Scenario planning for emergent technology (big data & cloud) in healthcare industry

Planificación de escenarios para tecnología emergente (big data y nube) en la industria de la salud

Planejamento de cenário para tecnologia emergente (big data & cloud) no setor de saúde

Recibido: 10 de mayo de 2018. Aceptado: 11 de junio de 2018

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Abstract

The emergence of big data, as well as advancements in data science approaches and technology, is providing pharmaceutical companies with an opportunity to gain novel insights that can enhance and accelerate drug development. It will increasingly help government, health agencies, players, and providers to make decisions about such issues as drug discovery, patient access, and marketing. In this paper we use scenario planning tools and system dynamic to evaluate the impact of emergent technology such as big data &cloud &in healthcare industry. In this case we have four scenarios of big data and emergent tech transformation in Iran health care industry.

Keywords: big data, scenario planning, health care industry, emergent technology.

Resumen

La aparición de grandes volúmenes de datos, así como los avances en los enfoques y la tecnología de la ciencia de datos, brindan a las compañías farmacéuticas la oportunidad de obtener información novedosa que puede mejorar y acelerar el desarrollo de medicamentos. Ayudará cada vez más al gobierno, agencias de salud, jugadores y proveedores a tomar decisiones sobre temas como el descubrimiento de medicamentos, el acceso de pacientes y la comercialización. En este documento, utilizamos herramientas de planificación de escenarios y dinámica del sistema para evaluar el impacto de la tecnología emergente, como Big Data y nube, y en la industria de la salud. En este caso, tenemos cuatro escenarios de big data y transformación de tecnología emergente en la industria del cuidado de la salud de Irán

Palabras claves: big data, planificación de escenarios, industria del cuidado de la salud, tecnología emergente.

Resumo

O surgimento de grandes volumes de dados, bem como os avanços nas abordagens e tecnologias da ciência de dados, estão proporcionando às empresas farmacêuticas uma oportunidade de obter novos insights que possam melhorar e acelerar o desenvolvimento de medicamentos. Ajudará cada vez mais o governo, as agências de saúde, os atores e os provedores a tomar decisões sobre questões como descoberta de medicamentos, acesso de pacientes e marketing. Neste documento, usamos ferramentas de planejamento de cenário e dinâmica de sistema para avaliar o impacto de tecnologias emergentes, como big data e nuvem e no setor de saúde. Neste caso, temos quatro cenários de big data e transformação tecnológica emergente na indústria de saúde do Irã.

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Palavras-chave: big data, planejamento de cenários, setor de saúde, tecnologia emergente.

1-Introduction

Big Data has emerged in the past few years as a new paradigm providing abundant data and opportunities to improve and/or enable research and decision-support applications with unprecedented value for digital earth applications including business, sciences and engineering. At the same time, Big Data presents challenges for digital earth to store, transport, process, mine and serve the data. Cloud computing provides fundamental support to address the challenges with shared computing resources including computing, storage, networking and analytical software; the application of these resources has fostered impressive Big Data advancements (Qunying Huang, 2016).

The increasingly availability and growth rate of biomedical information, also known as "big data" provides an opportunity for future personalized medicine programs that will significantly improve patient care. Recent advances in information technology applied to biomedicine are changing the landscape of personal information with patients getting more control of their health information.

Big data analytics is already impacting health decisions and patients care. A series of breakthroughs in medical science and IT are triggering a convergence between the healthcare industry and the life sciences industry that will quickly lead to more intimate and interactive relation among patients (Costa, 2013).

1-1-Big data in healthcare.

For example, the analysis of comprehensive EHR patient data collected in real time during doctor or hospital visits provides an opportunity to better understand diseases, treatment patterns, and clinical outcomes in an uncontrolled, real-world setting. These valuable insights complement those gained from clinical trials and can provide an opportunity to assess a wider spectrum of patients that are traditionally excluded from clinical trials (e.g., elderly, frail, or immobile patients, as well as people with rare indications and diseases not yet studied in clinical trials). It also allows companies to assess real-world challenges that cannot be observed in a clinical trial, such as drug compliance and the utilization of health care resources.
While these advances are generating great opportunities, they also pose resourcing and capability development challenges. One of the biggest is how to make the transition from legacy technology and analytical competence to more-powerful and sophisticated analytical tools and analysis methodologies.

Historically, the pharmaceutical industry has recruited SAS programmers who have executed well-defined analyses of clinical trials in a standardized, efficient manner. This worked well, given that clinical trials have been designed to answer questions about efficacy and safety with clean data sets in an industry-standard structure with few missing values.

But real-world data comes in a variety of different formats, is often highly unstructured (containing textual and other nonnumeric data), and is rife with missing values. It is messy data, filled with inconsistencies, potential biases, and noise. These attributes force data scientists to find creative ways to answer critical research questions to support drug research and development and ultimately to provide patients with access to the right therapies.

Consequently, there is an emerging need for analysts and data scientists who can take full advantage of tools and techniques developed in Silicon Valley that are capable of handling noisy data and presenting results to stakeholders in a simple, easy-to-interpret way. These analysts must be able to deal with ambiguity and be collaborative, entrepreneurial, and adaptive in their approaches. They must be able to apply “options thinking” to figure out what questions to ask, what data to examine, and what methodologies and technologies to use to address the aim. They must also have a deep knowledge of the health care system, including its standard practices, in order to understand how the data was originally collected, what biases may exist, and how it can be repurposed to answer clinical research questions (Copping, 2016).

Big data describe a new generation of technologies and architecture, designed to extract value from large volumes of a wide variety of data by enabling high-velocity capture,

discovery and analysis (Costa, 2013)(YichuanWang, 2015). This world of big data requires a shift in competing architecture so that researchers can handle both the data storage requirements and a heavy server processing is needed to analyze large volumes of data (costa, 2013).

Most of the big data surge is unstructured information and is not typically easy for traditional databases to analyze it. Therefore, the predictive power of big data has been explored recently in fields such as public health, science and medicine. At the forefront of the rapidly advancing techniques of artificial intelligence (AI) are natural-language processing, pattern recognition and machine learning. Those AI technologies can be applied to many fields, especially in biomedicine and life science (Knoppers, 2012).

2-1-BIG data, big impacts

Big data describe a new generation of technologies and architectures, designed to extract value from large volumes of a wide variety of data by enabling high-velocity capture, discovery and analysis (Villars, 2011).
Computational solutions and the use of the internet are also helping to create tools to manage diseases. For example, data repositories have been created to guide doctors and patients that suffer from diseases such as cancer helping them find the right drug for their diseases.

Big data describe a new generation of technologies and architectures, designed to extract value from large volumes of a wide variety of data by enabling high-velocity capture, discovery and analysis.

Personal health information and data generated by next generation DNA sequencers (i.e. omics data such as genomes, transcriptomes, exomes, epigenous and other types of similar information) are correlated, transferred to the cloud or internal servers, analyzed and visualized using different solution and tools that are available for big data analytics. Finally, data is translated as a short report to pharmacy for clinicians and researchers for a deep analysis for biomarkers and drug target s associated with specific disease phenotypes and after comparisons with public or private data base.

In big data model we use hardware and software infrastructure and cloud technology for store data in pharmacy and using ig data analytics such as Hadoop for identifies pattern of drug side effect and the most treatment for particular condition for optimized decision making by sending report for physicians Smartphone (Gerstein, 2012).

Computer aided medicine, web-based solution and big data analytics, will need to be taken seriously by physicians. A wave of new sequencing technologies, named third and fourth generation DNA sequencing ,make it possible to sequence genomes, transcriptomes and epigenomes faster at lower cost (anon, 2012).
With the increased need to store data and information generated by big projects, computational solutions, such as cloud-based computing, have emerged. Cloud computing is the only storage model that can provide the elastic scale needed for DNA sequencing, whose rate of technology advancement could now exceed Moors law. Moors law is the observation that, over the history of computing hardware, the number of transistors on integrated circuits and the speed of computers doubles approximately every 2 years. Although cloud solutions from different companies have been used, several challenges remain, particularly related to the security and privacy of personal medical and scientific data. (Fig 1).

Perhaps the greatest advantage could be the ability to offer a broad platform for the development of new analysis and visualization tools as well as software service to use these tools on shared data sets in a secure and collaborative workspace. In fact, some companies and big corporations already offer such solutions applied to healthcare and life sciences (Table 1and 2).

Data mining can be defined as the process of finding previously unknown patterns and trends in databases and using that information to build predictive models.

The need for healthcare organization to make decisions based on the analysis of clinical and Transformation and digital development recently has created waves around the world.

Governments and businesses need to know where the path to the peak of each wave along with the changing trends in the digital world. Today very few companies have digital strategy. While the absence of such a strategy has led to a lack of understanding opportunities and loss, but

if the great potential of digital transformation taken under control, interests in the field of economic and human development will follow.
At the same time, many possibilities ahead of tomorrow's digital world. As the scope and application of the Internet could not be predicted at the present time, today it is hard to predict.

Although there are certainty in this space, including the future course of the economy, more people own businesses online offer, but the uncertainty is still widespread. Who will have access to the Internet how, why, when and at what price can drive business innovation and value creation, social and human.

Interaction between people's decisions, including users, actors in the field of industry, policymakers now and in the near future, the evolution of the digital world and the farther in the future will determine.

Thus, the need for a set of stories diverging scenarios about the future, helps in exploring .

future possibilities the digital world and prepared for our business. The need for healthcare organization to make decisions based on the analysis of clinical and financial data. Insight gained from data mining can influence cost, revenue, and operating efficiency while maintaining a high level of care.

Healthcare organizations that perform data mining are better positioned to meet their long term needs, Benko and Wilson argues. Data can be a great asset to healthcare organization, but they have to be first transformed into information.

Yet another factor motivating the use of data mining applications in healthcare is the realization that data mining can generate information that is very useful to all parties involved in healthcare industry. For example, data mining application can help healthcare insurers detect fraud and abuse (Tan & Hian Chye and Gerald)

3-Simulation result

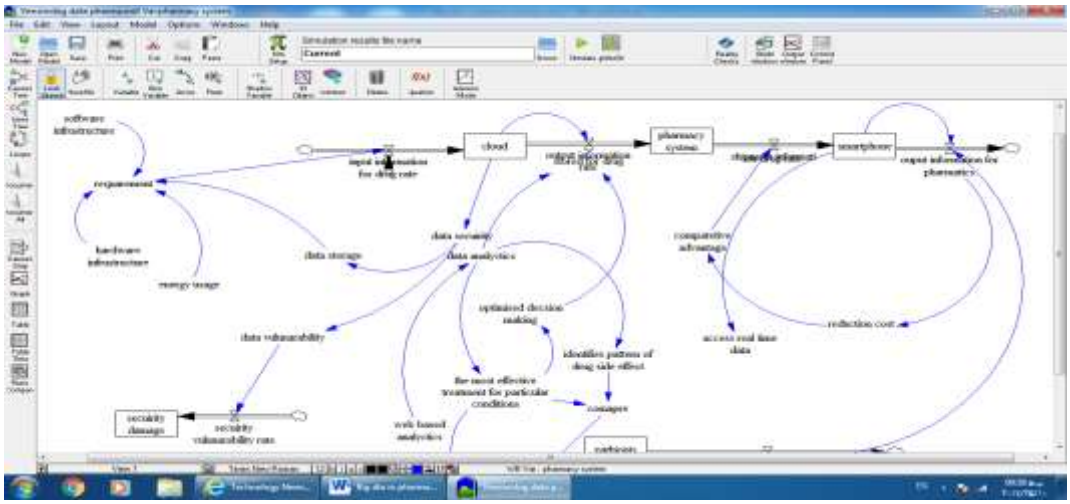

Fig 1. Simulation Media

Simulation of the model was conducted using vensim PLE, a fully functional system dynamics software package from ventana systems, inc.(Harvard, MA,USA). The unit time frame selected was a month, and the model was run over a period of 30 months, representing a medium-term security planning horizon. Attempting to simulate for longer periods would entail greater uncertainty and less meaningful results because longer term predictions are difficult to accurately make in health care. The model was run under variety of conditions to understand the impact of different big data and cloud technology in health care industry, damages, patients recovered. This was done to help managers make effective decisions concerning about big data platforms.

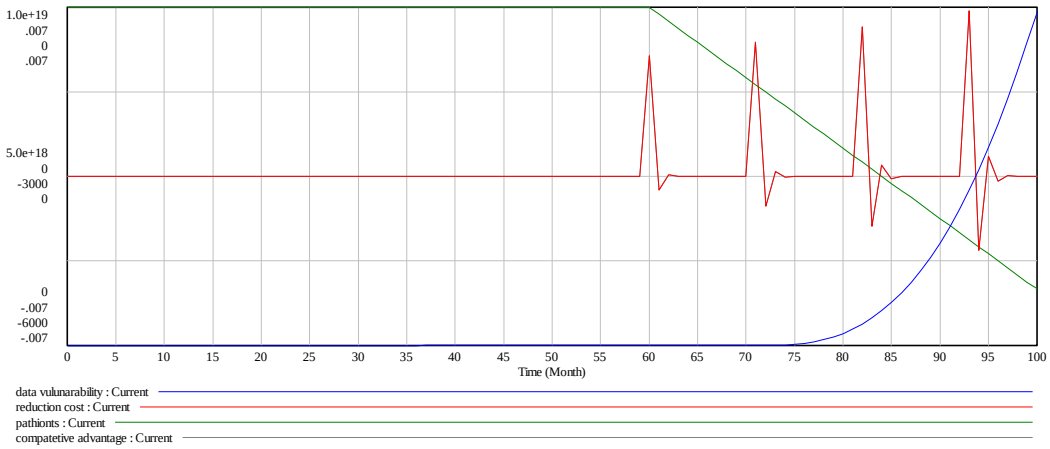

Fig 2.

In the present study, trends in this field were identified by examining the changes and developments in the digital world, as well as the state of digital transformation at the international level by conducting library studies and reviewing various and various international documents and then interviewing experts. After identifying trends, with categorization and understanding The relationship between these trends has been determined by the proponents of these trends.

Investigating and collecting experts' opinions ultimately led to two uncertainties, but each of these uncertainties has a range of predictions that can lead to a number of possible outcomes, and each of these consequences can play a different role in digital transformation.

4-Scenario planning:

By creating a scenario matrix and cross-axis of two uncertainty intervals for each of the factors, four scenarios are formed, each one unique and with outstanding features. Each of these scenarios is explained in more detail, each of these features is mentioned, and the factors causing each one are also examined

4-1-determine uncertainty scenarios for the formation matrix

Scenario1: smart Iceland:

In this scenario the industry reaction of major digital transformation (Cloud, big data, media) with maturity. In this case, industry always enters new technology and have not innovation, industry and not smart.

At the same time, the development of technologies is selective and their growth and application depends on the values or infrastructure that is identified by society and sovereignty.

Because surrounding constraints prevent residents from innovating and will be merely consumers. In this case, the country is not a smart city or intelligent community, but merely as a small island with many restrictions imposed on it and reflected in the same intelligence.

The smart space, sovereignty plays a crucial role in the development of technology selectively, first through the introduction of infrastructure appropriate to the community, and secondly through directing public opinion and educating and educating worthwhile. Society and sovereignty both call for big data technology, there is a selective mechanism and the type and extent of their application in the community space based on values and needs. In this space, concerns such as security, cost, lifestyle, identity and national and religious values are factors that influence the choice of type and extent of technology use.Top of FormBottom of Form

Cloud infrastructure and large data are handed over to certain businesses by obtaining relevant licenses, most of which are available to the government (such as the oil and gas industries, Iran Khodro, government companies, military and security agencies, etc.). In this way, the general model of cloud develops. These businesses grow with the privilege of using up-to-date technologies, but competition is eliminated and the country cannot take advantage of the benefits of innovation. Large

data is also evolving in this situation, as other technologies, including the Internet of Things, have grown and produced large data. Of course, this development is more in the public sector.

Scenario 2: child toy

When key digital transformation technologies (cloud, ioT, large data, media) are selective as in the previous scenario for the reasons given, the reaction and acceptance of the community and the primacy of governance are accompanied by trials and errors. In this case, the digital literacy of society and the sovereignty is low, and the identification of needs and the adaptation of infrastructure to technology is not associated with puberty and consciousness, but is based on tests and errors; this means that infrastructure may first be introduced or the pull of the people's market Unknowingly moving toward a technology, but because of the lack of awareness of how that technology is used, its disadvantages are more likely to emerge from its own interests.

The reason for naming this scenario for children's toys is that under such circumstances, the opportunities and challenges of key technologies remain unclear for a long time until the necessary knowledge is obtained. The weak and even fun aspects of a technology may grow despite the unwillingness of sovereignty, but the constructive aspects of it are flawed.

Scenario 3: In the course of the storm

This scenario describes a situation in which broad-based technology exists, and no-one has the desire to choose, or because of the dramatic advances, the ability to select technology has been eliminated, while, at the same time, society and sovereignty are also for the recognition of needs on the one hand and awareness On the other hand, opportunities and challenges have not matured enough.

Technology has been likened to various winds, storms, storms, or fires in various metaphors, as it makes the situation unrecognizable and brings about dramatic changes. The lack of adequate maturity of society and sovereignty, in turn, is driven by this technology, instead of directing the community to the direction of technology. In this case, if the country is not among the leading countries in the world, it will inevitably have to do with technology and infrastructure, laws and Its culture will be the function of the leading nations

Scenario 4: Spring wind

This scenario describes the conditions in which, as in the previous scenario, technology has comprehensively absorbed society and is not selective, but contrary to the previous scenario, society and governance have a satisfactory maturity level that leads to their needs as well as opportunities And technology challenges

Technology, as it can be likened to the storm, can flourish in different areas, just like the spring breeze. The lack of preparedness for technology and its inevitable changes have led to a more prominent technology and a society of transformational transformations, while attempting to align with it and anticipating and directing its path to the desired extent as possible makes society Facing challenges effectively and taking advantage of technology opportunities.

In this case, the digital transformation that the world's four most welcome technologies infrastructure in the country. Legal infrastructure has been developed. Research centers all its efforts in order to identify opportunities and challenges to come. Identify community needs and applications of technologies and updated regularly. The use of waste-based technology free from the constraints of the law, tends to encourage innovation. Of the leading countries, but also according to their status in the production and innovation in technologies and applications deals.

4-Conculusion:

Transformation and digital development recently has created waves around the world. Governments and businesses need to know where the path to the peak of each wave along with the changing trends in the digital world. Today very few companies have digital strategy. While the absence of such a strategy has led to a lack of understanding opportunities and loss, but if the great potential of digital transformation taken under control, interests in the field of economic and human development will follow.

At the same time, many possibilities ahead of tomorrow's digital world as the scope and application of the Internet could not be predicted at the present time, today it is hard to predict. The evolution of the Internet and the digital world in the future what will.

Although there are certainty in this space, including the future course of the economy, more people own businesses online offer, but the uncertainty is still widespread. Who will have access to the Internet how, why, when and at what price can drive business innovation and value creation, social and human Interaction between people's decisions, including users, actors in the field of industry, policymakers now and in the near future, the evolution of the digital world and the farther in the future will determine Thus, the need for a set of stories diverging scenarios about the future, helps in exploring future possibilities the digital world and prepared for our business.

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