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Revolutionizing Healthcare With 5G

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Abstract

This paper discusses the impact of latest telecom communication standard like 5G on the future of healthcare and how it will digitally transform preventive, routine diagnostic checkup and therapeutic care. At the core of the discussion would be the breath of applications encompassing Big Data, Wearable devices, IoT and Analytics; all of which would disrupt and transform the healthcare value chain. Everything from resource efficiency, convenience and security would drive telecommunication operators to explore and penetrate the healthcare ecosystem.

Keywords: Healthcare, 5G, AI, IoT

1. Introduction to the 5G Ecosystem

Our "need for speed" has put automobile, aviation and telecom industry on tenterhooks. As per Gartner (Liam Tung, 2017), 20.8 billion devices would be connected to the internet by 2020. This number stands at only 6.4 billion as of now. Telecom companies have just a little over a year to bridge this gap. And that calls for a new paradigm of connectivity. This is where 5G comes into the picture.

There's a huge speculation (not without any reason!) about 5G becoming the de facto standard for wireless network speed. Businesses and consumers are gradually getting a feel of the future 5G networks. As per (Tom Chitty, 2019) CNBC news, the massive and aggressive development in China is driving much of the early adoption of 5G. This is expected to result into 1 billion global consumers on 5G speed by 2030.

Here are a few predictions (Hung, 2017) related to 5G and how it will affect business and individuals:

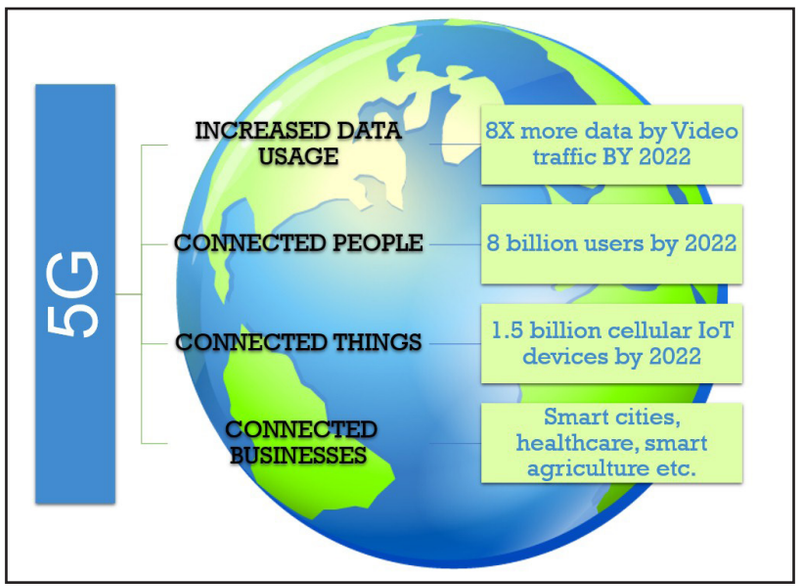

Fig. 1: 5G Ecosystem

5G is not just a small upgrade in the upload/download speeds. Just to give some perspective, today the average US home enjoys download speeds of approximately 6.5 megabytes/second but 5G will provide them the speed of 500 megabytes/second. It's the sheer speed of the network that has immense applications.

This phenomenal speed that 5G promises will potentially change the ways organizations manage their day to day communications internally and externally with their customers. In near future, business communications and operations are expected to be more efficiently managed by leveraging mobile technology.

In this paper, we will talk about at some of the most important changes 5G will bring to the healthcare industry.

2. 5G Transforming the Future of Healthcare

The Healthcare system is confronted with abundant challenges spread across data management, lack of expert workforce, connectivity, infrastructure and lack of real time monitoring framework. A study shows that 40% of the countries have less than 1 doctor available per 1000 population. The statistics is worse for hospital beds per patient (Krishna Rao, n.d.).

Issues like connectivity, available bandwidth, network speed, available spectrum and lack of dedicated network slice for healthcare are impediments to improving the quality of healthcare and life.

Communication technologies have a come a long way in being able to support real-time healthcare needs. This was not possible when the first-generation cellular systems using analog signal transmission came on the scene. Data speed of less than 10 Kbps had no application in healthcare. Then came the digital signal processing based 2G network. This was that time when healthcare applications started getting explored. It was possible to transmit voice and other data (in compressed format) through TDMA, CDMA, GSM and iDEN algorithms. But healthcare needed more than 2G to be usable. 3G and 4G were the ones where healthcare saw applications. With the advent of millions or connected devices and need to real-time data, even 4G was not enough.

We are on the verge of a massive healthcare revolution and it would be driven by 5G. The convergence of myriad technologies (5G, Smart Sensors & AI) is going to change the healthcare ecosystem. It is going to transform the way people comprehend health, diagnose and deliver treatment and to expand the network of people who need access and the experts.

The key here is the data and how to access to it is fast or easy. As per research data (Gemalto Publications, 2018), healthcare contributes to about 30% of the world's data and needless to mention, its increasing as medical technology gets more advanced. 6.5 We believe that this data, combined with 5G and AI can help in unleashing insight from data. Healthcare is about to get wings of predictive and proactive prognosis and diagnosis.

The last healthcare revolution saw the advent of telehealth and remote home monitoring systems. These systems are still prevalent now and are exploding. People in remote or rural areas with limited access to healthcare (when they need it most) get access to consultations and treatment over a video call and even send prescriptions or imaging device output. This has resulted in congestion and lag in network speed. As the number of patients seeking remote consultations increase, the network is the first casualty. The problem compounds as more and more connected devices get added and the Internet of Things (IoT) technologies create devices that create more data. Here is when 5G would come to the rescue. Here are a few areas that benefit from the advent of 5G technology:

- *Expanding the Horizon of Telehealth:* As per Market Research Future, the telehealth industry is set to grow at a GAGR of 16-17% from 2017 to 2023 (Market Research Future Publications, 2018). This also means that more people in rural areas would have access to healthcare. This explosion can only be supported by 5G that would allow real-time HD video consultations. This would result in people getting access to specialist as and when they need it.

  5G comes to help when high quality imaging files are involved. MRI, CAT and other healthcare imaging systems generate huge sized image files. If they can be transmitted to specialist for consultations and advice, both individuals and hospitals can benefit by saving precious time during emergencies.

  Capture Proof is one such company that has taken telehealth to the next level. It provides a HIPAA compliant solution for patients & providers to communicate through sharing of photo/video with the entire care team. In India, 'mfine ONE' is an AI driven, on-demand solution that provides access to physicians (Capture Proof, n.d.).

- *Real Time Monitoring Device Getting More 'Real':* IoT technologies enable wearable devices to send health related information to experts for getting personalized care. The number of wearable devices is going to increase as they become more capable of helping doctors take quick (and sometimes lifesaving) decisions. With 5G, the ever increasing IoT devices can be supported and would help in improving the quality of healthcare services.

  ADAMM manufactures wearable technology to monitor asthma. It includes a wearable device, a smartphone app and a portal to detect and treat asthma. Health Patch MD has come up with a skin patch-based technology for healthcare professionals to keep tabs on the vital information of their patients. iTBra by Cyrcadia Health is a smart bra helps keep track of breast health. It has embedded sensors that keep track of the conditions and rhythms in the breast tissue to alert the possibility of breast cancer (Health Care Originals, n.d.).

- *AI Powered Healthcare:* As previously mentioned, 30% of the world's data is healthcare related. This data is getting richer by the day and most of it would be useless if experts can't derive any insights from it. Artificial Intelligence can work on this data (most of it are located remote) and make the right medical decision. With 5G, AI tools can run on the smallest of devices and help healthcare experts predict, diagnose and treat ailments.

  IMB is at the forefront of using AI for healthcare. Launched 3 years ago, IMB launched Watson Health that brought the power of AI to help medical and healthcare professionals take on the biggest healthcare challenges. Amongst many use cases, the following are the ones that stand out:

  - Helping diabetic and non-diabetic people manage their glucose levels.
  - Helping in cancer related clinical decision making with a suite of oncology products.

IBM Watson leverages the power of AI and data to inform the daily decisions doctors make in treating cancer. These data points could be in various formats (video, images, data etc.) and require 5G for reaching the right people at the right time (IBM Watson, n.d.).

Apart from the ones mentioned, there are various other areas of healthcare that would get transformed. Think of how healthcare can be improved or dispensed with Virtual Reality and Augmented Reality? Networking Hardware companies like ZTE and Huawei are making substantial strides in development of several components of 5G that would possibly do away with bulky computer terminals and make healthcare VR and AR practical on a large scale (J.C. Kuang, 2018).

One such application, BioflightVR's pediatric trauma simulations, combines rich 3D models and AI-powered curriculum customization to simulate real-world conditions which can be experience by healthcare professionals using AR and VR. 5G is poised to open a new chapter in healthcare, wave particle by wave particle (Bioflightvr, n.d.)!

3. Key Trends and Technologies - 2019 & Beyond

5G will not only make consumers' lives easier and provide them the speed that they dreamt off; it will also enable businesses to become far more efficient. Newbie technologies like - AI, 5G and the IoT are top on the list to transform nearly every industry in near future.

To put it in the words of Brain Modff, EVP Qualcomm:

"We spent the last 30 years connecting people.
We will spend the next 30 years connecting things".

Let's look at the Technology Trends of 2019 & beyond from the report captured by CES (Pete Pachal, 2019).

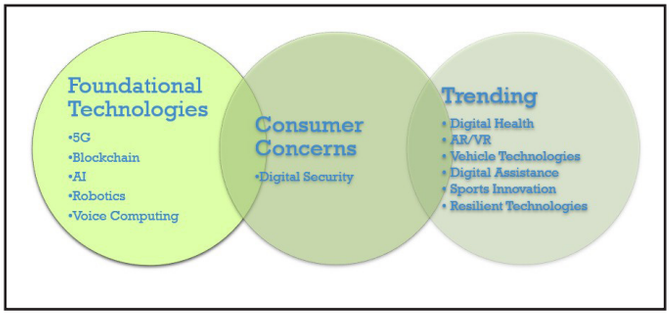

Fig. 2: Technology Trends of 2019 & Beyond

Expanding connectivity will be the focus of the next era. Bear in mind, 4G came to the market only in 2010 and it already accounts for more than 50% of the connected market in the developed nations.

Industry reports suggests that global mobile data consumption is projected to reach 49 exabytes in 2021 from 0.3 exabytes back in 2010 (Cisco Publications, 2014).

Connectivity will further bring lot of behavioral shifts of how we use technology today. YouTube is the world's second largest search engine today - it has 3 billion users per month, out of which 1 billion are unique users (Mushroom Networks Publications, n.d.). More than 100 videos are watched every minute (Mushroom Networks Publications, n.d.). Today YouTube is bigger than Bing, Yahoo, Ask and AOL (Mushroom Networks Publications, n.d.).

Tech companies across the globe are watchful of the trends & progress of 5G - a new video sharing Chinese app called TikTok, is gaining lot of market momentum. Facebook is not behind; they have built Lasso (a video sharing app) to capitalize on the market share of TikTok (Lasso by Facebook, n.d).

5G is being piloted in many cities in 2019 before it's official launch in 2020. It will allow people to view high quality video without any latency or buffering. This is expected to revolutionize Robotic surgeries and have more success stories of digital healthcare in the near future. Apart from high connectivity, 5G will also increase the amount of meaningful data being captured from sensors through wearable devices, leading to proliferation digital healthcare sector and discovery of newer drugs. All of these in turn is expected to improve the modern healthcare sector and improve human lives across the globe (Caitlin McGarry, 2019).

In this context, below is a sneak peak of 5G development around the world (Corinne Reichert, 2019):

Information Source: CES

Fig. 3: 5G Progress Around the Globe

4. Conclusion

The rise of 5G technology represents a vital expansion role of 5G radio network mobile technologies in the wider economy to drive more efficiency. 5G will aid the Mobile technology to transition from an enabling technology to a transformative, general purpose technology across industry verticals. The health care sector is a perfect example of this transition. The dependability and omnipresence of 5G networks, in conjunction with the role of such networks in empowering "computing at the edge", will directly enable the personalization of health care. The personalization of health care means "more prevention", "more precision", improving patients' quality of life, improving health outcomes and reducing costs to the health care system. 5G will enable considerable advancements in health informatics and thus empower both new business opportunities and significantly enable "outcome-based" health care model - the much needed one.

Every disruptive technology has its own set of challenges. Needless to say, 5G technology's use in healthcare may have substantial issues to deal with. We can only hope

that the initial challenges are ironed out, but we really cannot predict the quantum of influence and the future of this revolutionary technology.

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