Capgemini invent

CXO INSIGHTS

CXO TECH BRIEF FOR HEALTHCARE

1. SECTORAL EXEC SUMMARY

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Inevitably, new technologies will profoundly change every component of the value chain and transform the user experience in the healthcare world.
This transformation has already started with the widespread use of mature technologies such as AI or IoT and will now accelerate exponentially with new technologies such as 5G.

These transformations will need to be monitored through technology watch to identify other new technologies such as Edge Computing, given that they will continue impacting the healthcare value chain and will create new use cases for healthcare organizations.

1. SECTORAL EXEC SUMMARY

SECTORAL OVERVIEW WITH A RETROSPECTIVE ON 2020 AND PROJECTIONS FOR 2021

The COVID-19 crisis of 2020 has had strong consequences on healthcare activities.

With the healthcare system under immense pressure and a significant increase in operations due to COVID-19, the need to reinforce IT capabilities to ensure business continuity has become/been a top priority for healthcare CIOs.

Healthcare organizations are investing to "secure their foundations" and this trend will continue for the next three years. The top priority given to CIOs is to reduce their IT costs through the rationalization of their hardware and application portfolios, in line with the government's GHT convergence strategy.

Furthermore, an increase in the number of cyberattacks has made cybersecurity a major concern for them. CIOs will need to upgrade their cybersecurity levels to reduce their systems vulnerability and improve their resilience.

With the support of the government strategy, healthcare companies will need to accelerate the use of new technologies:

- The launch of "Segur digital phase (€2 billion)" has reinforced the need to share files between healthcare providers and to centralize patient data. CIOs will need to improve their IT capabilities to answer this need and capitalize on new technologies to provide new value-added services to patients and healthcare / their respective organizations. By integrating different kinds of software solutions, from AI to PRM, healthcare professionals will have better insights to provide help in complying with regulations or predict the evolution of the epidemic/pandemic.

- With the 2030 Health Innovation Strategy, healthcare organizations will also be able to accelerate their research with a dedicated budget (€650M)

- Through the Digital Health roadmap, new services will be provided to patients and healthcare professionals (digital health identity, "mon espace santé", "prosantéconnect", etc.)

The "Call for Expressions of Interest" for e-health projects from the French government, in collaboration with BPI France, will help identify and finance new products, technological processes or innovative services.

Technologies will deeply impact the healthcare value chain with new use cases that will be detailed on the following pages of our report.

2.1 HOW IS THE VALUE CHAIN DISRUPTED BY TECH?

HEALTHCARE VALUE CHAIN

Prevention | **Diagnosis** | **Treatment** | **Health center management**

CHALLENGES

Use data and AI to prevent medical issues or provide a quick and customized response to them

- Real-time monitoring and notifications
- Predicting patient outcomes

Improve patient diagnosis with latest technologies

- Augmented doctor
- Improved diagnosis

Offer new ways of treating patients for a better medical response

- Customized medicine
- Digital and remote surgery

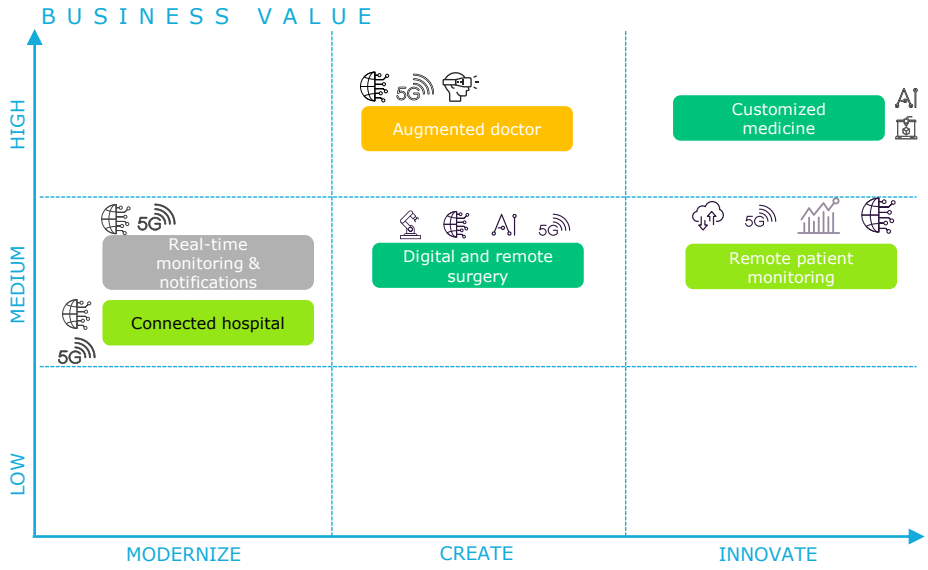
Improve patient experience and interactions with healthcare centers

- Connected hospital

Remote monitoring

Focus on use cases

2.2 FOCUS ON TECH DELIVERY MATURITY & BUSINESS VALUE FOR HEALTHCARE



From a technology perspective, we identify 3 main groups:

- **Must-have technologies:** IOT, AI and data analytics specially to address **efficiency** and **predictability** stakes and to provide a customized patient experience
- **Future must-have technologies:** Quantum computing to accelerate data exploitation and nanotech to improve **drug efficiency.**
- **Enabler technologies:** 5G to facilitate mass data transfers. Blockchain to improve traceability and network security.

Value chain positioning: Prevention | Diagnosis | Treatment | Health center management

Timeframe: 1-3 years | 3-5 years | < 5 years

AI/Machine learning | 5G Network | Blockchain | Quantum | Robotics | Virtual Reality | IoT | Cloud / Edge | Augmented Reality | 3D Printing | PWA | Data analytics

3. FOCUS ON VALUE CHAIN BLOCKS ALONG WITH USE CASES

Prevention

Overweight and obesity are responsible for about 80% of cases of type 2 diabetes

Improve medical outcomes by predicting and detecting medical issues

Access ready-to-use technologies

5G, AI, Patient Apps

- **Stakes and why now:** "Prevention is better than cure". However, most of the time, when a patient comes in for a check-up, he or she is already sick. To improve the chance of recovery and to limit drug consumption, prevention must become the norm. Understanding patient history is the key to do so. A new B2B2C paradigm shift with better patient data collection is the need of the hour.
- **How tech can help:** the development of AI technologies will ease the process of predicting medical issues, and the centralization of patient data through digital files will enable doctors to easily access patient history
- **Examples of use cases:**
- Accuhealth and Intel: Creation of predictive models thanks to real-time patient data to decrease the number of emergency consultations and hospitalizations
- Vodafone and SocialDiabetes: personalized and updated real-time recommendations of insulin doses and technological support to have real-time information

Diagnosis

The global telehealth market is expected to grow at a CAGR of 17% per year between 2020 and 2025

Foster innovation to help diagnose medical issues

Access ready-to-use technologies

Mobile Apps, AI, IoT

- **Stakes and why now:** The earlier the tests are performed, the more efficient they are, the better are the ultimate outcomes and the cheaper the treatment. For example, as shown by Cancer Research UK, early diagnosis of colon cancer could multiply the survival rate of this disease by about 9 and reduce the costs of its treatment by a factor of about 4.
- **How tech can help:** The use of telemedicine has skyrocketed over the past months due to Covid-19 with an increase in virtual visits, digital symptom checkers or remote patient monitoring.
- Moreover, new technologies allow medical staff to continuously monitor patient health and engage people in programs dedicated to cure diseases.
- **Examples of emerging use cases:**
- Through its investment fund Amgen Ventures, Amgen has recently invested in a startup called GNS Healthcare to make it easier for healthcare providers to find the most effective drugs, procedures and interventions through the use of AI

3. FOCUS ON VALUE CHAIN BLOCKS ALONG WITH USE CASES

Treatment

The personalized medicine market will be worth $3.18 trillion by 2025

Provide personalized medical monitoring in which patients are fully engaged

Access ready-to-use technologies

3D printing, IoT, 5G, AR/VR

- **Stakes and why now:** The traditional medicine market suffers from a major flaw: for the most part, it supplies standardized drugs to customers while healthcare should mainly be about providing patients with solutions that are as tailor-made as possible. Ideally, each person should be given customized drugs that take into consideration their size, weight, gender, etc. Typically, this is not the case and standardization of drugs can lead to overmedication, undermedication or under optimized choices of drug components for certain people.
- More often than not, surgeries are extremely demanding in terms of accuracy and timing. In this regard, new smart tools could significantly help surgeons perform tasks in a quicker, more efficient and more precise way.
- **How tech can help and examples of use cases:** 3D printing could hold the key to this issue by significantly improving the level of customization that can be achieved in medication. When the technology is mature enough, it may very well be possible that each patient takes different medication based on their own specific needs.
- Surgeons can be equipped with AR solutions that can display important information at any time without them having to look at screens or to consult doctors around them – thereby enabling them to be more focused on the patient.

Health center management

Nurses spend 72 minutes per shift searching for assets

Reduce the administrative burden, increase efficiency

Access ready-to-use technologies

5G, IoT

- **Stakes and why now:** The staff workload in hospitals is incredibly taxing. On an average, nurses spend 72 minutes per shift searching for assets, coworkers and wandering patients. Smart hospital solutions focus on optimizing cost and energy efficiencies, improving patient outcomes, increasing staff productivity, or complying with changing regulations.
- **How tech can help:** The use of simulation and virtual technologies have helped extend hospital facilities in a very efficient way. Reduce the workload of hospital staff by equipping patients with connected devices interfaced with appropriate health monitoring platforms"
- **Examples of emerging use cases:**
- Smart buildings (data and automation)
- Flow and asset management
- Automated/robotic activities
- Alcatel Lucent and Medcare have facilitated access to patient data for all hospital staff, enabling them to be more productive and providing a better quality of service to patients

4. FOCUS ON USE CASES AND ASSOCIATED TECHNOLOGIES

CONNECTED MONITORING

PREVENTION

Connected clinical trial monitoring could be used to:

- Improve the study ROI per patient by reducing the time required for transcription assessment
- Reduce the burden on clinical sites and achieve potential savings on site stipends
- Increase patient compliance
- Get access to real-time and cleaner data with fewer falsified datapoints

Continuous monitoring could be used to:

- Predict potential issues by seamlessly transferring data instantly from IoT devices (e.g., inhalers, pacemakers)
- Collect information in real time
- Reduce the incidence of adverse events
- Empower patients with their own data

MARKET TECHNO IMPACT

Market and techno rationale:

- Sending apps and devices to patients at home: Thermometer patch (Tucky), Spirometer (SmartOne), Oximeter (Oxitone)
- Results: Live tracking of patient metrics, an improved relationship between patients and medical staff
- NeuroPace has developed a surgically implanted device to prevent seizures. The implant autonomously monitors neuronal activity to identify and prevent seizures. Results: reduced the incidence of epileptic seizures by 44% after its first year of use and 72% after 3 to 7 years.

TECHNOLOGIES

IoT
5G
AI

AUGMENTED DOCTOR

DIAGNOSIS

Many technological innovations aim at facilitating the work of doctors and reducing their administrative burden.

Several use cases have been identified and tested already. Following are some of the notable use cases:

AI has empowered conventional imaging approaches, including CT scans and X-rays, to meet the increasing challenges by providing detection accuracy and reliability. Recently, deep learning models, the core algorithms of AI, have been used to develop a thoracic CT image analysis system that can automatically detect COVID-19 patients and quantify the disease burden

Online healthcare services have been utilized to provide treatment to patients at home with mild COVID-19 and to provide information about the symptoms and prevention of the disease to all patients. Telemedicine services have also been recently expanded for the medical management of mild non-COVID-19-related issues. Telemedicine services are vital as they decrease the number of hospital visits and free up hospital resources

MARKET TECHNO IMPACT

Market and techno rationale:

- Ericsson
- King's College London
- VirtualiSurg
- SimforHealth
- Microsoft…

TECHNOLOGIES

5G
AI
IoT
AR/VR

Why now:

- 5G is expected to deliver seamless connectivity and guaranteed levels of performance including low latency, high throughput, and reliability, which will make all this possible in the coming years

4. FOCUS ON USE CASES AND ASSOCIATED TECHNOLOGIES

CUSTOMIZED MEDICINE

TREATMENT

Providing customized medicine is the key to reducing the cost of treatment and improving its efficiency; several use cases have been identified in this regard:

- AI to improve health diagnosis
- 3D printing could hold the key to this issue by significantly improving the level of customization that can be achieved in medication. When the technology is mature enough, it may very well be possible that each patient takes different medication based on their own specific needs. 3D printing also makes it possible to develop pills with a sophisticated mechanism that once ingested can release their active ingredients at different times.
- Use of quantum computing to help customize the "diagnosis path" of every individual, wherein the results of each test determine the next set of tests to be carried out and when they should be carried out.

MARKET TECHNO IMPACT

Market and techno rationale:

- Median Technologies is a company that offers an end-to-end solution to healthcare professionals to help them diagnose their patients
- Boxcat and Qnami are two startups that leverage quantum computing to enhance image analysis; they target medical imaging industries
- Multiply Labs uses 3D printing to make pills that contain multiple compartments releasing active principles at different times

TECHNOLOGIES

Quantum, IoT, AI, 5G, 3D Printing

Why now:

- AI maturity has been improving every year, making it possible to deliver initial results and commercial applications

DIGITAL AND REMOTE SURGERY

TREATMENT

Many technological innovations aim at facilitating the work of doctors.

Several use cases have been identified and tested already. Following are some of the notable use cases:

- The world's first remote surgery, about 50 km away, was tested in China
- The use of AI and machine learning to enable the computer to understand surgical procedures, predict what happens next and guide the surgeon thanks to visual recognition. Decrease in the rate of hospital readmission within 30 days of discharge
- Development of an immersive, interactive, and collaborative platform for training health professionals
- Development of haptic gloves used in remote surgeries to feel what the robot is touching in real time

MARKET TECHNO IMPACT

Market and techno rationale:

- Development of haptic gloves with Ericsson and King's College to get touch feedback from sensors on robot arms
- Training platform developed by SimforHealth and Virtualisurg
- Digital Surgery developed in partnership with Microsoft

TECHNOLOGIES

IoT, Robotics, 5G, AI

Why now:

- The various applications of these technologies have been successfully tested over the years and now need to be scaled up

4. FOCUS ON USE CASES AND ASSOCIATED TECHNOLOGIES

CONNECTED HOSPITAL

HEALTH CENTER MANAGEMENT

Decrease the administrative burden in hospitals, optimize costs, and increase efficiencies with IoT and 5G solutions. Two main categories of use cases have been identified for connected hospitals.

Decreasing the administrative burden:

- Reduce travelling for patients (Telemedicine)
- Increase and ease communication between patients and doctors (5G)
- Accelerate administrative processes through eConsent and other initiatives

Smart buildings (data and automation):

- Smart infrastructure technologies can help reduce maintenance and energy costs, while increasing energy resilience
- Room automation allows staff to have full control of their workspace with access control, lighting adjustment, temperature setpoints, and airflow control

MARKET TECHNO IMPACT

Market and techno rationale:
UK's National Health Services (NHS) has integrated telehealth and telemedicine into their healthcare services

- Patients can access their medical information through the NHS App, remotely connect with doctors, check their symptoms using the virtual assistant, do all this and more from the comfort of their homes
- Results: this new digital service is expected to replace 30 million clinic visits a year

TECHNOLOGIES

IoT

5G

Why now:

- Smart hospital solutions focus on optimizing cost and energy efficiencies, improving patient outcomes, increasing staff productivity, or complying with changing regulations

REMOTE PATIENT MONITORING

CROSS-FUNCTIONAL USE CASE

Ensure patient monitoring and personalized care via connected objects and teleconsultations through IoT and 5G:

- Remote consultation: Improve patient experience by reducing patient travel and consultation delays
- Real-time monitoring and notifications: Improve patient experience by sharing live metrics and using lighter devices
- Chronic diseases and post-operative follow-up: enable 24/7 real-time status monitoring of the patient's reaction to medication
- Provide AR/VR Therapy

Data will be at the heart of patient monitoring that medical professionals will be able to analyze using mobile-connected sensors supported by cloud services

MARKET TECHNO IMPACT

Market and techno rationale:
Many startups are already working on these innovations:

- Doctolib
- Think Biosolution
- Doctor On Demand
- Kry
- …

TECHNOLOGIES

IoT

Cloud / Edge

5G

Data analytics

Why now:

- COVID-19 has accelerated the deployment of remote patient consultations

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