

penetrated one is still relatively marginal. Also, the unfortunate sanitary moment we all are facing, can definitely drive more people in understanding the importance of our own health, and the cruciality of having certainties about it. New pharmacies packs, or provided insurances could provide those specific needs in the best possible way.

Implementing the opportunity to sell specific packs could be difficult for small-medium drugstores, because of the economic and structural effort necessary to create an efficient service.

On the other, hand selling third parties insurance would not need many implementation or initial cost, but still offering a substantial possible economic return because of the unexploited market and advantageous commission of third parties insurance companies.

The creation of a unique and complete hub exclusively devoted to health and well-being will be able to cuddle a vast amount of clients, according to the personalization and flexibility of services and packs offered, spanning all the different niches of the population.

The new market would be able to supersede the traditional pharmacy, leading to the creation of services based pharmacies, in which the actual sales of drugs will have a steady decrease in importance.

However the innovation of pharmacies, aimed to become a service-based hub for healthcare and lifestyle has to comprehend also a technological improvement to make most of the new services offered effective and efficient. Technological improvement, which could have been seen as an enemy in the first part of the analysis, because of online pharmacies, has just turned in the best and essential key able to open the door to the future of drugstores.

Theranos Study Case:

THE IDEA

The first significant project that was attempting to haunt digital health was Theranos, ideated and founded by Elizabeth Holmes.

The idea of discovering a totally new way to see, and idealize the health system as a whole, actually drove Elizabeth Holmes in her entrepreneurial trip. She described a world in which drugs would be minutely tailored to individuals thanks to Theranos's blood-monitoring technology. The idea had such a massive resonance that in few years made the founder of Theranos the youngest and wealthiest self-made female billionaire in America, based on a \$9-billion valuation of Theranos by the end of 2014²⁹. Theranos was an innovative company with the aim to revolutionize traditional blood analysis, considered by its founder to be inefficient and innovation lacking.

Everything started in 2002 when Stanford's student Elizabeth Holmes had an internship at the genome institute in Singapore. During her experience, she had to work with the old system to find specimens from patients. The experience shocked the ambitious Holmes, who, driven by her fear of needles, was confident that a better way to diagnose patients.

In 2003, she left Stanford and founded "*Real-time cures*", the company that would have turned in Theranos as the outcome of the mixture of words "therapy" and "diagnosis".

Determination and courage were such distinctive characteristics in Holmes that she was able to convince everyone of the quality of her idea: the business model was based on the ground that blood tests could have been run with only a finger pinprick a small amount of blood required, avoiding large syringes used by traditional labs³⁰.

Holmes also argued that tests would have been able to detect medical conditions like cancer and high cholesterol³¹, and that its technology would be able to analyze over 100 tests all within minutes³². The time showed that the idea, even if already implemented in many drugstores, was very far from reality.

²⁹ <https://www.forbes.com/profile/elizabeth-holmes/?sh=1b26949147a7>

³⁰ John Carreyrou, October 2015, "Hot Startup Theranos Has Struggled With Its Blood-Test Technology". The Wall Street Journal
<https://www.wsj.com/articles/theranos-has-struggled-with-blood-tests-1444881901>

³¹ John Carreyrou, October 2015, "Hot Startup Theranos Has Struggled With Its Blood-Test Technology". The Wall Street Journal
<https://www.wsj.com/articles/theranos-has-struggled-with-blood-tests-1444881901>

³² that makes Theranos ideal for drugstores

THE TRUTH BEHIND THERANOS

On October 15 2015 started the very steep decline of Theranos: a Wall Street Journal's report unveiled the truth behind the, so far, successful company.

First of all, Edison³³, the machine that should have needed a single drop of blood, did not work correctly, and it did account only for 10 % of the over 240 promised tests. The over 200 tests left had been done with "traditional and old" machines in two different ways.

About 80 tests were conducted starting from a drop of blood diluted with a "special" dilution method, that had been relieved to be unreliable ³⁴.

Same Patient, Different Results

For one Arizona woman, Theranos found abnormally high levels for six tests. Hospital tests two days later were normal. Theranos says variation across labs is commonplace and can be caused by medicines and diet.

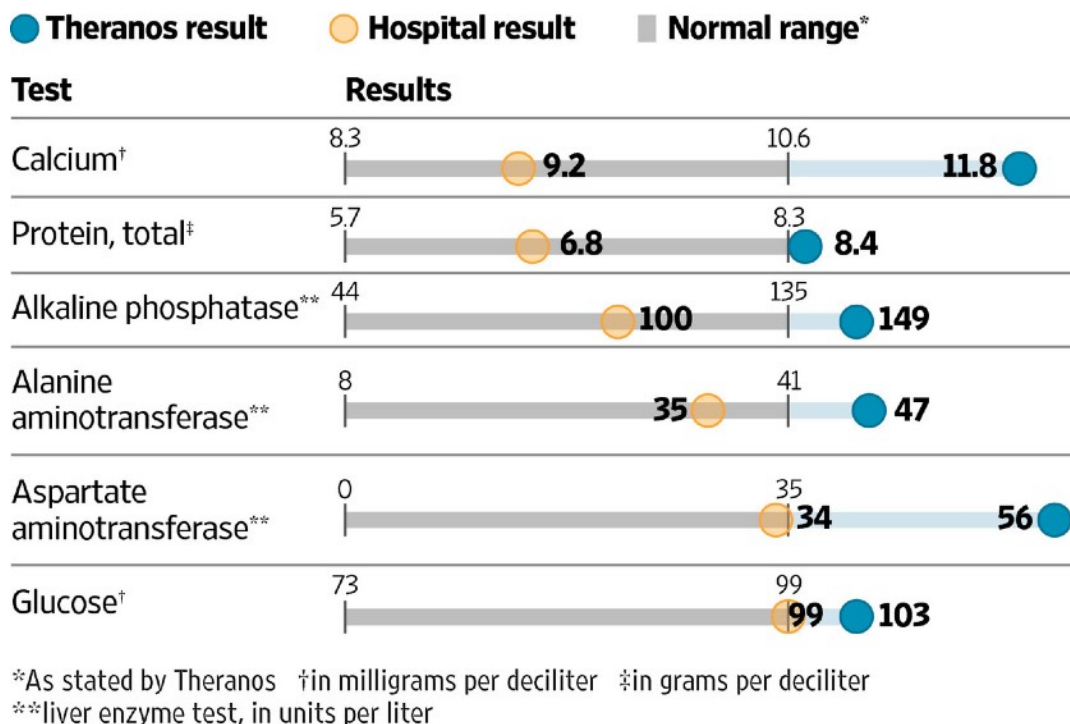


Table 11

Carreyrou, J. (2021). *Hot Startup Theranos Has Struggled With Its Blood-Test Technology*.

from <https://www.wsj.com/articles/theranos-has-struggled-with-blood-tests-1444881901>

³³ The machine called Edison, took inspiration by the homonym inventor, famous for the creation of the electric bulb in 1878. Edison Machine was a desktop-printer-sized blood tester that purported to quickly perform hundreds of scans on a micro-dose of blood, and was the basis of Theranos project as a whole.

³⁴ Some of the potassium results at Theranos, for example, were so high that patients would have to be dead for the results to be correct, according to one former employee.

The remaining 130 tests were made with the aid of the previously condemning long needles. Elizabeth Holmes was able to hide and mask all the critiques from the scientific community arisen since the actual tests were commercialized, and she actually tried to kill the new revelation from the WSJ, trying to convince Rupert Murdoch and his media empire ³⁵. He promptly declined the offer. The release of the article became the beginning of a storm for Theranos very quickly. Some months later, in January 2016, the Centers for Medicare and Medicaid Services, which used to regulate Theranos, said that the company's blood tests "pose immediate jeopardy to patient health and safety." ³⁶

Moreover, in June, Forbes estimates Elizabeth Holmes worth close to 0, from over 4,5 billion that she achieved in June 2014, when she became the richest woman that did non inherit her own worth. Precisely two years were remarkably enough to dissipate one of the 400 wealthiest people's worth. The company, tried to run out of the deep crisis, but despite the stubbornness of its founder, Theranos finally shouted down on September 4, 2018, where it was announced by email to investors that its operations would have been ceased, and that its assets and remaining cash to creditors after all efforts to find a buyer did come to zero³⁷.

³⁵Tom Huddleston Jr.; Mar 2019. "6 of the most fascinating revelations from 'Bad Blood' on Theranos debacle and Elizabeth Holmes". CNBC

<https://www.cnbc.com/2018/05/22/stories-from-bad-blood-book-on-theranos-and-elizabeth-holmes.html>

³⁶ Herper, M. (2021). Bad Blood: The Decline And Fall Of Elizabeth Holmes And Theranos. Retrieved 22 September 2021,

<https://www.forbes.com/sites/matthewherper/2016/10/08/bad-blood-the-decline-and-fall-of-elizabeth-holmes-and-theranos/?sh=482505a4c335>

³⁷ <https://en.wikipedia.org/wiki/Theranos>

THE UNICORN

The crucial part of the company's history has been determined by the research of funds from investors, from the birth of the company, to the last day of its life. Financial allowed the company to reach the value of over 10 billion between 2013 and 2014 ³⁸, and a comprehensive financing of over 1.4 billions. ³⁹Financing of Theranos can be divided clearly into two different stages: one comprehends pre-seed, series alb and c investment, and on the other hand, more consistent investors that invested. The first part of Elizabeth Holmes's search for funding started with what can be considered pre-seed financing: it started in 2003, when the ambitious entrepreneur left Stanford University to follow her innovative business ideas⁴⁰. By 2004 she had some money successfully from Tim Draper, the father of her childhood friend and former neighbor, and Victor Palmieri, one of her father's long-time friends, in pre-seed financing worth more than five hundred thousand dollars⁴¹. At the end of 2004, thanks to the series A financing worth almost 6 million dollars, its business's evaluation was about 30 million dollars. The most relevant investor in that phase was Rupert Murdoch, owner of the world-famous News Corporation and Sky. Series B funding allows the company to raise another 9.1M dollar by February 11 2006 with ATA Venture as the most relevant investor. Series C financing, about one year later enhanced Elizabeth Holmes to get in the company four more investors, which took other 28.5 Millions Dollars. As Theranos started to rake conspicuous amounts of funding, the founder became the subject of media attention and interest in the tech world. She graced the covers of Fortune and Forbes, gave a TED Talk, and spoke on panels with Bill Clinton and Alibaba's Jack Ma⁴². The most conspicuous investments started in 2010, where the company was able to reach 45 Million Dollars from a Venture Rounds, 50 million from

³⁸ <https://en.wikipedia.org/wiki/Theranos>

³⁹ https://www.crunchbase.com/funding_round/theranos-series-b--007595ee

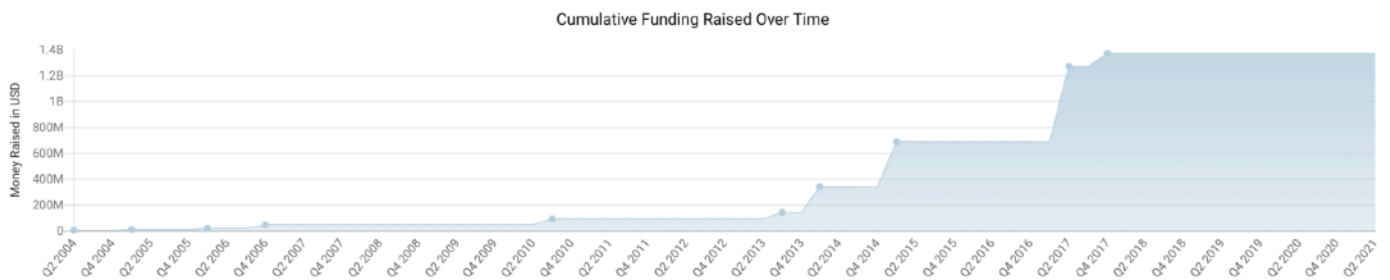
⁴⁰ L.Ramsey Pflanzner, D. Radovanovic. (2021) "The rise, fall, and pivot of Theranos, in one graphic". Retrieved 22 September 2021, from <https://www.businessinsider.com/timeline-of-theranos-controversy-2016-10?IR=T>

⁴¹L.Ramsey Pflanzner. (April 2019)."The rise and fall of Theranos, the blood-testing startup that went from Silicon Valley darling to facing fraud charges". Retrieved 22 September 2021, from <https://www.businessinsider.com/the-history-of-silicon-valley-unicorn-theranos-and-ceo-elizabeth-holmes-2018-5?IR=T#in-order-to-raise-initial-funding-holmes-leveraged-several-family-connections-the-first-two-investors-in-theranos-were-tim-draper-the-father-of-her-childhood-friend-and-former-neighbor-and-victor-palmieri-one-of-her-fathers-long-time-friends-by-the-end-of-2004-holmes-had-raised-nearly-6-million-4>

⁴² Nast, C. (2016) "Exclusive: How Elizabeth Holmes's House of Cards Came Tumbling Down." Retrieved 22 September 2021, from <https://www.vanityfair.com/news/2016/09/elizabeth-holmes-theranos-exclusive>

Walgreens in 2013, almost 550 million from 2014 and 2015 in a private equity round, and finally, almost 700 million dollars from the secondary market and debt financing in 2017⁴³.

That stage of financings allowed Theranos to achieve a total of 1,4 Billion investment, and comprehended many influent names such as Larry Ellison, founders of Oracle ⁴⁴, the Waltons, founders of Walmart, with \$150 million⁴⁵, and Carlos Slim that put in about \$30 million⁴⁶.



Announced Date	Transaction Name	Number of Investors	Money Raised	Lead Investors
Dec 23, 2017	Debt Financing - Theranos	1	\$100M	Fortress Investment Group
May 25, 2017	Secondary Market - Theranos	1	\$582.2M	—
Mar 1, 2015	Private Equity Round - Theranos	8	\$348.5M	—
Feb 1, 2014	Private Equity Round - Theranos	—	\$198.9M	—
Sep 9, 2013	Funding Round - Theranos	1	\$50M	Walgreens
Jul 8, 2010	Venture Round - Theranos	—	\$45M	—
Nov 17, 2006	Series C - Theranos	4	\$28.5M	—
Feb 21, 2006	Series B - Theranos	1	\$9.1M	ATA Ventures
Feb 11, 2005	Series A - Theranos	1	\$5.8M	Rupert Murdoch
Jun 15, 2004	Seed Round - Theranos	1	\$500K	Threshold

Table 12

https://www.crunchbase.com/funding_round/theranos-series-b--007595ee

⁴³ https://www.crunchbase.com/funding_round/theranos-series-b--007595ee

⁴⁴ The fable of the unicorn. (2015). Retrieved 22 September 2021, from <https://www.economist.com/business/2015/10/31/the-fable-of-the-unicorn>

⁴⁵ Sheetz, M. (2018) “Secretary DeVos, Walmart heirs and other investors reportedly lost over \$600 million on Theranos” <https://www.cnn.com/2018/05/04/theranos-devos-other-investors-reportedly-lost-over-600-million.html>

⁴⁶ <https://www.nytimes.com/2018/05/04/health/theranos-investors-murdoch-devos-walmart.html>

Analyzing the fraud from a future perspective, some questions will probably come to mind: How could experienced companies invest and put their money into a company with no data about it? How could an idea with no solid scientific fundamentals rise 1.4 billion dollars?

According to Michael Greeley, General Partner of Flare Capital Partners in Boston, Theranos's later stage investors seemed to have been too superficial in their due diligence and were swayed by the emotional draw of Theranos's mission to democratize blood-testing coupled with CEO Elizabeth Holmes's celebrity status to keep making regular investments. According to John Carreyrou, "she could cast a spell on people and to really get them excited and enamored with the vision that she was articulating to the point where they forget to ask if she would ever be able to do that⁴⁷. Though those are not the only reasons.

⁴⁷ as he declared in an interview to CBC

<https://www.cbc.ca/radio/asithappens/as-it-happens-monday-full-episode-1.4671937/new-book-documents-the-rise-and-fall-of-silicon-valley-wunderkind-elizabeth-holmes-1.4671941>

A GLIMPSE OF THE FUTURE

Investors' perception was to be financing the future of pharma; a too fascinating opportunity to be wasted. In 2004, when Theranos was founded, investors were already aware that the future of drugstores would have passed by fast, reliable and affordable analysis. The ability of Elizabeth Holmes was basically to understand trends and create the product that would have been able to cover the lack in the market.

Since she was a child, she has been profoundly inspired by Steve Jobs; or obsessed by him, as John Carreyrou writes.

While people closed, and who actually worked with her found her worshipping in the intonation of her voice, in style (the iconic black turtleneck), investors found a similarity in attitude and in the approach. She was found to say that Theranos was the iPod of Health Care to demonstrate her devotion to Steve Jobs and his model⁴⁸. Apple's founder succeeds in creating a variety of products during his career, and most of them had been able to revolutionize the tech market as a whole: it is easy to verify the impact of the first macOS, or iPod, iPhone, and Ipad. Since their release, the world has never been the same. His strength was to understand the need of customers before they actually knew⁴⁹,and in this, the founder of Theranos wanted to succeed.

Investors were persuaded by Holmes, her attitude and willfulness, driven by a strong feeling that health care as a whole would have been changed by Theranos, as Jobs did in the previous years in the tech sector. A vision of the future was very ambitious and complicated to accomplish, but she managed to make it consistent, solid, and credible. The lack of transparency in Theranos and the ability of Holmes to hide the discrepancy between an idea and a reliable product, did not allow investors to recognize what they were actually dealing with.

However, the opportunity was gluttonous, and the possible benefits of being part of the future far overcame the risks. Though, the risk took was more extensive than expected, and the only return was a mere glimpse of the future.

⁴⁸ Tom Huddleston Jr.; (2019). "6 of the most fascinating revelations from 'Bad Blood' on Theranos debacle and Elizabeth Holmes". CNBC

<https://www.cnbc.com/2018/05/22/stories-from-bad-blood-book-on-theranos-and-elizabeth-holmes.html>

⁴⁹ Some people say, "Give the customers what they want." But that's not my approach. Our job is to figure out what they're going to want before they do. I think Henry Ford once said, "If I'd asked customers what they wanted, they would have told me, 'A faster horse!'" People don't know what they want until you show it to them. That's why I never rely on market research. Our task is to read things that are not yet on the page."

A right and innovative vision of the future, the idea of how to implement it, and the ability to sell it, without the actual technology enabling a said process, will only create a giant bubble. And that was what has happened.

Despite the failure of Holmes's project, there are some hints to be considered: maybe that was not the right time, or probably that was not the right company on which to rely, but the idea was genial. So genial that it actually created an even more significant gap in the health market, than the one she just tried to fill with Theranos.

One of the emotions-driven investors was Walgreens Boots Alliance, the most significant pharmaceutical retail business⁵⁰. Holmes, her attitude and willfulness persuaded investors and drove Walgreens not to limit itself in investing in the new revolutionary Holmes's company, but also in implementing the brand new machine ideated by Theranos in over 40 pilot centers in Arizona to open many more. The overall commitment in Theranos counted about 140 million dollars.⁵¹ In 2010 yet, Walgreens saw the blood-testing company as the first step of its efforts to help meet patients' needs for greater access to affordable health care⁵², not only to buy the actual drugs, but also to provide services that do not necessitate people to go in the hospital or to the doctor's office. Their idea did not have the expected result, due to Theranos's lack of accuracy, but despite the tremendous and ruinous first attempt, Walgreens started a vital partnership with LabCorp, a blood-test laboratory, with the same aim. The gap in the market had become too big to be ignored.

On LabCorp's official website, on June 28, 2017, appeared the announcement of the imminent collaboration between the two companies:

"This agreement brings together Walgreens' trusted pharmacy and community health care services with LabCorp's long-standing reputation for innovation and quality in diagnostic laboratory testing," said Alex Gourlay, Walgreens Boots Alliance, Inc. president, and co-chief operating officer. "We look forward to bringing affordable and accessible health care to the communities we serve."

⁵⁰ in terms of profit

⁵¹ Sweeney, B (2018). "Walgreens partners with a new blood-testing firm". Retrieved 22 September 2021, from <https://www.modernhealthcare.com/article/20181011/NEWS/181019973/walgreens-partners-with-a-new-blood-testing-firm>

⁵² <https://news.walgreens.com/press-center/news/walgreens-and-labcorp-collaborate-to-bring-patient-service-centers-for-laboratory-testing-to-select-walgreens-stores.htm>

"I cannot imagine a better partner than Walgreens to bring LabCorp closer to consumers in locations where they are already accessing high-quality health care services," said David P. King, LabCorp's chairman and CEO. "The customer-centric culture and nationwide footprint of Walgreens are a perfect match for LabCorp and the patients we serve. This significant collaboration will enhance LabCorp's patient engagement in key markets across the country and offer increased access to LabCorp's broad range of laboratory services as we execute our mission to improve health and lives."⁵³

Walgreens just showed how important are those analysis for their present, as well as it would be in the future. As crucial that they chose to take a step back, and implement "traditional" analysis, instead waiting for new technologies and a new and, this time, reliable Theranos alike startup. Theranos has been just more than a fraud, and just more than an idea.

⁵³ <https://ir.labcorp.com/news-releases/news-release-details/walgreens-and-labcorp-collaborate-bring-patient-service-centers>

Pharmacogenomics

Pharmacogenomics is a relatively new trend that will be every year more effective and common in the healthcare sector as a whole.

The innovation in the traditional analysis that people were looking for when invested in Theranos could be found in that advanced branch of healthcare.

Pharmacogenomics, which sometimes is also called pharmacogenetics, is the field of science that studies how a person's genes affect how he or she responds to medications⁵⁴. The basis on which this new branch relies is the knowledge and analysis of every singular person's DNA. The idea that everyone's DNA could have been read started in 1990 with the National Human Genome project. From there on the project has been hailed as an important milestone in the history of science⁵⁵ and in the history of humanity; a project whose completion would not only 'transform the practice of medicine but also change forever the course of human history'⁵⁶. Until NHG has born, the study of DNA did stop its development in understanding the structure of it. The subsequent step and attempt were to read and decipher the code embedded in it. In 1998 yet, only 4% of the code had been discovered. In just 5 years the team led by Francis Collins achieved the result: 99,99% of the DNA code had been encrypted. Being able to do so was an enormous investment in terms of money and time. It has been declared that the Human Genome project costed over 2,7 billion⁵⁷. According to National Human Genome Research

Institute the cost of a complete genome encryption was calculated above 100.000.000 dollars in 2001. The technological progress was impressive, and following a curve even steeper the Moore's Law suggests, become 1/10 of the initial price in 2006, and has reached the 1000\$ level at the end of 2018, being affordable and accessible for the largest of the population worldwide⁵⁸.

⁵⁴ <https://www.nigms.nih.gov/education/fact-sheets/Pages/pharmacogenomics.aspx>

⁵⁵ Zwart, Hub. (2015). Human Genome Project: History and Assessment. 10.1016/B978-0-08-097086-8.82036-X.

⁵⁶ Davies, Kevin, 2001/2002. Cracking the Genome. Inside the Race to Unlock Human DNA. John Hopkins University Press, Baltimore and London.

⁵⁷ [https://en.wikipedia.org/wiki/\\$1,000_genome](https://en.wikipedia.org/wiki/$1,000_genome)

⁵⁸ The "\$1,000 genome" has become shorthand for the promise of DNA-sequencing capability made so affordable that individuals might think the once-in-a-lifetime expenditure to have a full personal genome sequence read to a disk for doctors to reference is worthwhile.

Church, G. M. (2006). "Genomes for all". *Scientific American*. 294 (1): 46–54. doi:10.1038/scientificamerican0106-46. PMID 16468433.

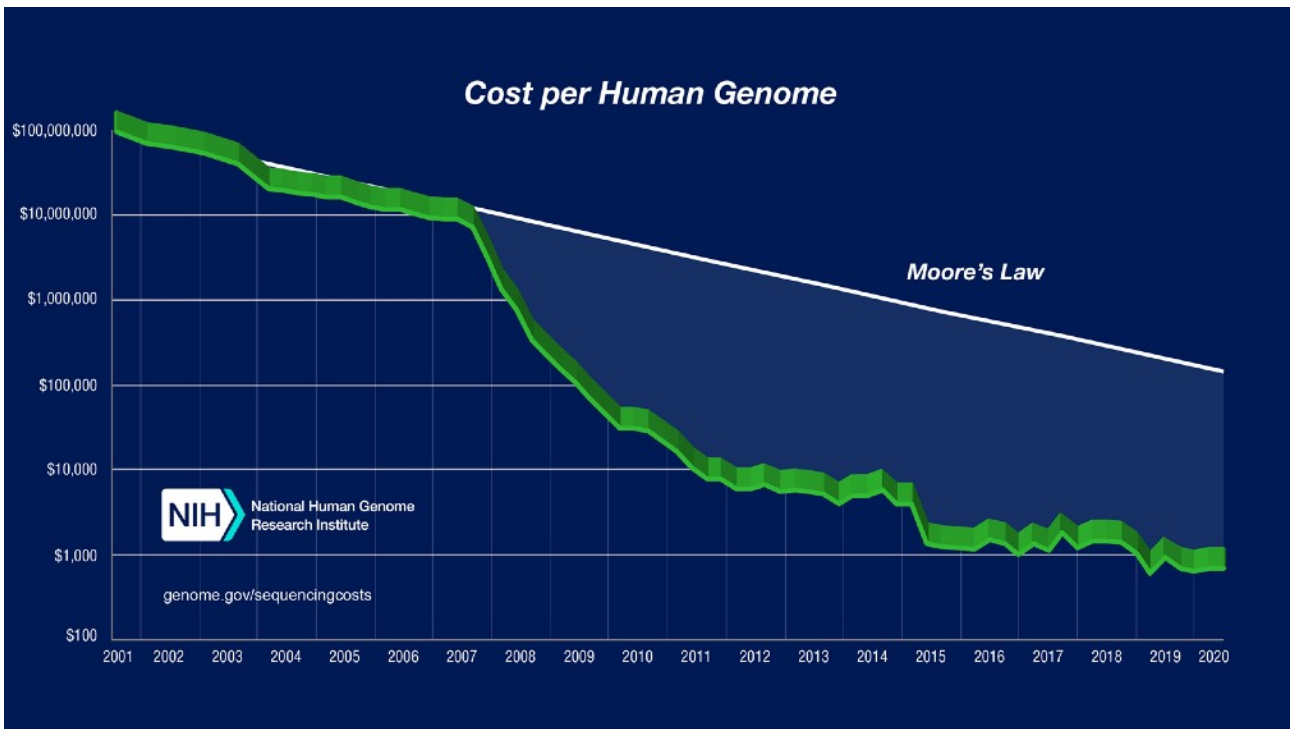


Table 13
<http://genome.gov/sequencingcosts/>

THE ACTUAL STAGE OF DNA TESTS

In nowadays, genomic tests have become far more affordable than some years ago. The technological progress allowed companies to sell their genetic test for about 300 dollars⁵⁹, and get all the information you actually need to know. Many companies entered in this innovative market due to the long term perspective and predictions of the sector, expected to grow exponentially, as the same pace of technological development, especially in the U.S.

One of the most interesting projects in Italy is represented by Netgenomics. The company started its activity in 2019, and in just few years became one of the more relevant players in the Italian market for predictive tests. The company already provide a variety of different products that space from beauty, nutrition performance and clotting⁶⁰, where every test has a determined focus. At the actual stage in Italy but also worldwide predictive tests are more common and sold if compared to diagnostic tests. The difference between them is that a predictive one does not analyze the so-called "pathogenetic variants", the factors undoubtedly associated with a pathological condition, and for this reason it is not intended to diagnose a pathology already in progress. Though, diagnostic tests are applied to people suffering from some pathology, often transmitted with the mendelian or straightforward inheritance model or to dysmorphism caused by a chromosomal or genomic pathology and are used to confirm a clinical suspicion or to help the clinician in a diagnosis.

⁵⁹ the price of a genetic test differs from the price of an entire human genome sequencing, since it will sequence only a fraction of the whole genome.

⁶⁰ that will be released soon on the website.

FUTURE PERSPECTIVE

The long-term goal is to assist doctors in selecting the drugs and doses best suited for each person. It is part of the field of precision medicine, which aims to treat each patient individually⁶¹.

Netgenomics, in this sense, is very confident of a future founded on customization based on clinical trials and genome's analysis, to guarantee an integrated personal approach; but this is only a part of their vision. Netgenomics indeed, views the customer at the center of a long term project based of the 4P medicine⁶² founded not only in customization but also on Predictions, Prevention and Activeness. Prediction medicine will be able to calculate risks factor, and possible adverse reactions after drugs assumption, analyzing the potential toxicity of medicines to our body, as well as the efficiency that a drug could have on us. Also, it will allow to establish reliable probability of the display of a said illness in advance, in order to adapt our lifestyle. Prevention has to be intended as the approach aimed to prevent illness before they hurt our body, or before they become too difficult to be cured, with the intention of allowing the patient to have a healthier life. The last part on the 4P medicine is composed of the activeness of the individual: being able to know themselves, people would be able to make wiser choices.

According to Netgenomics, customers need an important support also after they actually receive their results. In this sense the implementation of genetic tests in drug stores will lead to an infrastructure able to assist customers. Nevertheless, at the actual stage pharmacist does not consider genetic tests attractive. Rossella Baiano, operation manger in Netgenomics suggests that, at least in Italy, the problem dwells in the mentality and in the shortness of the vision of pharmacies, that probably are not able to understand the potentiality of the product. To avoid the absence of support the idea of Netgenomics is to create an AI based coach, able to help the customer in interpreting the results and understand how to improve their lifestyle according to the suggestion provided by the test.

Nevertheless, genetic tests will soon be fundamental for the future of pharmacies. The first reason is an economic one: the market for DNA testing is growing at a fast rate, and it would be a waste, not to exploit it. The global "direct-to-consumer" genomic testing market was valued at \$117 million in 2017⁶³ market size and it is expected to be more than times bigger in less than ten years by now ⁶⁴.

⁶¹ <https://www.nigms.nih.gov/education/fact-sheets/Pages/pharmacogenomics.aspx>

⁶² in Italian, personalizzata, predittiva, preventiva e partecipativa.

⁶³ <https://www.genome.gov/dna-day/15-ways/direct-to-consumer-genomic-testing>

⁶⁴https://bisresearch.com/industry-report/global-pharmacogenomics-market.html?utm_source=Statista

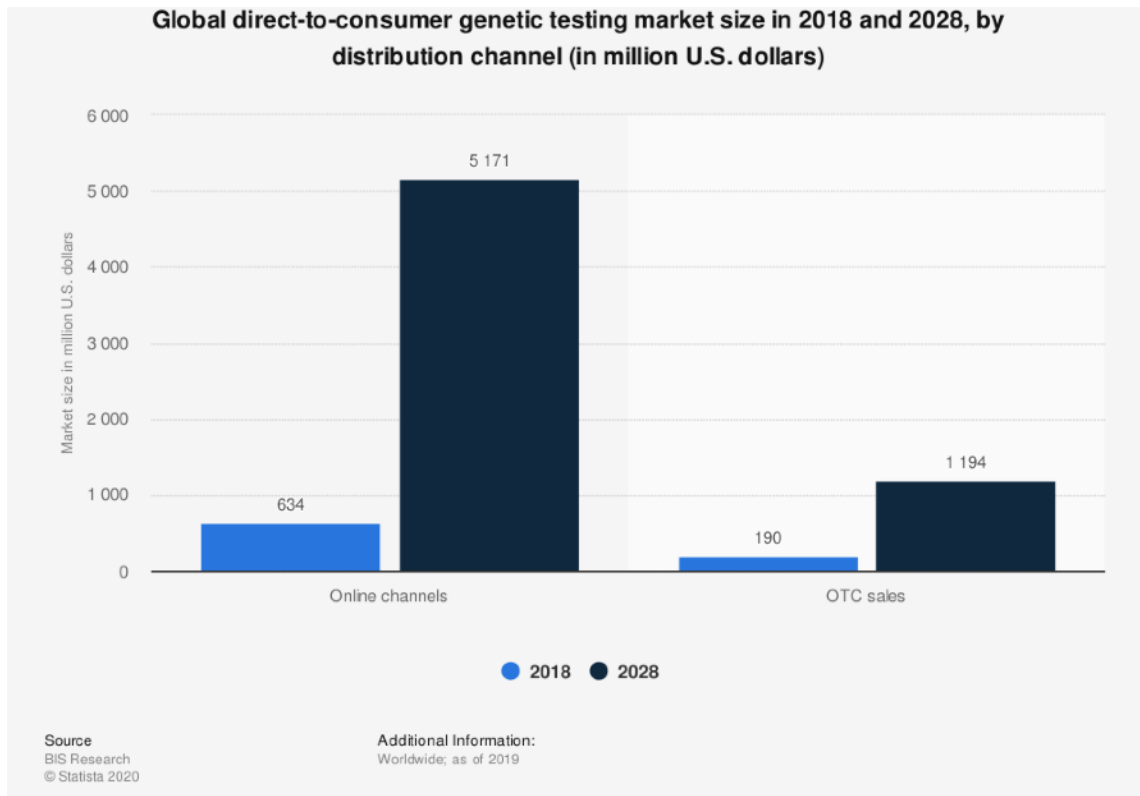


Table 14

DTC genetic testing market worldwide by channel 2028 | Statista. (2021). Retrieved 23 September 2021, from <https://www.statista.com/statistics/1045740/dtc-genetic-testing-market-value-worldwide-by-distribution-channel/>

The main issue that made pharmacy reluctant, especially in Italy, is the feeling that the product would not have been understood and appreciated. Already in the 1900s Henry Ford quoted “If I had asked people what they wanted, they would have said faster horses.”; intending that customers express their preferences based on their actual necessity, and often are probably limited in imagining the future. Pharmacies would have to have the courage to implement the new product and make people understand the importance of that.

In this way Netgenomics started an ambitious and long project with the aim to raise awareness of the topic in Italy. Even if the market is already displaying notable results in terms of sales, what makes the sector even more interesting is the unexplored potential: the reason that led customers to buy genetic tests in 2018 were for about 65% commanded by the volition to learn something more from the own family history.

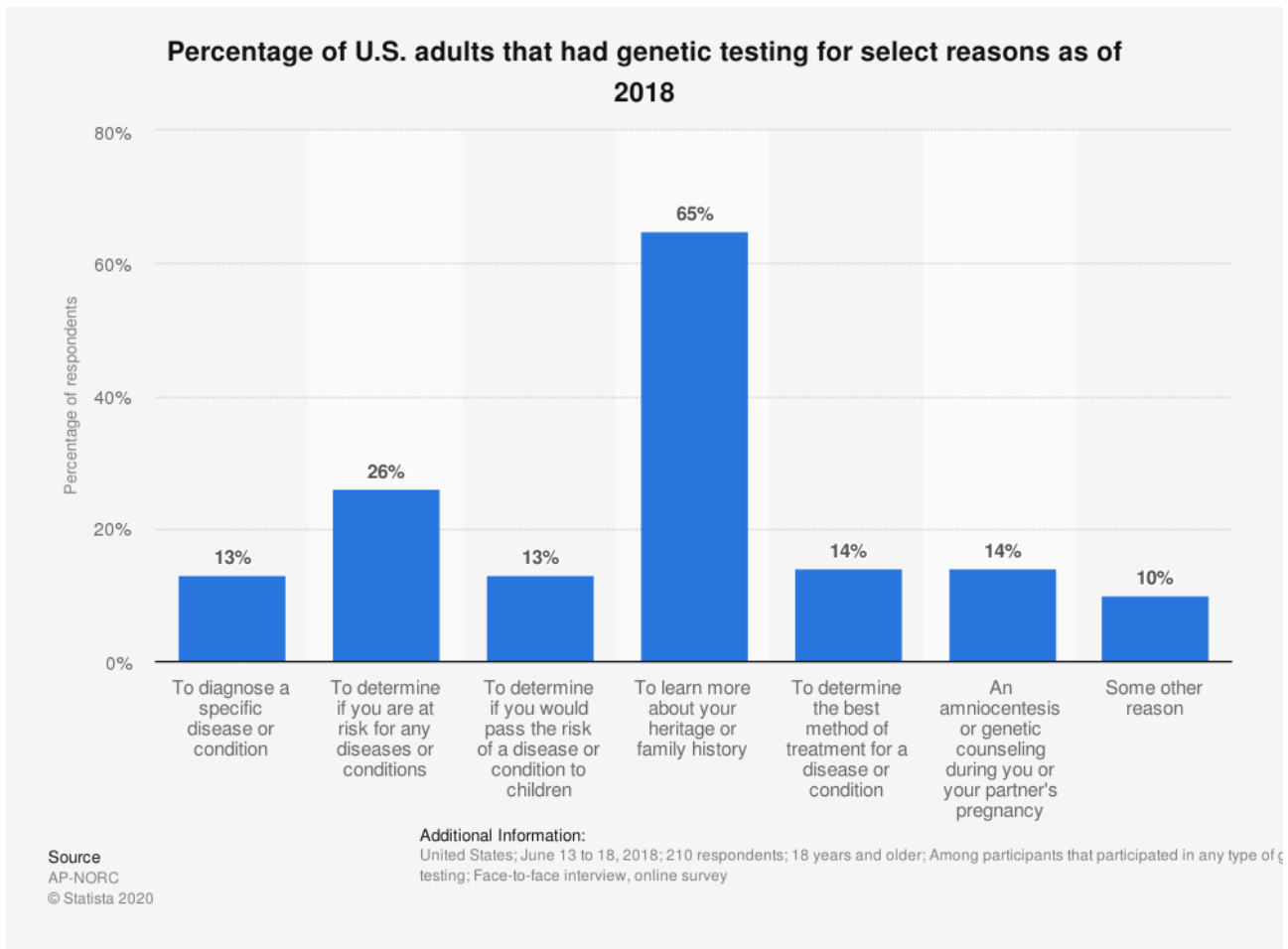


Table 15

Reasons for using genetic testing U.S. adults 2018 | Statista. (2021). Retrieved 23 September 2021, from <https://www.statista.com/statistics/944230/reasons-for-using-commercial-genetic-testing/>

That is for sure a brilliant application of DNA tests, but sort of limited if we consider how powerful and helpful this tool could be for the wellness of people. Another evidence, if it was necessary to find one, is that we are living just an embryonal stage of the future market development.

The second and most important reason is that those tests will guarantee the opportunity to know the patient in a totally new and more accurate way. Starting from DNA predictive data, it will be possible to offer customized services and products that will perfectly fit with every different person. Ignoring those tests would be like avoiding the opportunity to bring the key that can open an innumerable variety of brand new services based on the previously analyzed 4P.

Once more, having more information about the customers, will give pharmacies a substantial competitive advantage over competitors, in offering more efficient services created ad personam.

For example, the opportunity to offer customers customized vitamins, instead of generic ones can provide a great service, able to attract more people. The market for vitamins, if we take in consideration over the counter drugs sales in the U.S, is the most relevant by far, and being able to attract a good percentage of the market in the brand new pharmacy, will drive to a substantial increase in sales and relative revenues.

Leading over-the-counter product categories in the United States in 2020, based on sales (in million U.S. dollars)

Top OTC product categories in the U.S. 2020, based on sales

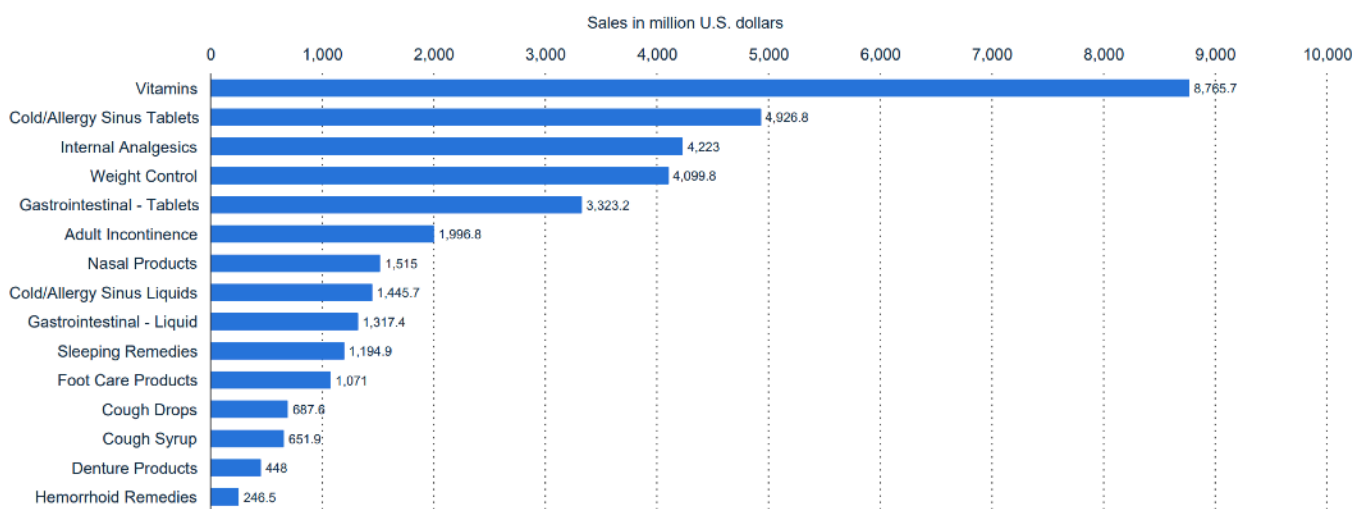


Table 16

Leading U.S. OTC product categories | Statista. (2021). Retrieved 23 September 2021, from <https://www.statista.com/statistics/807186/leading-us-over-the-counter-product-categories/>

Moreover, vitamins are subjected to a less strict regulation if compared with generic drugs, and it would lead to the opportunity to implement the customization in a minimal period of time.

There are already companies specialized in creating customized vitamins, and one of the most interesting ones is Multiplylabs. As stated on their own website they combine deep expertise in robotics and pharma, to build the robotics infrastructure⁶⁵ that will enable personalized medicine⁶⁶.

⁶⁵ the real change offered by Multiplylabs is their licensed technology that exploit the advantages of 3D printing and it applies it to the drug make.

⁶⁶ <https://multiplylabs.com/about>

If we also consider the category of diagnostic tests, pharmacies will be also able to customize therapies and help the patients to fight in the best possible way with the illness took in consideration, allowing them to enter deeply in the pharmacogenetics market: an opportunity aimed to worth over 8900 million dollars by 2028.

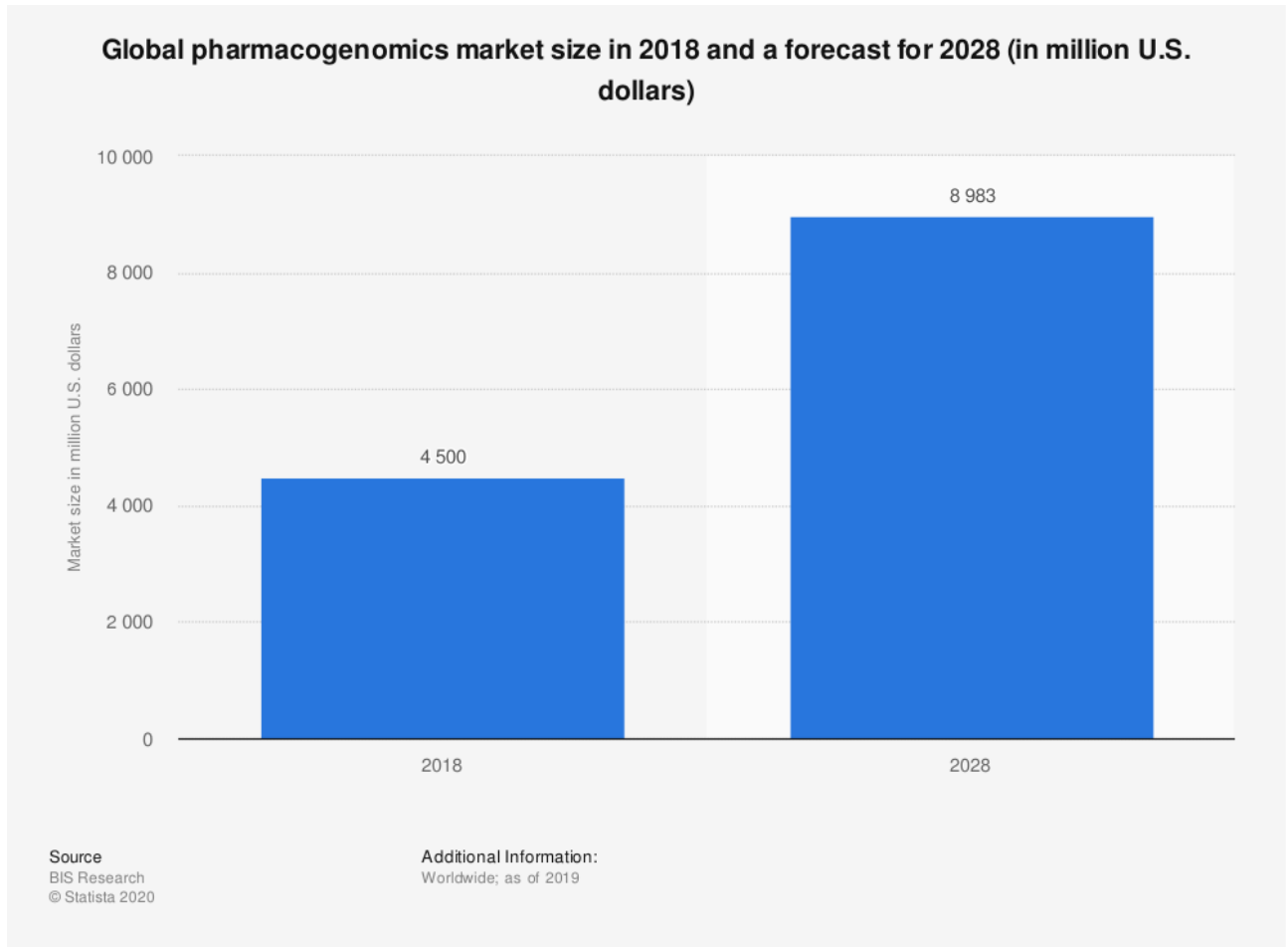


Table 17

Pharmacogenomics market worldwide 2028 forecast | Statista. (2021)

from <https://www.statista.com/statistics/1045769/pharmacogenomics-market-value-worldwide/>

Prevention, predictive medicine and healthcare analysis sectors are being under the focus of the biggest retail drugstores chains as Wallgreens, CVS and Walmart. The importance of that sector is due to the huge expansion of the potential market, making drugstores a place to go even before

experiencing an illness, but to avoid it. As analyzed previously, Walgreens ensured a collaboration with Labcorp, in order to provide blood-test inside pharmacies or in affiliated clinics as a confirmation of the expansionary aim. Also, in order to help and supporting patients (so people that are already suffering from an injury or illness), Walgreens in 2018 launched on the market the service called “ find a care now” to allow people to find in store clinic, or receiving telemedicinal support by partners such as MDlive⁶⁷ and hospital all around the U.S ⁶⁸.

There is no reason to avoid a more straightforward of DNA test, able to high the accuracy and range of generic tests, being able to provide predictive products to who is already healthy and wants to better off its own life style, and a diagnostic one to whom wants to know the better therapy to follow to recover.

As with every game changer, DNA analysis will need some time to be accepted by people, considered trustable and as important as a blood test. It will require some years from consumers point of view and seller too. The technology itself is too futuristic and innovative, to be appropriately understood in a short period of time.

The confidence in those new services, and also the knowledge, vary abundantly from region to region, due to the different social cultural context. North America, for example, owns the leadership on the market, and it is expected to maintaining it. Europe looks more resistive to those new technologies, and in Italy in particular.

⁶⁷ one of the most important company in the branch of telemedicine

⁶⁸ <https://www.mobihealthnews.com/content/walgreens-launches-find-care-now-digital-platform-connecting-customers-healthcare-providers>

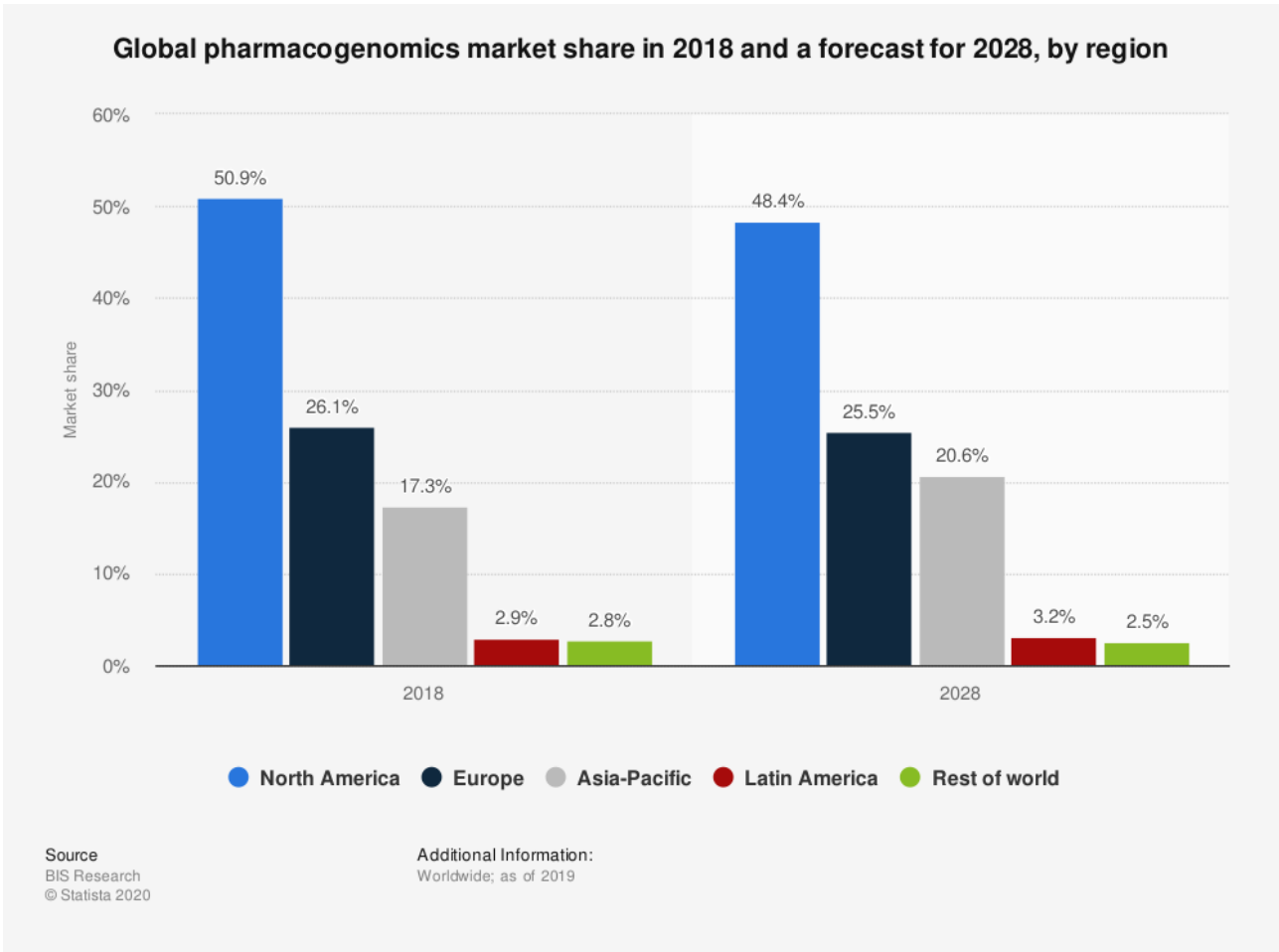


Table 18

Pharmacogenomics market worldwide 2028 forecast | Statista. (2021). Retrieved 23 September 2021, from <https://www.statista.com/statistics/1045769/pharmacogenomics-market-value-worldwide/>

It is impossible to make any prediction of the future, but in a delicate and crucial sector, as healthcare is, a powerful tool to know ourselves will be the basis of a substantial development, that could lead to a possible revolution in the sector.

The market, as has been analyzed in previous paragraphs, has been just recently created by price reduction and technological development and in less than ten years has become more and more precise and accurate, and the market itself has already started to have many players inside, as a demonstration of the strong belief on a future based on DNA tests. Drugstore will be able, then, to guarantee a number of new services based on it. Pharmacies really have the need to understand the power of the passepartout they have very handy.

Blockchain technology

A BRIEF DESCRIPTION

Blockchain technology can be defined as a database ⁶⁹ with the feature of being decentralized and distributed on a network as a chain of blocks. The previously cited blocks are the key element of this technology: it is possible to create those, though it is impossible to delete or modify once added one. Everything is based on a shared consensus, in which every node⁷⁰ in the blockchain has the decisional authority over every single change that can occur in the chain itself.

The immutability, added with the consensus protocols, guarantees cryptography and absolute security. The outcome is an open and transparent system able to store each kind of information decentralized and encrypted.

Although blockchain looks futuristic, the actual concept is not that new: Stuart Haber and W. Scott Stornetta, two scientists who described the idea behind this technology yet in 1991. However, this technology went unused and the patent lapsed in 2004, four years before the inception of Bitcoin⁷¹. From 2008 blockchain started its rise to the mainstream thanks to Satoshi Nakamoto, the anonymous creator of Bitcoin. Satoshi exploited the lapsed patent in order to create a decentralized ledger, able to store data about anonymous peer-to-peer payment.

That cryptocurrency started a new era of decentralized peer-to-peer payments: from 2009, when the first bitcoin was mined, more than 4000 cryptos have been developed ⁷², obtaining a comprehensive market cap of 2.30T dollars⁷³. However, cryptos are only to be considered as an (incredibly) successful application of a technology that has not been exploited at its full potential.

⁶⁹ or digital ledger in the case of cryptocurrency

⁷⁰ which consists most of times in a physical network device, even if its definition is able to vary within the different context in which it is involved.

⁷¹ History of Blockchain | Binance Academy. (2021).

Retrieved 22 September 2021, from <https://academy.binance.com/en/articles/history-of-blockchain>

⁷² <https://www.investopedia.com/tech/most-important-cryptocurrencies-other-than-bitcoin/>

⁷³ <https://coinmarketcap.com/it/>

FILECOIN

The reason behind a massive amount of Blockchain projects devoted to cryptocurrencies has to be related to the opportunity, in terms of earnings, that they have offered so far. Cryptos, since their very start, showed heaps of rewards for those who actually developed or invested in those ⁷⁴. Only few applications of blockchain focused on “simple” data storage, even if the technology ⁷⁵ was already available, primarily because of a lack of interest in a database that did not provide any economic incentive.

However, there is one project that has successfully solved that issue. The project is called Filecoin, and was released in 2017, but the actual coin was dropped in the market at the end of 2020. This project is able to mix the advantages of a cryptocurrency and a decentralized database. Filecoin aims to empower clients, to store crucial data in a secure and decentralized way, according to IPFS protocol, its Proof-of-Spacetime ⁷⁶ and Proof-of-Replication ⁷⁷.

Data stored in Filecoin database, will be divided into smaller blocks, encrypted and then distributed over the network. In this way, every database will only contain a small part of each data, making it impossible to be exploited by store-owner. The hardware necessary to create a network of database, is essentially provided by investors worldwide: the idea is that anyone has some spare storage space that could be used by someone else. The storage supply by investors will be waged by a fraction of the fees that consumer would have to pay, and will be distributed by their own homonymous crypto: Filecoin. In this way there would be multiple opportunity, for a large number of different people: clients interested in having a secure and decentralized cloud storage, and investors interested in having a profit for giving the opportunity to store some files in their own computer⁷⁸.

This revolutionary and ambitious cloud storage system pretends to be a concrete competitor of Dropbox, Amazon Web Services "AWS", Microsoft Azure, and Google Cloud, even in terms of cost for the final user ⁷⁹.

⁷⁴ First price increase occurred in 2010 when the value of a single Bitcoin jumped from around \$0.0008 to \$0.08. In April 2021, Bitcoin has the value of almost 60.000 dollars. It is also interesting to notice how the actual anonymous founder of bitcoin, only basing on its own bitcoin, has a net worth of over 57 Billions dollars, and basically the 20th person in the world. Since his identity is unknown it has not be considered in the chart styled by Forbes.

⁷⁵ The IPFS protocol

⁷⁶ Verifies the entirety of a file is being stored, unaltered, over the agreed-upon duration, <https://filecoin.io/store/#sectors>

⁷⁷ Verifies the agreed-upon number of copies of a file are being stored, <https://filecoin.io/store/#sectors>

⁷⁸ or mining computer

⁷⁹ Duade, J. (2021) FileCoin: “Decentralized Cloud Storage Competitor To AWS, Microsoft Azure, And Google Cloud”. Seeking Alpha <https://seekingalpha.com/article/4419553-filecoin-decentralized-cloud-storage-competitor-aws-microsoft-google>

FileCoin Data Storage vs AWS	
FileCoin Price	\$185.85
Price per GiB per Month AWS	\$0.0134217728
Price per GiB per Month FileCoin	\$0.0000522000
FileCoin Cost Relative to AWS %	0.38892%
How many more GiB can you Store with FileCoin Relative to AWS	257.1222874
Price of FileCoin if Data Storage Costs Were Equivalent to AWS	\$47,786.18
Chart Created by James Duade	
Used Data from FilStats on 4/16/21 at 7PM EST	

Table 19

Duade, J. (2021) FileCoin: “Decentralized Cloud Storage Competitor To AWS, Microsoft Azure, And Google Cloud”. Seeking Alpha <https://seekingalpha.com/article/4419553-filecoin-decentralized-cloud-storage-competitor-aws-microsoft-google>

Comparing them is crucial, since they are the most used platforms in which clinical data are generally stored.

As stated in their own website Filecoin is working for “a robust foundation for humanity’s information”⁸⁰, and they already provide their support for critically important public data, such as open access scientific data, creative commons media, historical archives, preservation, and more. The most interesting project supported is gnomAD, a coalition of investigators seeking to aggregate genome sequencing data from a variety of large-scale sequencing projects, and to make summary data available for the wider scientific community. The Filecoin network will store a copy of the v3 short variant data set, which spans 71,702 genomes from unrelated individuals sequenced as part of various disease-specific and population genetic studies.

The interest of Filecoin for an ambitious and innovative scope, as a genomic database clearly shows the feasibility of an innovative health database, fully backed by blockchain technology, and the importance that it will have in the very next future.

⁸⁰ <https://filecoin.io/store/#foundation>

BLOCKCHAIN IN PHARMA

The future of drugstores⁸¹ finds its base on customization as one of the most critical aspects. However, the feasibility of a customized service strictly rely, and depends on data. They are also fundamental for the healthcare industry that needs them to develop new cures and therapies in a more accurate way.

In this sense last years the amount of data relative to our own health has increased exponentially from different sources. In facts fundamental and traditional data⁸² (mostly in paper form) originated from hospital and clinics, are starting to be supported by new sources, unknown until a few years ago: the commonest examples are newest smartphone, enabled to monitors our health processing our movements and including sensors able to screen critical parameters like blood pressure⁸³. The outcome, if combined with wearables is even more relevant⁸⁴, and it is the basis of the creation of a new science called mobile health (M-Health)⁸⁵.

⁸¹ and more broadly, of health as a whole

⁸² Such as administrative claims, electronic health records (EHRs), disease and device registries. Dhruva, S.S., Ross, J.S., Akar, J.G. et al. Aggregating multiple real-world data sources using a patient-centered health-data-sharing platform. *npj Digit. Med.* 3, 60 (2020). <https://doi.org/10.1038/s41746-020-0265-z>

⁸³ the first mainstream smartphone integrating blood pressure sensor is the Samsung Galaxy S5, released in 2014

⁸⁴ the first modern wearable tracker has been launched by Fitbit in 2009. It was a device to be connected by bluetooth with the smartphone in order to get information about movement, calorie burn and sleep throughout the day.

⁸⁵ The Global Observatory for eHealth of the World Health Organization defines mHealth as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices”. However, these definitions of mHealth are not universally accepted as of yet. Alternatively, mHealth may mean the use of mobile devices to monitor or detect biological changes in the human body, while device management entities, such as hospitals, clinics, or service providers, collect data and use them for healthcare and health status improvement. Park Y. T. (2016). Emerging New Era of Mobile Health Technologies. *Healthcare informatics research*, 22(4), 253–254. <https://doi.org/10.4258/hir.2016.22.4.253>

However, an increasing amount of data is much harder to be administrated, according to the nature of data itself. Unlike most data that we generate visiting every website (and in particular social media), health data are much more delicate and difficult to manage.

The most relevant issues that need to be accomplished in the field of health's data are:

- Interoperability ⁸⁶
- Data Sharing
- Mobility
- Security and Privacy

The first three problems arose dealt with the aggregation of a variety of data, collected by many different sources, make them available for different entities in any time. Nowadays there are many companies devoted to the creation of a transversal platform able to sync different data, and bundle them, making them easier and more efficient to use. If a software is able to obtain and aggregate these additional real-world data sources for patients receiving therapeutic medical devices or procedures could help advance the understanding of medical device safety and effectiveness, and also provide a patient-centered approach to generating real-world evidence.⁸⁷

A worldwide used blockchain is VeChain, already implemented by prestigious companies such as BMW, LVMH Group, and BYD⁸⁸, at a first look seemed to be feasible with the requisites. In fact VeChain gives the opportunity to enhance supply chain management and business processes⁸⁹. The platform also aims to become the leading one in fields of initial coin offerings (ICOs) and in managing transactions between Internet of Things (IoT) connected devices.

Even if it looks perfect for medical devices communication and the creation of a unified medical record, the main issue of this blockchain resides in its public block's nature that does not guarantee the privacy of data: everyone could have access to data in the blockchain itself.

There was the need to create a brand new solution.

⁸⁶ the process of sharing and transferring data among different sources
Azaria, A., et al., 2016. Medrec: using blockchain for medical data access and permission management. In: Open and Big Data (OBD), International Conference on. [https:// doi.org/10.1109/OBD.2016.11](https://doi.org/10.1109/OBD.2016.11). IEEE.

⁸⁷ Dhruva, S.S., Ross, J.S., Akar, J.G. et al. Aggregating multiple real-world data sources using a patient-centered health-data-sharing platform. *npj Digit. Med.* 3, 60 (2020). <https://doi.org/10.1038/s41746-020-0265-z>

⁸⁸ <https://www.nasdaq.com/articles/vechain-is-gaining-popularity-as-a-dual-crypto-and-logistics-blockchain-solution-2021-04>

⁸⁹ <https://www.investopedia.com/terms/v/vechain.asp>

A concrete one is represented by Hugo Health: a software developed by Yale University that is able to order data coming from different entities or devices and make them clear and efficient. Their view is actually to “gain agency over your health data”⁹⁰. Thanks to their application, data would always be in the smartphone, and easy to be consulted. Also in terms of interoperability, Hugo platform offers the opportunity to institution to exploit those data to improve quality of therapies and customize them.⁹¹

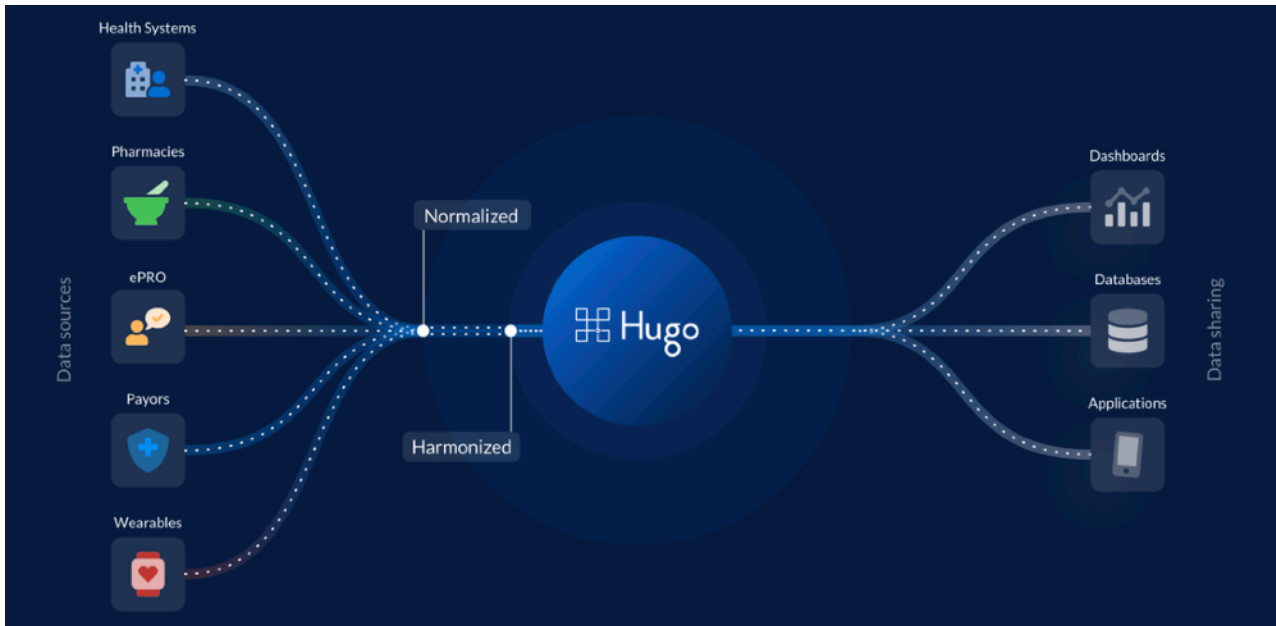


Table 20

<https://hugo.health>

It is interesting to notice how also in Hugo’s vision, pharmacies have a crucial role in the community and in the creation of health data, since it has been tested to work properly with data generated by CVS and Wallgreens⁹². In fact, those two huge giants already developed an own patients portal, mainly devoted in managing RX prescription and refill⁹³ in an easier way.

Despite the innovative and intelligent integration suggested by Hugo Healths, and even if it has an essential focus on privacy in its website, the issue of health data has not been solved at all.

⁹⁰ <https://hugo.health>

⁹¹ in 2015 yet, the 10 hospitals in southwestern Ontario that did implemented Hugo Health, reduced the number of adverse drug events by 35 percent
<https://www.canhealth.com/2015/08/26/hugo-produces-huge-gains-in-patient-safety/>

⁹² while Walmart will be available in the very next future

⁹³ during the covid-19 pandemic Wallgreens also implemented a new vaccine section.

At this stage, to deep into the topic, it is important to define the difference between privacy and security.

Security is defined as the protection against unauthorized access to data⁹⁴, while privacy refers to someone's right to keep its own personal matters private⁹⁵.

In many cases they run into the same direction: it is crucial that no one could see other's clinical trials, as well as individual information, remains private. In healthcare case, for example, privacy and security have to coexist in order to create a secure database.

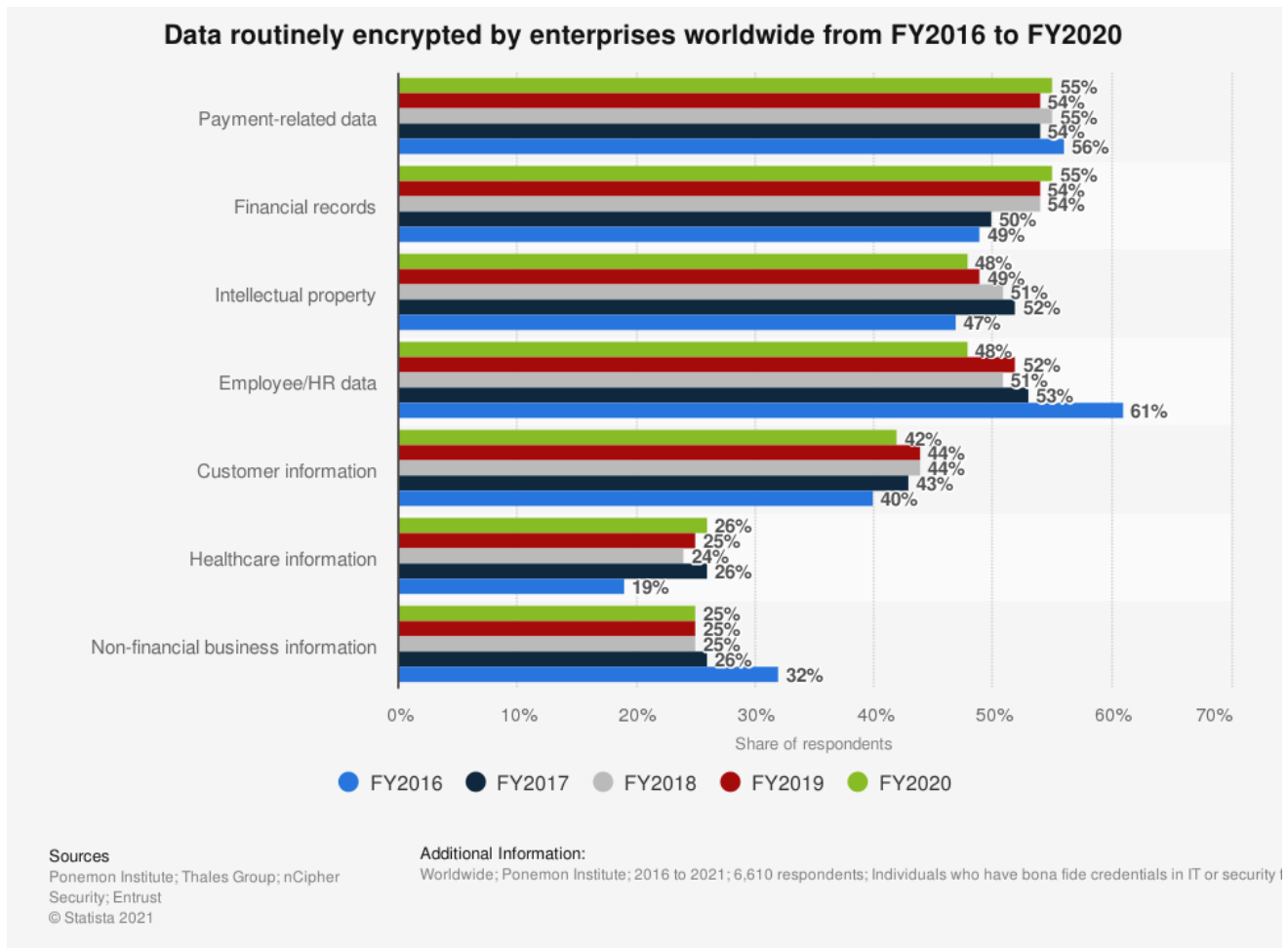


Table 21

*Routinely encrypted data types 2016-2020 | Statista. (2021).
from <https://www.statista.com/statistics/529981/worldwide-enterprise-encryption-data-types/>*

⁹⁴ <https://www.hiv.gov/blog/difference-between-security-and-privacy-and-why-it-matters-your-program>

⁹⁵ <https://dictionary.cambridge.org/it/dizionario/inglese/privacy>

Unlike the sources of data, security and privacy did not grow at the same pace. Despite the importance of those data, the percentage of encryption per data has not increased substantially from 2016 to 2020, remaining below sectors as intellectual property or employee data. This data really shows the urgency of a progress in this crucial field.

As a result of this lack of encryption, several data breaches during years involved Health’s data.

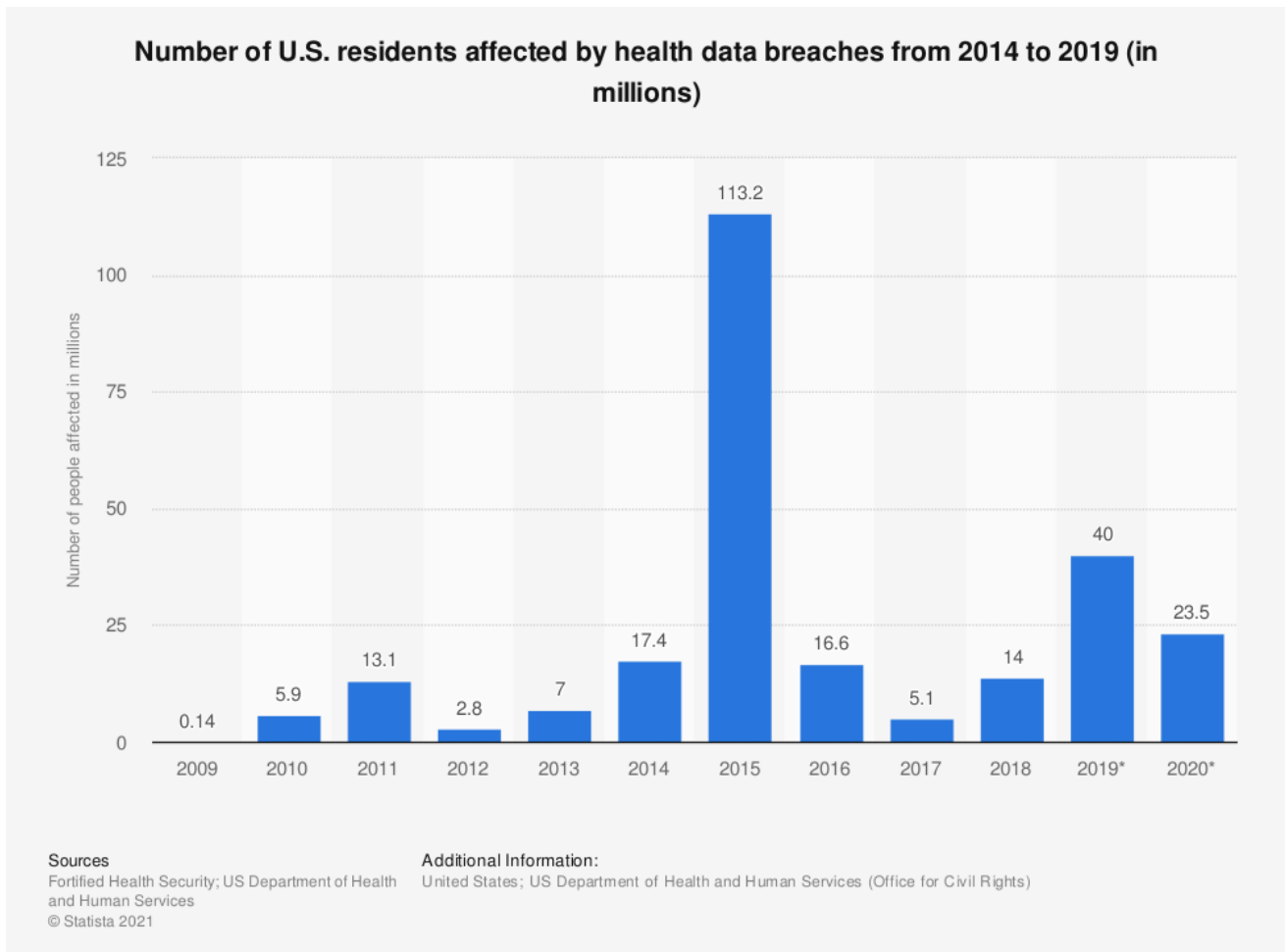


Table 22

Routinely encrypted data types 2016-2020 | Statista. (2021).
 from <https://www.statista.com/statistics/529981/worldwide-enterprise-encryption-data-types/>

A breach of data leads to critical privacy issues, as well as time and money issues. From an economic perspective, the risk of a data breach can be considered a severe aspect to be considered. The most relevant example is Anthem.Inc⁹⁶, that in 2020 settled to pay over 39,5 million dollar⁹⁷ for its massive cyber attack that involved about 78,8 million data⁹⁸.

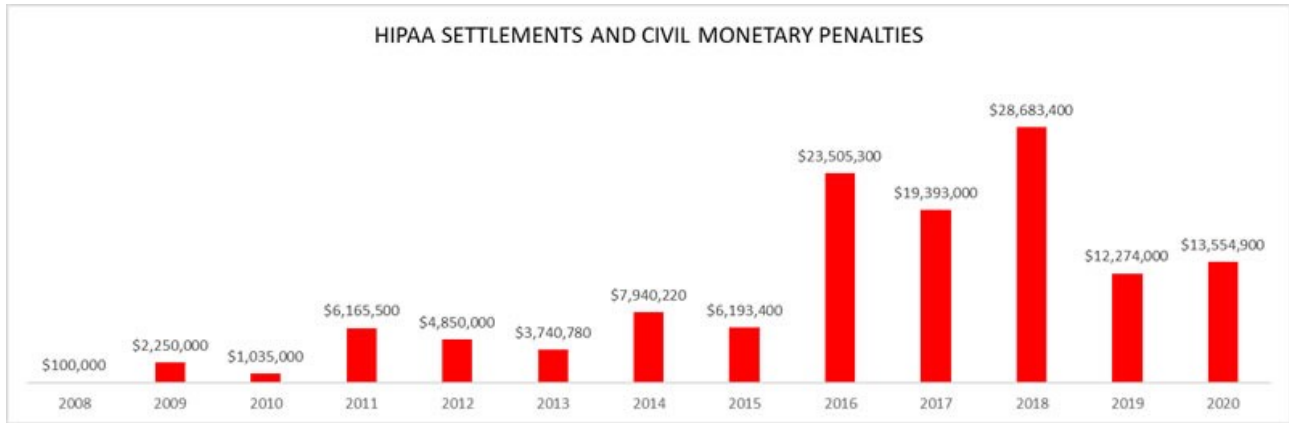


Table 23

Healthcare Data Breach Statistics. (2021)
 from <https://www.hipaajournal.com/healthcare-data-breach-statistics/>

According to Bitglass⁹⁹, breaches are becoming every year more difficult to manage. Also in terms of time needed to recover from one, on average it took 96 days to discover and 236 to fully recover in 2020. However, the most affected are patients, and their own privacy since only in the U.S it involved more than 26 million people in 2020¹⁰⁰. As analyzed in previous chapters, a crucial example of sensible data are the one coming from genetic analysis. It is not clear yet the possible use of personal clinical data, but the black market for those is mightily yet. According to the Trustwave report¹⁰¹, a healthcare data record could be valued at up to \$250 per record on the black

⁹⁶ an health insurance company in the US

⁹⁷ Staff, R. (2021). Anthem to pay nearly \$40 million to settle data breach probe by U.S. states. Retrieved 22 September 2021, from <https://www.reuters.com/article/us-anthem-cyber-idUKKBN26L2PW>

⁹⁸ Healthcare Data Breach Statistics. (2021). Retrieved 22 September 2021 from <https://www.hipaajournal.com/healthcare-data-breach-statistics/>

⁹⁹ company operating in cloud security field

¹⁰⁰ Vaidya, A., (2021) Report: Healthcare data breaches spiked 55% in 2020 - MedCity News. Retrieved 22 September 2021, from <https://medcitynews.com/2021/02/report-healthcare-data-breaches-spiked-55-in-2020/>

¹⁰¹ 2019 Trustwave Global Security Report 2 (2021) Retrieved 22 September 2021, from <https://www.trustwave.com/en-us/resources/library/documents/2019-trustwave-global-security-report/#>

market: an astonishing value if compared to the previously higher price for personal data available on the black market that was attributed to credit cards, priced 5.40 dollars on average¹⁰².

In Italy in august 2021 a cyber-attack successfully blocked new vaccine booking for 72h and hackers were very close to theft medical records of 5.8 million patients.

The most similar data, in terms of needed security, that we generate and rely on are the financial's: a sector that has already started relying upon blockchain technology. In fact, blockchain, due to his technology can be a concrete solution to ensure vital data, as health's one. According to Zhao, H., Lightweight backup and efficient recovery scheme for health blockchain keys of 2017, due to its advanced features, Blockchain allows to create a system that stands out for integrity, security, and non-repudiation, while storing all information in a public decentralized way, able to preserve privacy. One of the actual application of the blockchain technology in healthcare has been developed by MeDChain. Their vision is, as stated in the official website, to rebuild healthcare with a globally compliant blockchain for dapps and medical records¹⁰³.

The MedChain blockchain allows a dual function: electronic healthcare records and data streams. This flexibility makes Medicare one of the most outstanding projects in the field of blockchain administrated data¹⁰⁴.

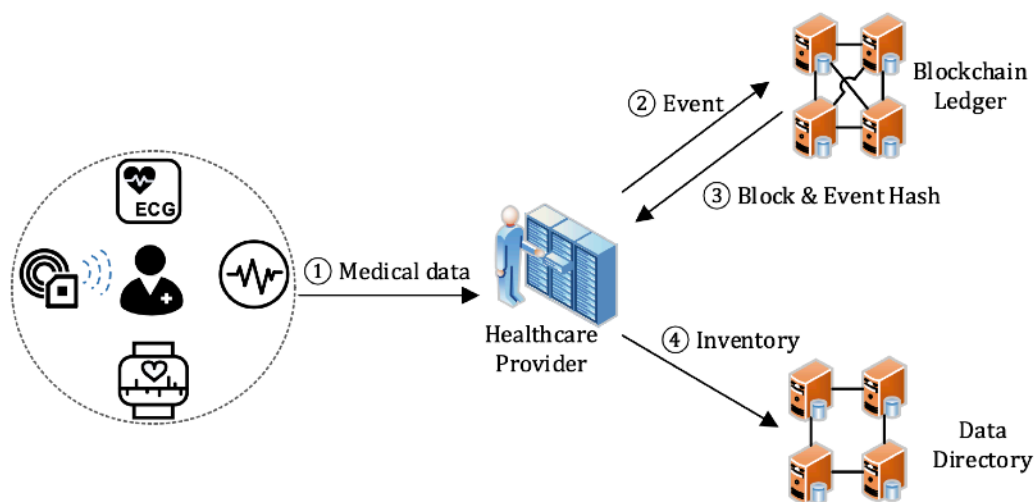


Table 24

<https://www.medchain.us/#team>

¹⁰²Neveux, E. (2021) Healthcare Data Breaches & the Value of Healthcare Data. Retrieved 22 September 2021, from <https://www.securelink.com/blog/healthcare-data-new-prize-hackers/#:~:text=According%20to%20a>

¹⁰³ <https://www.medchain.us/#team>

¹⁰⁴ according to MedChain: Efficient Healthcare Data Sharing via Blockchain, wrote by Shen B, Guo J, Yang Y. , data streams makes MedShare the most interesting project, and the only one able to combine it with healthcare record.

The data records are processed in 4 steps: Collection of healthcare data from a patient through medical devices and sensors, the creation of the event and the subsequent block, and the registration of the new entry in patient's inventory.¹⁰⁵

Datastream will consist of a more complicated procedure of 9 steps that have the ambitious aim to make data easy to consult, and safe at the same time. The use of Smart Contract¹⁰⁶,enacts the possibility to share data with third parties, and the security is guaranteed by a distributed storage that allows the decentralization of data.

¹⁰⁵ Shen B, Guo J, Yang Y. MedChain: Efficient Healthcare Data Sharing via Blockchain. *Applied Sciences*. 2019; 9(6):1207. <https://doi.org/10.3390/app9061207>

¹⁰⁶ A smart contract is a self-executing contract with the terms of the agreement between buyer and seller being directly written into lines of code. The code and the agreements contained therein exist across a distributed, decentralized blockchain network. The code controls the execution, and transactions are trackable and irreversible.

<https://www.investopedia.com/terms/s/smart-contracts.asp>

OPPORTUNITIES OF BLOCKCHAIN IN PHARMACIES

The previous paragraphs were devoted to analyzing the technology and the possible and already available implementation of it. Nevertheless, which can be the advantages of an implementation in a drugstore of blockchain ?

As we have previously discussed the enormous amount of health data, quintessential for the creation of a pharmacy based on services, needs a safer system to manage them. A verified, trustable and breach-free system will increase consumer confidence in the service and reduce expenses for pharmacies, since problems in managing data will be almost totally offset. Privacy concerns are the most critical factor contributing to the creation of barriers to digital strategies, as evidenced by the graph below.

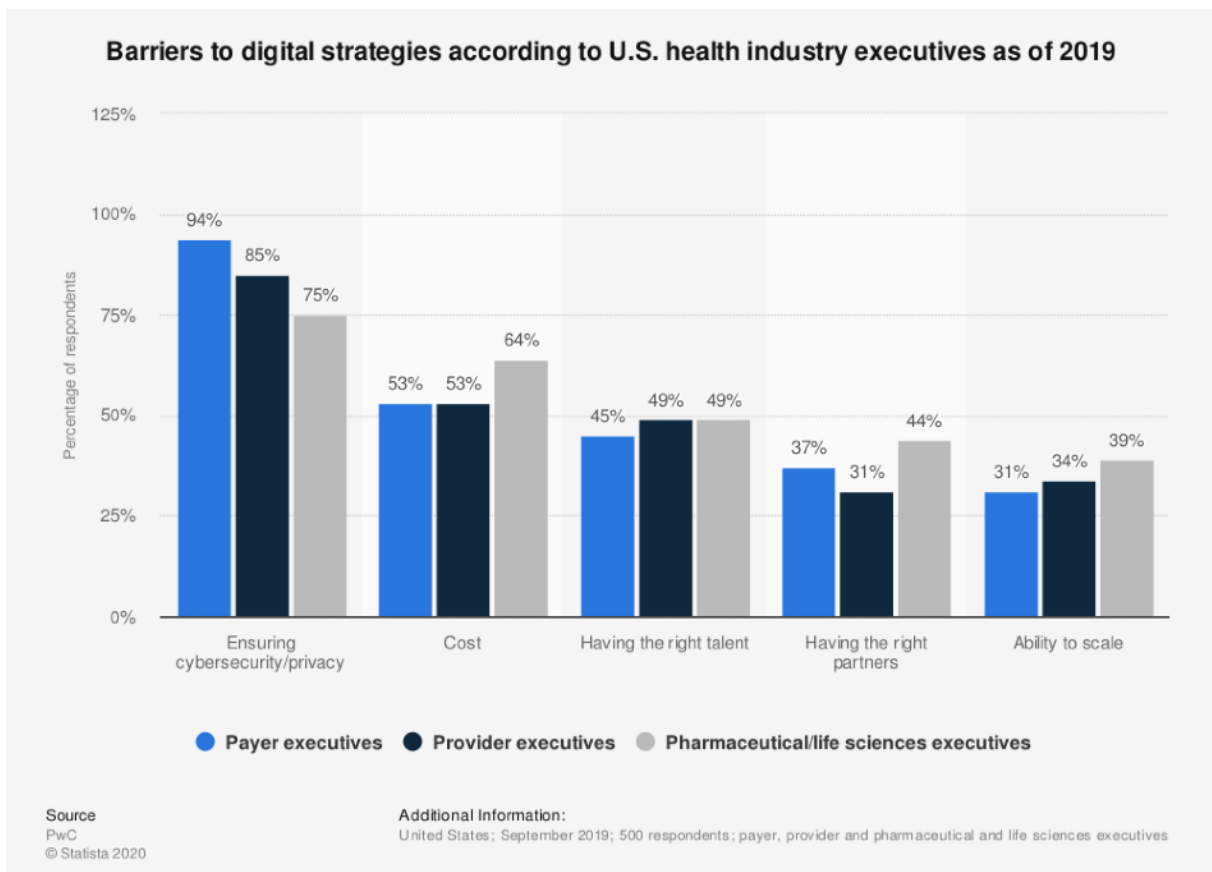


Table 25

Barriers to digital strategies in the health industry U.S. 2019 | Statista. (2021).
 from <https://www.statista.com/statistics/1087544/barriers-to-digital-strategies-health-industry-us/>

Blockchain is fundamental in trying to solve this key aspect, also according to its decentralized nature. In particular data if not distributed in a chain, are stored in datacenter that are vulnerable to hacks, and to the bad faith of the storing company itself.

Being able to offset almost totally this huge barriers will be able to guarantee an easier and faster development and application of digital health, prospecting a flourishing perspective for pharmacies. Furthermore, patients will increase their trust and their confidence in pharmacies¹⁰⁷ and digital health providers. Costs, that are the second most important issue, will decrease (both in terms of money and time) after the firsts expenses due to the initial implementation, due to a reduction in costly breaches. The brand image will also benefit from the vital focus in this aspects.

However, it is easy to understand that an implementation of the blockchain will be very tough if attempted from small and medium drugstores chain. An enormous initial effort could be accomplished only by affirmed chains such the previously mentioned CVS, Walgreens and Walmart: pharmacies that are already devoted an important attempt in offering digital platform able to record drugs usage, and even RX prescription. It would result in a worthless investment, create a blockchain ecosystem, than lacks of important partnership with local hospital, that did not offer in-store services as blood analysis, genetic tests, and all the other fundamental tools required in order to create a substantial amount of data. In this sense the barriers to entry in the sector of “pharmacy of the future” are much higher than the ones to be overcome to access in “traditional” drugstore sector. Indeed, this will allow big groups to have a substantial competitive advantage over small-medium sized competitors. Despite the hardness of the implementation, blockchain represents the future and could have an impact to be considered similar to the one that the internet had in the 2000s, and most of all will be able to bind all the different data together, in the same platform, allowing drugstores to loyal all its own client base. Even if underestimated, security of data and privacy will both have an increased relevance in a data-based world.

¹⁰⁷ according to Accenture. (February 21, 2017). Trust on health organizations among U.S. consumers for the security of digital healthcare data as of 2017, the trust in pharmacies was high in 32% of the cases, medium in 52%, not so high in 12% and low in 3%

ESTONIAN CASE STUDY

Not only private companies are interested in blockchain, but also more prominent entities such as entire countries. Estonia is a country that in the recent past has been extremely up to date; the fact that it is the first country in the world to use blockchain on a national level¹⁰⁸ in 2012 just strengthens the assumption.

Blockchain is just the tool that empowers the development of a larger project: e-Estonia, aimed at the creation of world's most advanced digital society¹⁰⁹

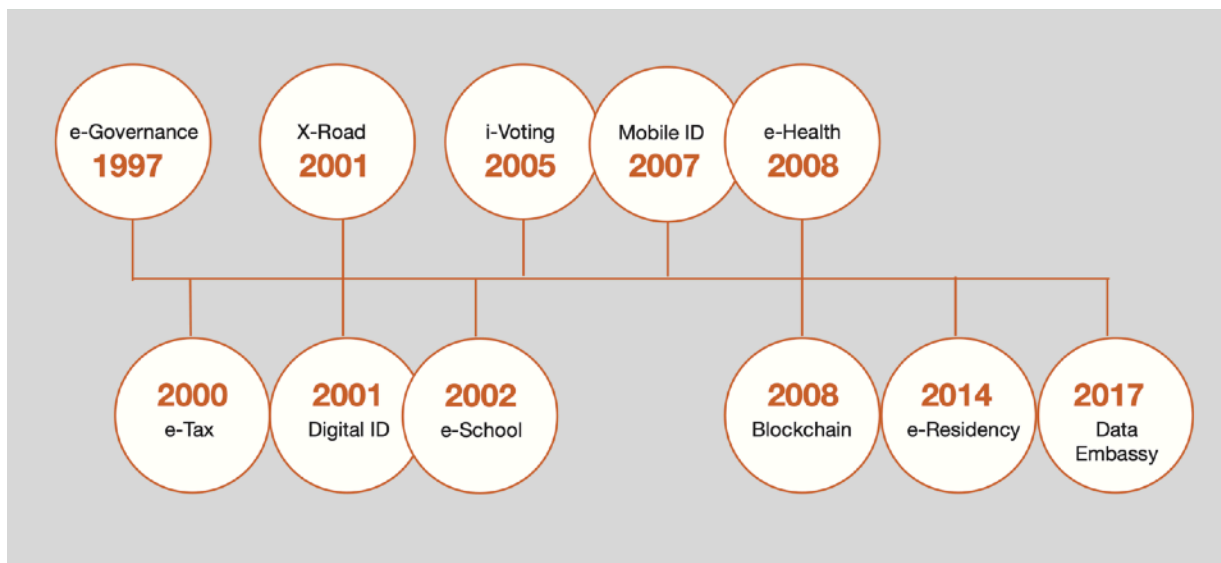


Table 26

<https://www.pwc.com/gx/en/services/legal/tech/assets/estonia-the-digital-republic-secured-by-blockchain.pdf>

Estonia created its own blockchain called KSI developed by Guardtime¹¹⁰.

KSI blockchain is one of the most advanced chains available in the market, and it distinct by:

1. Reliability, since it has to manage key data, that needs to be 24/7 available to citizens and institutions and cannot tackle periodical maintenance or malfunctions of the entire system;
2. Powerfulness, since it must handle a substantial amount of data, and massive volumes in the shortest possible time.

¹⁰⁸ as mentioned in their official website : <https://e-estonia.com/solutions/security-and-safety/ksi-blockchain>

¹⁰⁹ <https://e-estonia.com>

¹¹⁰ “Guardtime is a cyber-security provider that uses blockchain systems to ensure the integrity of data. The company has its roots in US defence systems and expertise in state-level digital security”

<https://www.digitalinsuranceagenda.com/featured-insurtechs/guardtime-the-worlds-largest-blockchain-company/>

3. A long-term view, since the infrastructure needs to be created to be up to date for the longest time, and in this sense the encryption of KSI will be able to resist to quantum computing attacks¹¹¹.

The world most advanced country's blockchain system allowed Estonia to create three primary services: Digital ID, X-Road and e-Residency.

Digital ID is the key to access to all Estonian e-services such as national health insurance card, proof of identification when logging into bank accounts, digital signatures, i-Voting, and most of all digital medical records and e-Prescriptions.

If an entire country implements at a national level a blockchain based system for prescription and medial record, and it does in a very successful way, it appears even clearer how feasibly it could be for a private company to do that efficiently.

X-Road is a technological and organizational environment enabling secure Internet-based data exchange between information systems, and it is based on an interoperable ecosystem.¹¹²

It is, in this sense, possible to exchange data across different countries instantly: the proof is that from 2017 Estonia and Finland are able to exchange data automatically by X-Road.

¹¹¹ KSI Blockchain Timestamping — Guardtime. (2021). Retrieved 22 September 2021, from <https://guardtime.com/timestamping>

¹¹² <https://www.pwc.com/gx/en/services/legal/tech/assets/estonia-the-digital-republic-secured-by-blockchain.pdf>

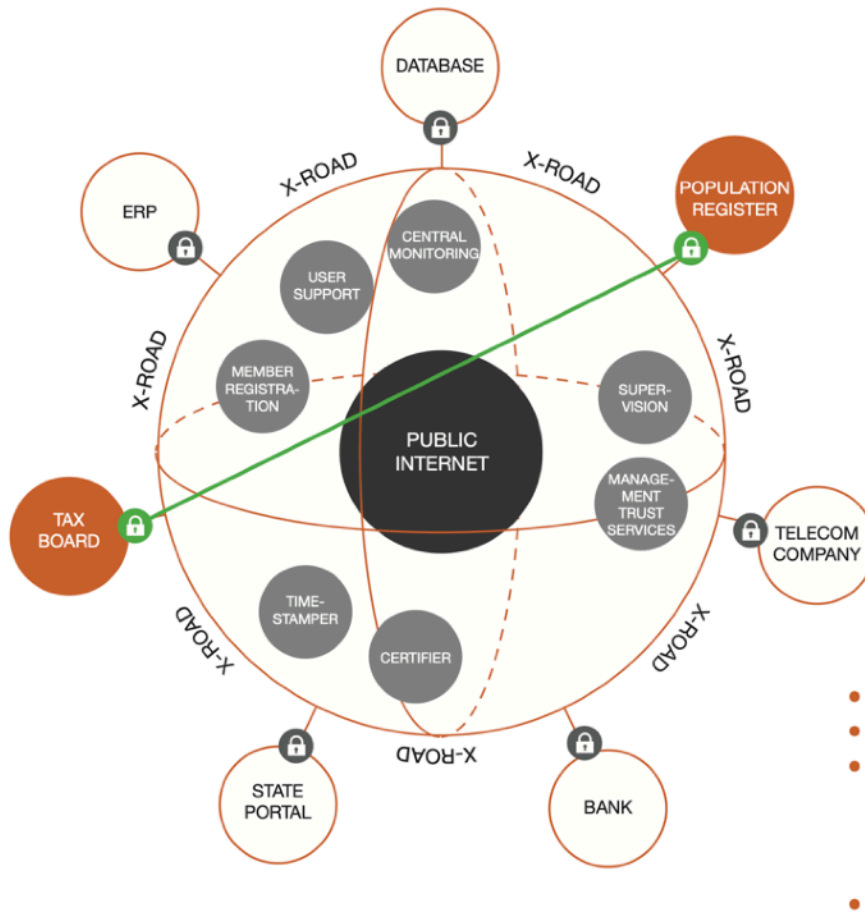


Table 27

<https://www.pwc.com/gx/en/services/legal/tech/assets/estonia-the-digital-republic-secured-by-blockchain.pdf>

The third blockchain-based service is e-residency, aimed to provide access to all the government services to all the people around the world, just with a click. Even a not Estonian will be allowed to access to all the services, and most of all open a business in Estonia. E-residents are more than 50.000 so far, and companies created by them are about 5000.

The virtuous American model compared to Italians'

In the U.S. the shift from traditional drugstores has occurred in advance if compared to Europe and, in particular, Italy. The most important drivers are the structure of American's health and the size of pharmaceutical chains. The substantial lack of public health assistance¹¹³, leads pharmacies to develop an even more crucial role in the community, and to offer a vast number of services at the lowest price. Also, the opportunity to create huge pharmacies group allowed companies such as Walgreens and CVS to invest in innovation.

In this sense, the shift from a normal drugstore to a service based pharmacy has already occurred for those two giants, and with stunning results.

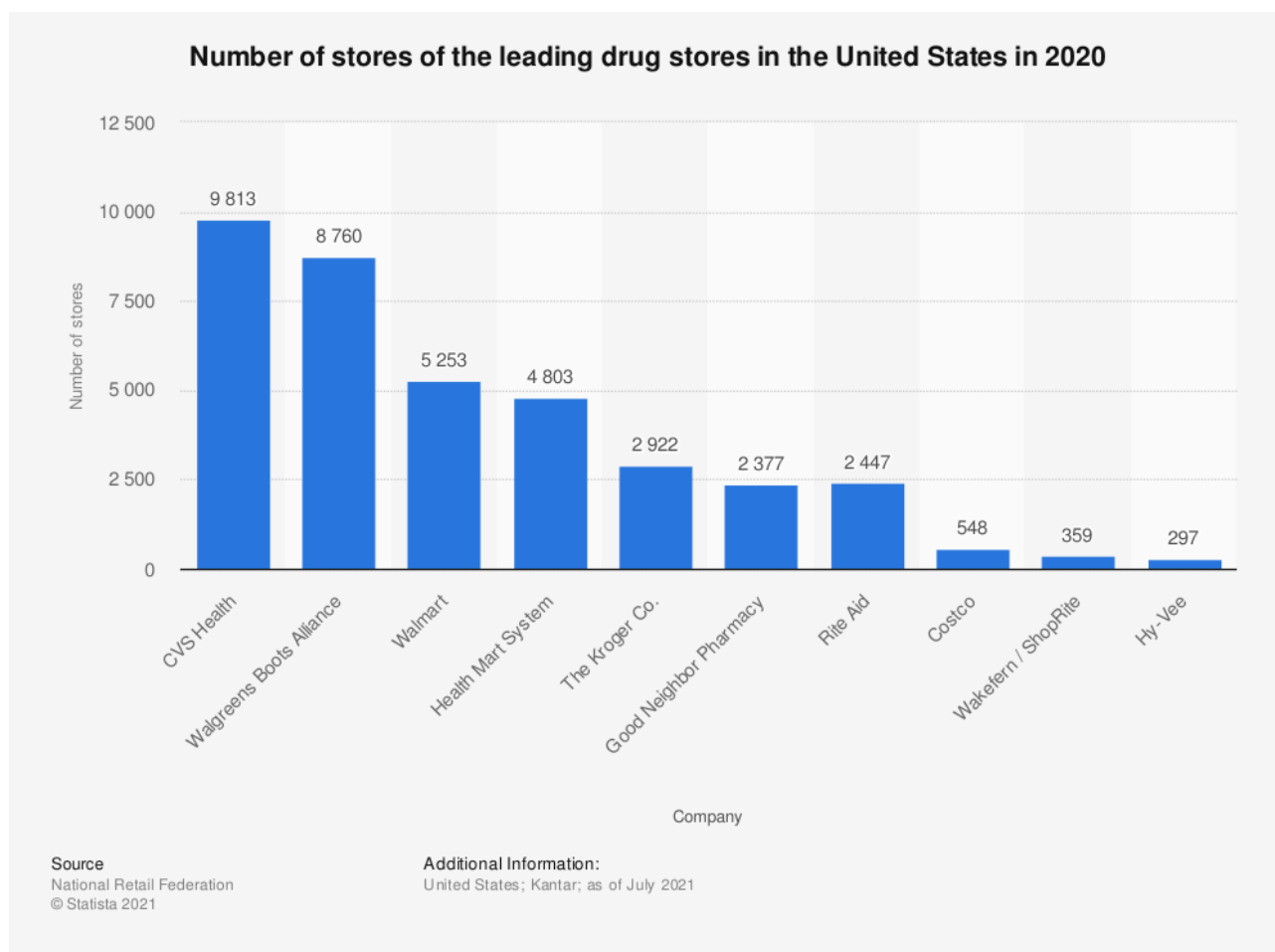


Table 28

Number of stores of the leading drug stores in the U.S. 2020 | Statista. (2021)
from <https://www.statista.com/statistics/197848/number-of-stores-of-top-drug-stores-in-the-us/>

¹¹³ though with some exception, such as Medicaid, aim to cover 60% of medical expenses for lowest income

As it can be noticed from the graph below, from 2012, revenues of CVS started to relying for more than 50% on pharmaceutical services, and in following years the trend also continued its rise in terms of services importance.

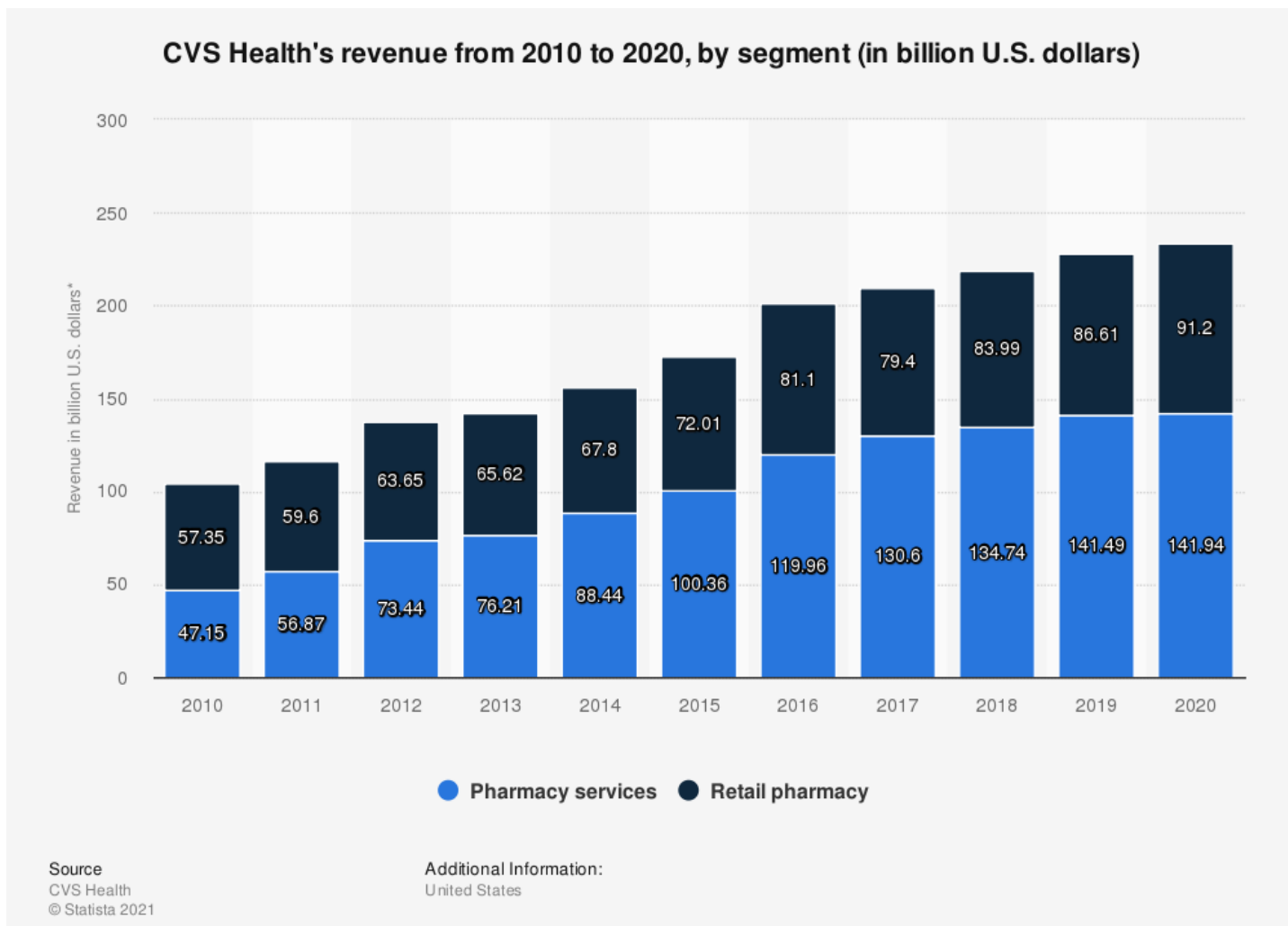


Table 29

CVS Health's revenue 2020 by segment | Statista. (2021).
from <https://www.statista.com/statistics/261282/cvs-caremarks-revenue-by-segment/>

Even an extraordinary event, such the pandemic was in 2020 did not stop this trend that could have been undermined by the difficulty for patients to betake oneself in Pharmacy, and with an increased need for drugs. The main services available are: *Pharmacy advisor*, which helps clients with medications and health management with a private assistant, *ScriptPath* and *ScryptSync*, which automatically reviews the patient's prescription information and makes refills easier and more convenient; *SimpleDose*, which simplify the management of their daily medications; *Immunization*

services; *HealthHUBs*, that offer access to health care in stores or online by the use of telemedicine.

Walgreens, the second-biggest pharmacy group in the U.S, similarly to CVS has a brand history deeply characterized by innovation as shown from the figure below.

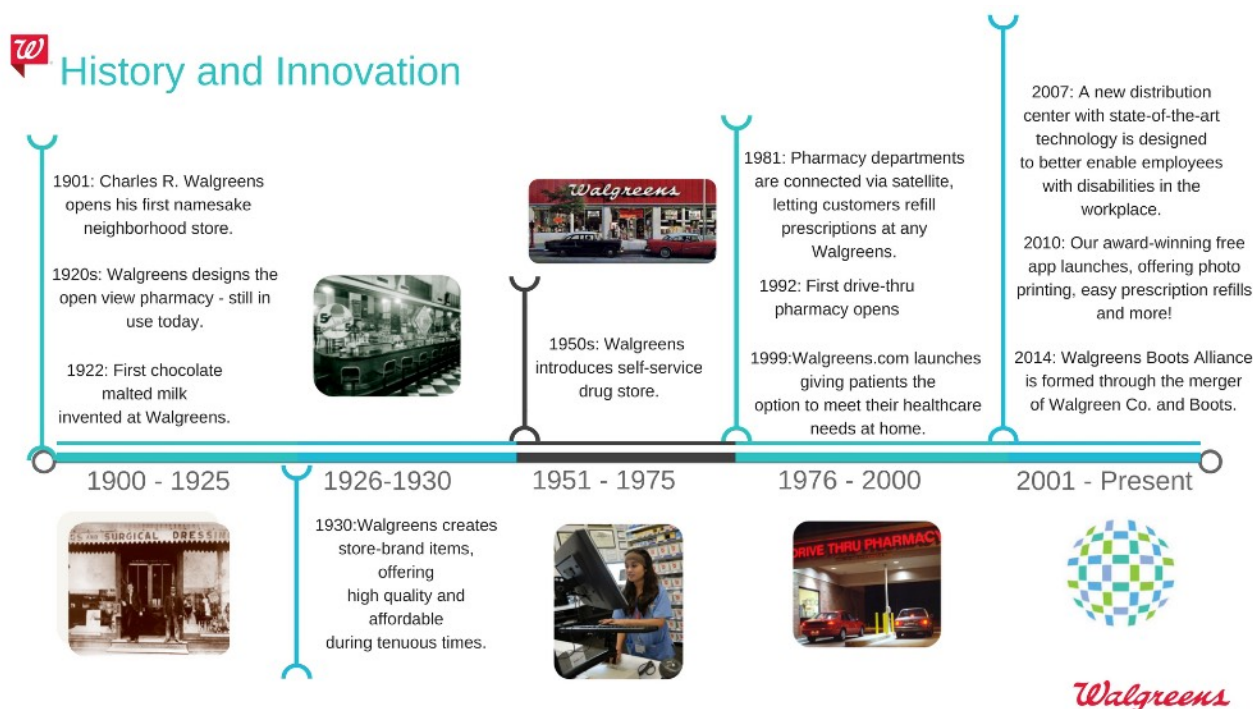


Table 30

<https://jobs.walgreens.com/innovation>

Nonetheless, it is the second biggest pharmacy chain in U.S.¹¹⁴, it has started to face relevant has revenues shrink from \$40.6 billion in 2016 to a value of \$38.8 billion in 2019 and it is expected an even bigger revenue shrink further in 2020 to around \$37 billion¹¹⁵. However, even with an important contraction in retail sector, Walgreens has increased revenues coming from

¹¹⁴ in terms of local store and sales

¹¹⁵Team, T. (2021). Walgreens' Strategy: Lose \$3 Billion In Retail To Gain \$24 Billion In Pharmacy?. Forbes

Retrieved 22 September 2021, from <https://www.forbes.com/sites/greatspeculations/2020/05/19/walgreens-strategy-lose-3-billion-in-retail-to-gain-24-billion-in-pharmacy/?sh=42a83c6f1ad3>

pharmaceutical business¹¹⁶ by over \$23.5 billion between 2016 and 2019. The third and last category is represented by pharmaceuticals wholesale which comprehends all the pharmacy related services, that at the beginning of 2020 worth over 15% of the revenue of the company, and it is expected to grow in the very next future.

The major services offered are, other than the automatic refill of RX drugs, delivery and dedicated app, are devoted to approach customers to a closer and easier care. The most important product in this field is “*find care*”, and it is designed to connect healthcare providers to customers and patients, by the use of virtual care, available 24/7. Its success during the pandemic is incredible, since the service was able to help more than 20 million of patients in U.S.¹¹⁷

What those two groups have in common is the idea of business, their focus on innovation and the consciousness that pharmacies need to update and upgrade their original idea, in order to create a new entity based on services.

While drugstores in US are already facing a massive transformation in their scope and in their business model,

Italian Pharmacies are not following the same pace. Which are the reasons?

First of all, cultural and social differences play a crucial role in this field, since both patients and drugstores owners are not looking for a change. In particular pharmacies seem to be seen just as a place aimed to provide a service, and not as a business activity. The almost total absence of distinctive element from one pharmacy to another makes challenging to create a loyal client base.

From a personal point of view the lack of innovation in most of pharmacies is very noticeable, and the differences between a pharmacy of 10 years ago, and a modern one are hardly visible.

Italian regulations are another key aspect to be analyzed. Until 2017¹¹⁸, it was not possible to create a real pharmaceutical chain, and this limited deeply the rate of innovation and investments.

Legislation about the number of pharmacies per citizen allowed pharmacies to maintain a relevant consumer base over time.

¹¹⁶ the one that comprehends prescription drugs

¹¹⁷ Salazar, D. (2021), “Walgreens Find Care expands service provider offerings”, Drugstorenews . Retrieved 22 September 2021, from <https://drugstorenews.com/walgreens-find-care-expands-service-provider-offerings>

¹¹⁸ Gazzetta ufficiale della Repubblica Italiana, legge 4 agosto 2017 n°217

Although many drugstores were not reactive enough to the change in terms of technological and legislative progresses, there are some noticeable exceptions. Farmacie Igea made innovation the main drive for their business activity. Innovation has not to be confused with technology, even if they both have some characteristics in common. Maria Catena Ingria, owner and manager of Farmacie Igea is the core of its own activity, and has been able to make innovation a base on which to build her business.

The first example of innovation in Farmacie Igea, totally unrelated from technology has to deal with opening and closing times, in a period in which it was unusual, and even prohibited to do so. Her attempt was so loud that she was the first pharmacy to side against the entire union of pharmacists, in order to obtain the (fairly) hoped deregulation. She actually won the challenge, and she was able to collect more than 8 thousand signatures of patients that just wanted to have the opportunity to choose to in the pharmacy they wanted, even on weekends.¹¹⁹

The second step aimed to innovate drugstores, was the decision to sell a vaster amount of different products and services inside the pharmacy. The idea was that with a broader choice inside the pharmacy, would have benefited customers, not only for healing, but also for improving the well-being. The final goal of Maria Catena Ingria is to be able to create the figure of the doctor inside the pharmacy. The idea is to involve young doctors, who would not have the opportunity to prescribe drugs, but their role would be to help patients in all the small-medium size health problems or quandaries. Even if it could be possible to implement online by the use of telemedicine, Farmacie Igea suggests that having a doctor physically available inside the pharmacy itself would make patients more comfortable and secure in asking for some advice.

Technology, even if not quintessential, has obviously a considerable impact and relevance in innovation.

Farmacie Igea strongly believed in technology, and since 2009 tried to develop a system of online doctors, in order to assist people that could not, or did not want to move from their home. They decided to develop a powerful online shop in advance if compared to their competitor, with the idea of serving its products all around Italy, through small towns, but even further: they proudly started to send their product in Dubai.

¹¹⁹Liguori, AM. (2007), "Chiusa la mega-farmacia Igea 'Non può aprire ogni weekend' - la Repubblica.it. Retrieved 22 September 2021, from <https://ricerca.repubblica.it/repubblica/archivio/repubblica/2007/11/25/chiusa-la-mega-farmacia-igea-non-puo-aprire.html>

Also from the machineries point of view, technology can improve the quality of the analysis and the feasibility of an implementation inside the drugstore. A smart implementation of machinery such as electrocardiogram, ecodoppler would help customers in achieving a more complete prevention, which would even lighten the burden on hospital emergency rooms, transforming the pharmacy in a first aid center. At the same time modernize logistics is essential and Farmacie Igea implemented ROWA systems in order to speed up the process of search of the drug, by the use of advanced robotics.

An important focus will be also on feeding, not only defined by diets, but most importantly on a correct and customized lifestyle program based on healthy food. It would be possible indeed to integrate an appropriate nourishment that better fits any different customer: from a sportsman, to a pregnant mum, passing for a teenager.

Dr. Ingria confirmed the importance of the interoperability of data, and an efficient digital records system will be essential to guarantee an high level of services, like other countries are already operating¹²⁰.

¹²⁰ France and Estonia are the most successful example in Europe.

Opening the windows to the future

The following paragraph will give the idea of the world that we will live in our very next future, of the economic, sanitary, social and environmental impact of those technology and changes in next years.

Despite the radical change is possible for big companies such as Walgreens or CVS, it would be hard for small-medium size drugstores to completely change their own business model. The investments that are necessary to be competitive against the two previously mentioned companies are in many case barriers that are too high to be overcome, and in Italian market it could be a concrete issue because of the nature and the vision of pharmacies.

However, the “renewed” healthcare business it already started to be seen as a greedy opportunity by the most insidious competitors that any company could have: the 4 tech giants¹²¹.

It is interesting to notice how tech-giants are increasing the interest in the healthcare sector as a whole and especially in digital health. Alphabet, Amazon, Apple, and Microsoft are gunning to carve out spaces within the healthcare market, and each is targetting its own set of sectors to transform or disrupt.¹²²

¹²¹ Sica,D. (2021)“How Big Tech Giants Are Leveraging The Healthcare Market” — SnoQap. Retrieved 23 September 2021, from <https://www.snoqap.com/posts/2021/3/10/how-big-tech-giants-are-leveraging-the-healthcare-market>

¹²² Big Tech in Healthcare: Here's who wins and loses as Alphabet, Amazon, Apple, and Microsoft target niche sectors of healthcare. (2021). Retrieved 22 September 2021, from <https://www.businessinsider.com/2-14-2021-big-tech-in-healthcare-report?IR=T>

A NEW MARKET LEADS TO NEW COMPETITORS

The proof that the opportunities offered by renewing the healthcare sector are massive, largest hi-tech giant already started to invest in that: Apple, Amazon, Google and Microsoft are already betting on the sector¹²³.

The fact that tech companies, that at first look seem to be utterly distant to healthcare companies shows also that this entire sector already started to be revolutionized by technology, and it will be even more in the very next future. In every other sector, technology has become a fundamental base, and the distance between hi-tech companies and health related is constantly reducing. Players that already are in the market needs to focus in managing the time in advance, if compared to new entrants, in order to be ready for the impact of new technology and competitor, and to differentiate, when possible, shifting the core business from the mere sale, to a more articulated, and service-based pharmacy. Trying to compete directly with enormous and powerful companies could be very risky and sometimes even useless. On the other hand, for smaller pharmacies or groups it will be easier to implement the newest technology with a significantly lower economic effort, relying to third-party ones offered by tech giants.

¹²³ Here's where tech giants like Microsoft and Amazon stand in their race to revolutionize healthcare. (2021). Retrieved 23 September 2021, from <https://www.businessinsider.com/how-microsoft-google-apple-amazon-are-investing-in-healthcare-2021-4?IR=T>

BIG TECH IN HEALTHCARE				
	Alphabet	amazon	Apple	Microsoft
Strengths	<ul style="list-style-type: none"> • Google Cloud • Verily Life Sciences • AI data analytics 	<ul style="list-style-type: none"> • Amazon Web Services • HIPAA-eligible voice assistant • Amazon Care • PillPack 	<ul style="list-style-type: none"> • Apple Watch • Research functions • Apple Health Records • iPhone consumer base 	<ul style="list-style-type: none"> • Azure • Microsoft Genomics • Health Bot
Weaknesses	<ul style="list-style-type: none"> • Initiatives fragmented across divisions 	<ul style="list-style-type: none"> • Many projects still in nascence 	<ul style="list-style-type: none"> • Mixed clinical effectiveness of Apple Watch • Limited to iOS 	<ul style="list-style-type: none"> • Lack of consumer-facing services
Opportunities	<ul style="list-style-type: none"> • Remote patient monitoring or research via Fitbit • EHR market disruption • Precision medicine 	<ul style="list-style-type: none"> • Health insurance disruption • Broad-scale telehealth service • Medical supplies delivery 	<ul style="list-style-type: none"> • Remote patient monitoring • Health system partnerships • Healthcare payments 	<ul style="list-style-type: none"> • Precision medicine • Population health • Clinical decision support • Chatbot market dominance
Threats	<ul style="list-style-type: none"> • Consumer trust • Data security • Competition in the wearables space • Cloud competition 	<ul style="list-style-type: none"> • Consumer trust • Data security • Cloud competition • Healthcare voice tech market competition 	<ul style="list-style-type: none"> • Consumer trust • Data security • Competition from low-cost wearables 	<ul style="list-style-type: none"> • Consumer trust • Data security • Cloud competition

Table 31

Big Tech in Healthcare: Here's who wins and loses as Alphabet, Amazon, Apple, and Microsoft target niche sectors of healthcare. (2021). from <https://www.businessinsider.com/2-14-2021-big-tech-in-healthcare-report?IR=T>

APPLE

During WWDC¹²⁴ 2021, held in June, Apple revealed to investors and developers the latest news and development of its ecosystem. Unsurprisingly one of the most conspicuous parts of the presentation has been devoted to the implementation of health apps.

In particular, since they first created the Health app in 2014, they focused on the integration of sensors available in iPhone and apple watches in order to create a constant and reliable source of data to implement in their own app. In 2018 they realized an update of the app, allowing it to store health records of patients, while in WWDC 2021 they stepped even further creating a new function that enables third parties to consult the patients' health records. The power of the brand Apple will guarantee a large scale adoption, and a fundamental easiness for customers to exploit this new function of their own Apple device.

AMAZON

Amazon focus on the healthcare sector has become striking in last few years in two different sectors: Amazon pharmacy and AWS¹²⁵.

Amazon pharmacy is devoted to the creation of the most extensive online pharmacy, secured by Amazon fast shippings and Amazon ecosystem. Its development already started with the acquisition of PillPac from Amazon in 2018, and after starting to operate in the U.S, it has the target to arrive in Europe too within few years. What really differentiates Amazon Pharmacy from other online drugstores, is the opportunity to buy on the portal even drugs different from OTC, simply uploading the prescription to the portal. This important feature will not be available in Italy because of a strict regulation relative to RX drugs.

On the other hand AWS already provides cloud services to 90% of the 10 biopharmaceutical companies globally, and offers a variety of services for storing clinical trials, and also elaborate those data with the integrated AI.

¹²⁴ Apple Worldwide Developers Conference

¹²⁵ Amazon web services

MICROSOFT

Microsoft, competing directly with Amazon, has developed its own cloud service ideated for healthcare able to connect patient experience, enhance health team productivity, optimizes data management, ensures to reliability security and privacy¹²⁶. The main partners that are already implementing Microsoft's health cloud are KMPG, Cognizant, PWC, Accenture Avanade and HCL. Also its division Microsoft Azure has implemented specifics features for helping to transform the journey of medical assistance¹²⁷. Moreover, telemedicine has much relevance in Microsoft plans, that aims to conduct Telehealth visits on Microsoft Teams¹²⁸.

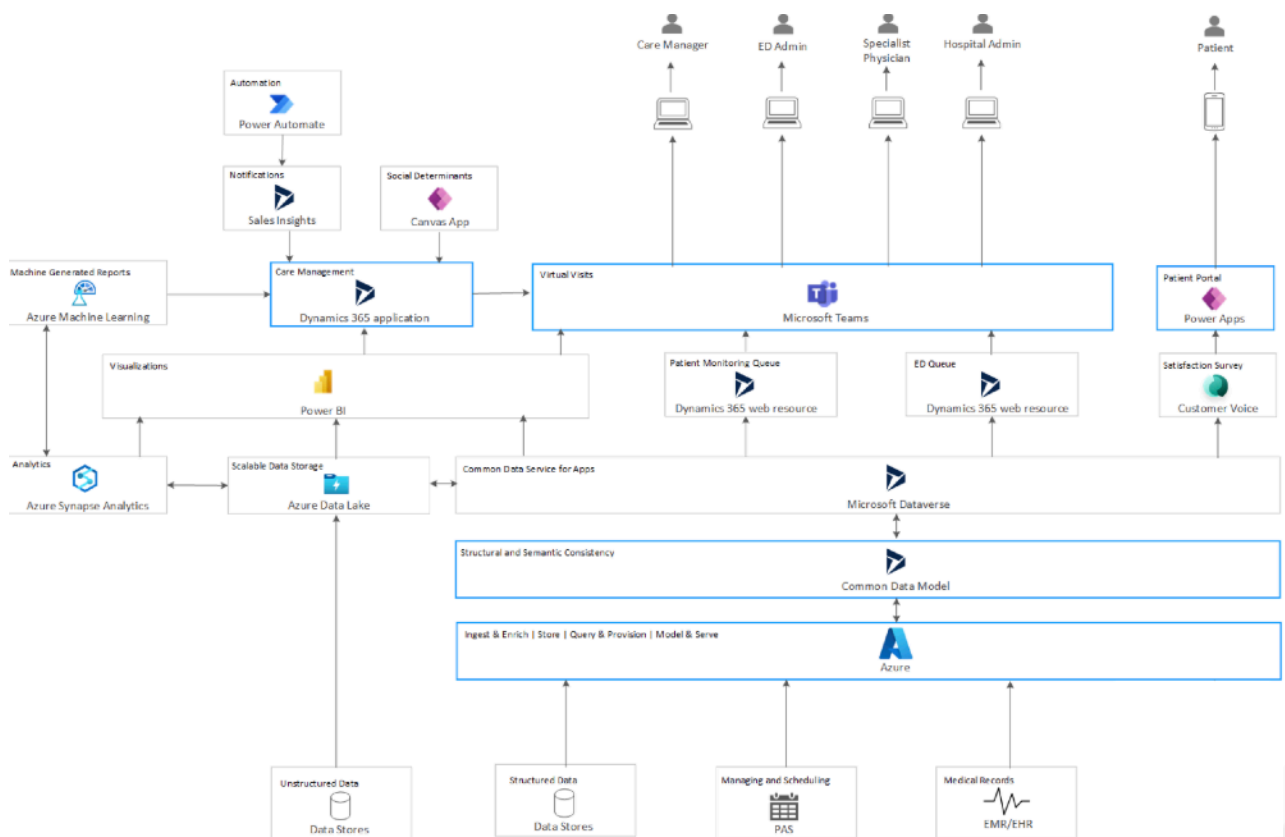


Table 32

<https://www.microsoft.com/en-us/industry/health/microsoft-cloud-for-healthcare>

¹²⁶ <https://www.microsoft.com/en-us/industry/health/microsoft-cloud-for-healthcare>

¹²⁷ <https://azure.microsoft.com/it-it/industries/healthcare/>

¹²⁸ <https://www.businessinsider.com/how-microsoft-google-apple-amazon-are-investing-in-healthcare-2021-4?IR=T>

GOOGLE

Also Google has invested in the sector, and in particular in developing tools to improve medical care. Their first attempt was already in 2006, when they created their Health section, that, due to a lack of interest and adoption was retired in 2012. However, the company continued its investments in the sector. As well as Amazon and Microsoft it has developed an intelligent cloud able to integrate AI and intelligent search through medical documentation. The AI in particular is the sector in which Google is investing more resources. Its broad used webapps Google drive and Google Doc also were updated in order to support clinical data and interoperability. The power of Google algorithms reached the attention of hospital chains, and in particular HCA Healthcare, which signed an historical partnership with the tech giant in 2020¹²⁹. From a B2C point of view, as Apple did, in 2020 it invested in the launch of the app “Google Health” for Android, helping to monitor crucial data of patients.

A CHANGE IS NEEDED

Nowadays, it is impossible to analyze technological development without considering the impact of those in the environment. That is also true for companies: even if focusing on the environment was only optional some years ago, now it is a key element that investors are looking carefully. In the last few years, people are more aware of the importance of respecting and safeguarding our planet. Any business now has to take in consideration a new set of fundamental variables that were not considered until a decade ago.

In this sense, the need to change is even more urgent than from an economic point of view.

The health care industry is calculated to be the most carbon-intensive sector in the industrialized world¹³⁰. Pollution may be considered an acceptable cost, since it is produced by the sector that is improving our life every day, but it is not. Carbon pollution is not the only relevant one: pharmaceutical pollution started rising concern.

It can be defined as a pollution of the environment with pharmaceutical drugs and their metabolites, which reach the aquatic environment through wastewater.¹³¹

¹²⁹Evans, M. (2021). WSJ News Exclusive | Google Strikes Deal With Hospital Chain to Develop Healthcare Algorithms. Retrieved 22 September 2021, from <https://www.wsj.com/articles/google-strikes-deal-with-hospital-chain-to-develop-healthcare-algorithms-11622030401>

¹³⁰ Pichler PP , Jaccard IS , Weisz U , Weisz H . International comparison of health care carbon footprints. Environ Res Lett. 2019;14(6):064004.

¹³¹ https://en.wikipedia.org/wiki/Drug_pollution

Once excreted by patient's urine or feces, drugs, when it is the case, are transported to sewage treatment plants, where actual widespread technology is not able to guarantee they are efficiently deleted¹³². The phenomenon if not regulated it is expected to grow by 37% by 2035¹³³.

Moreover, the most scary part is that the sector devoted to save and improve the life of people, combined to a rash use of drugs are contributing in the creation of the first cause of death of 2050: antimicrobial resistance¹³⁴. It would be an issue that would be very hard to solve, and costly at the same time for private and public health. The problem is already very actual, since CDC's Antibiotic Resistance Threats in the United States, reported that more than 2.8 million antibiotic-resistant infections are already occurring in the U.S., counting more than 35,000 death in 2017¹³⁵.

The reason has to be attributed to the people's unconsciousness in taking drugs excessively and without the necessary awareness of them. Unfortunately, the decreased importance of pharmacist advices in the last decade leads to the undervaluation of the importance of a rational assumption of drugs. People, especially in developed and rich countries tend to assume much more medicines than they actually need. Furthermore, medicines are not dosed individually, but are created with general doses expected to fit most of the population. The issue resides in the fact that if the "standard" drugs have a dose that overcomes the patient's actual need, it will be expelled by his body and will end in wastewater. Once there it is costly and difficult to clean up the water, and most of times the actual clean does not occur. The contaminated water, if not in our home, it is used in watering, and finally vegetables will be contaminated as well, returning us the same drugs we expelled. Indeed, sometimes, even if unaware we are assuming some drugs accidentally. A better control of patients medicine assumption, by tracking apps, and customized drugs will be essential to prevent to generate and almost uncontrollable and invisible enemy, able to kill us.

¹³² Lertxundi, U., Hernández, R., Medrano, J., & Orive, G. (2020). Drug pollution and pharmacotherapy in psychiatry: A "platypus" in the room. *European Psychiatry*, 63(1), E33. doi:10.1192/j.eurpsy.2020.32

¹³³ <https://www.government.nl/documents/policy-notes/2019/02/12/reducing-pharmaceutical-residues-in-water-a-chain-approach>

¹³⁴ antibiotics and other antimicrobial medicines become ineffective and infections become increasingly difficult or impossible to treat, because of bacteria, viruses, fungi and parasites change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness and death.

<https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance>

¹³⁵ Clinical Infectious Diseases, Volume 72, Issue Supplement_1, 15 January 2021, Pages S17–S26, <https://doi.org/10.1093/cid/ciaa1581>

Blockchain has been started to be attacked by numbers o people because of its environmental impact. Even if the issue was already known by most, the last Elon Musk’s intervention¹³⁶ raised the awareness of the topic even more.

However, saying that blockchain itself its polluting would be misleading and inaccurate.

It all resides in the way the blockchain is developed, and in particular in how the consensus is developed, as well as the process behind creations of new blocks¹³⁷.

Since Satoshi Nakamoto first created Bitcoin using a Proof of Work protocol¹³⁸, the majority of cryptos used to implement the same protocol too. Since it is based on the effort that every member is applying, it results in being very energy consuming. The difficulty and the effort needed, are indeed growing at an exponential rate, making every creation of blocks more difficult than the previous one. It results in a massive energy requirement: according to a Cambridge research reported on BBC¹³⁹, Bitcoin requires as much energy as Argentina does.

¹³⁶ Browne. R (2021), “Why everyone from Elon Musk to Janet Yellen is worried about bitcoin’s energy usage”

<https://www.cnbc.com/2021/05/13/why-elon-musk-is-worried-about-bitcoin-environmental-impact.html>

¹³⁷ as explain detailed in the proper chapter

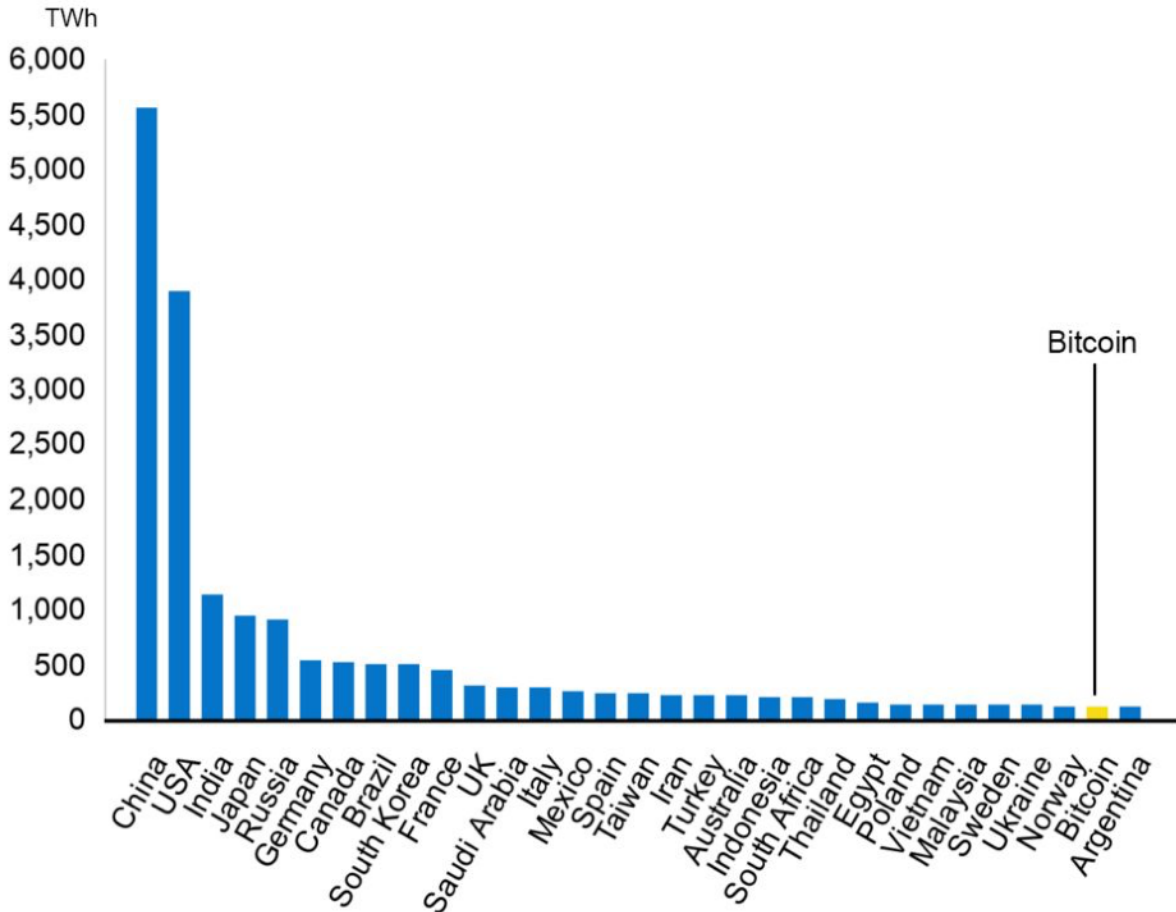
¹³⁸ Proof of work (PoW) is a decentralized consensus mechanism that requires members of a network to expend effort solving an arbitrary mathematical puzzle to prevent anybody from gaming the system.

<https://www.investopedia.com/terms/p/proof-work.asp>

¹³⁹ Criddle, C. (2021) ”Bitcoin Consumes 'More Electricity Than Argentina'". *BBC News*, <https://www.bbc.com/news/technology-56012952>. Accessed 22 Sept 2021.

Bitcoin uses more energy than Argentina

If Bitcoin was a country, it would be in the top 30 energy users worldwide



National energy use in TW/h

Source: University of Cambridge Bitcoin Electricity Consumption Index



Table 33

Criddle, C. (2021) "Bitcoin Consumes 'More Electricity Than Argentina'". *BBC News*, <https://www.bbc.com/news/technology-56012952>. Accessed 22 Sept 2021.

It would be necessary a further resource of data, in order to understand if the energy invested in bitcoin is a “green” one but it is clear that the sustainable energy production in 2019 accounted only for 13,2%¹⁴⁰, a too low value to justify a massive energy consumption. The crypto world already

¹⁴⁰ UNEP, & Bloomberg New Energy Finance, & FS-UNEP Collaborating Centre. (June 9, 2020). Share of renewable power in energy generation globally from 2007 to 2019

understood the unfeasibility of this protocol in a large scale adoption, and the majority of new cryptos and blockchain based project are implementing new kind of validation protocols to create new blocks. The most common and diffused are proof of stake, proof of history and proof of authority, and can already reduce by 99% carbon emissions if compared to PoW.

Summarizing, pollution issues are not to be attributed to blockchains, but to the actual protocol used by them in the validation process; the proper process will not lead blockchains to consume more than a common computer server.

Conclusion

The way companies will react to innovation and to a paradigmatic change in the entire sector is going to define the future of drugstores. The discrepancy between groups that will be prompt in embrace the change, and the more innovation hostiles would grow very quickly. It is not something new, something unknown or unique; changes are the nature and of the world we live in.

“Intelligence is based on how efficient a species became at doing the things they need to survive.” said Charles Darwin when online shops were not available yet. However, its quote it is more accurate and actual than ever, and especially in business. We just need to understand who is intelligent enough. It is also well known that where a change occurs, the best opportunities arise: let's think about computers, internet, smartphone, and bitcoin. Italian pharmacies, mainly due to regulations, did not evolve as much as American's. Now with the opportunity of creating a pharmacies chain¹⁴¹ (with a maximum of 20 % of the total of pharmacies), the competition in this field will be every year higher, leading to the need to differentiate from competitors. Digital is also becoming a factor in pharmacies, with a considerable number of services for customers, and behind the scenes, for pharmacists themselves. Transforming a traditional field in a digital one is necessary, and when occurred will give a vital competitive advantage, in terms of organization or services offered. Every year the digital sector is a step closer to traditional ones, and drugstores, even if different from other retailers, cannot be exempted. The tech giants' effort in the sector is the concrete proof of that. Pharmacies cannot fight with the digital transformation, and if they wanted, they would lose. The key is changing the mindset, and arrange a drugstore able to offer something more than future online stores (they are in the embryonal stage, and they can sell just a small range of products due to actual regulation), other pharmacies and especially more structured chains. Maria Catena Ingria, owner and manager of Farmacie Igea, suggests that the change need to come from individuals and drugstores, and does not necessitate an induction from third parties. Who will understand the need of customers before others will be able to survive, but also to be much stronger than before.

¹⁴¹ Legge 124/2017 “Legge annuale per il mercato e la concorrenza”

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<https://www.beckershospitalreview.com/healthcare-information-technology/google-receives-more-than-1-billion-health-questions-every-day.html>

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