DIGITAL OUTLOOK
HEALTHCARE INDUSTRY

Infosys®

INTRODUCTION

Last year, Peloton, a technology company from New York that offers an exercise cycle fitted with a tablet-like device streaming virtual cycling classes, received US$325 million in funding. Mobile electronic health record (EHR) firm Modernizing Medicine raised a further US$231 million, which it will partly deploy into other areas, such as e-commerce and telemedicine. And Ada Health scored US$47 million for its chatbot and artificial intelligence (AI) enabled telemedicine app.

For those in the business of digital health, 2017 was a great year indeed. While estimates may differ about the number, all agree that in the past 12 months, digital health companies hauled in record-breaking funding to the tune of US$5 billion.

2018 promises more of the same, with analysts and industry participants anticipating telemedicine, big data analytics, AI, digital health interventions, and healthcare ecosystems to be the dominant themes this year. As the technology partner of several healthcare organizations around the world, Infosys has a keen interest in the developments unfolding in this space. Hence, late last year, we commissioned a survey of 1,000 senior decision makers from business and IT, from large organizations (with 1,000 employees or more and annual revenue of at least US$500 million)

in nine industries, including 115 respondents from the healthcare industry to hear their views on the digital technology trends that would make the greatest impact on their business over the next three years.

While identifying the key digital technology trends was the most important objective of the study, it was not the only one. The survey also sought to understand which digital technologies were in use within healthcare organizations and the broad purpose for which they had been deployed – improve existing operations, solve new problems, or create new opportunities. Another objective of the research was to ascertain how ready healthcare companies were to take advantage of the favorable digital technology trends of 2018 and beyond.

Finally, the study reviewed these findings against current and immediate investments in digital technologies to understand where the healthcare industry is placing its bets.

The research findings were supplemented with our own perspective on the healthcare sector and anecdotes about the happenings in the industry to produce this short but incisive report.

EXECUTIVE SUMMARY

- According to the healthcare companies surveyed, investing in technologies for big data analytics for predicting risk and the onset of health problems (73 percent), EHR systems modernization (57 percent), and remote hospital-like care delivery (49 percent) are the most commonly reported trends for the next three years which will make a positive impact on their organization.

- Cyber security (77 percent), big data analytics (72 percent), and AI (59 percent) are the three digital technologies being utilized the most by healthcare companies today.

- Healthcare providers plan to invest in digital technologies in the coming 12 months. EHR systems (68 percent) and big data analytics (61 percent) are currently receiving investments from most companies who consider them a trend in the coming three years.

- A majority of healthcare respondents said that their organization could improve both existing skills and technologies in preparation for implementing the top trends of the next three years.

TOP HEALTHCARE TRENDS FOR THE NEXT THREE YEARS

1 **BIG DATA PREDICTS AND PREVENTS**

2 **ELECTRONIC HEALTH RECORD SYSTEMS GET A MAKEOVER**

3 **HOSPITAL-CARE TURNS REMOTE**

A diverse set of digital trends, from the use of nanosensors in treatment to hospital-like care delivered remotely outside hospitals, entered the conversation. When asked to name the trends with the greatest positive impact on their organization in the next three years, the respondents mentioned the following (only those named by 30 percent or more are listed below, not showing the three most commonly chosen):

a. Investment in technologies for managing compliance as healthcare increasingly tends towards value-based care, outcome-based pricing, and bundled payments.

b. Investment in technologies for reducing operational cost, which is even more important in this new healthcare paradigm.

c. Technology investments to support patient education, with the goal of promoting good health practices and mitigating medical emergencies.

d. Telemedicine, enabling patients living in remote areas to access medical services over the Internet or smartphone, often at a much lower cost than a physical visit.

e. Nanosensors implanted in the body that diagnose medical conditions, sometimes well before physical symptoms show up.

f. Emergence of a platform healthcare economy where providers can collaborate and consumers can make better choices.

On average, each respondent from the healthcare sector had four trends in their list of what would make a significant positive impact on their organization in the next three years. Of these, the three trends that received most mentions – cited by 73, 57, and 49 percent of the respondents, respectively, as making a positive impact on the business – suggest that healthcare companies anticipated that digital technology would improve current processes as well as enable providers to adopt new practices in care delivery.

The use of big data and analytics to track patient behavior, learn risk patterns, and predict onset of unfavorable health conditions was voted the most important digital technology trend for the next three years, receiving a mention from 73 percent of the respondents.

Improvement and modernization of EHR systems came next, cited by 57 percent of the healthcare respondents. In third place was the remote delivery of hospital-like care outside of the hospital, which was mentioned by 49 percent of the respondents.

Which of the following trends will have the most positive impact on your organization within the next three years?

Big data and analytics to track patient behavior, learn risk patterns, and predict onset of unfavorable health conditions	**73%**
Improving and modernizing EHR systems	**57%**
Hospital-like care delivered remotely outside of the hospital	**49%**
Investment in technology for compliance management	**46%**
Investment in technology for operations cost reduction	**45%**
Investment in technology for patient education	**40%**

Investment in telemedicine	**40%**
Investment in nanosensors	**35%**
Participation in the platform economy to collaborate and innovate for better care management or allow patients to select health plans more intelligently	**34%**
Sustained digital engagement (using AI for automated conversations with patients)	**22%**
Don't know	**1%**
Average number of trends that will have a positive impact on respondents' organizations within the next three years	**4**

Let us discuss these top three most commonly reported trends in more detail.

1 Big data and analytics for prediction and prevention of health risks and medical conditions

Healthcare organizations are using analytics to predict a variety of outcomes from patient satisfaction, staffing needs, and clinical outcomes to hospital readmissions, diagnoses, and risk of disease. A 2017 survey of 223 providers and payers by the Society of Actuaries found that 89 percent of the providers currently used predictive analytics or planned to within five years, whereas 93 percent of the respondents said it was important to the future of their business.

Today the healthcare industry is awash with big data gathered from a variety of sources ranging from patient health records to sensor implants to wearable fitness trackers. It also has the technology to perform sophisticated analyses on this data to model risk factors, predict the onset of disease, or simply gain better insights into a patient's day-to-day health situation.

Going forward, big data will transform the way the healthcare industry monitors and treats patients; one big example is that the data generated by wearable and other medical devices will be directly incorporated into a patient's electronic health record. The next three years will see a significant progress in this direction.

2 An upgrade for the EHR

The traditional paper-based medical file is becoming obsolete as clinics and hospitals increasingly store and retrieve patient records electronically. With a variety of clinical and patient-generated data being used for diagnosis, treatment, and post-treatment care, the demands on health information management have also multiplied. Already grappling with new payment, revenue sharing, and accountability norms, the healthcare industry has its hands full.

In this scenario, the EHR is an indispensable tool in healthcare delivery, acting as the definitive source of patient information, serving the needs of a variety of authorized healthcare participants from doctors to pharmacists to insurance companies. Also, EHR-based quality measurement and reporting helps healthcare providers and payers to comply with the requirements of accountable care, pay for performance, and similar value-based compensation policies by enabling them to assess the quality of healthcare delivery using metrics that have been validated in clinical settings. Specifically, practitioners can enter real-time data using the EHR, which then reports the quality and cost of care delivered. EHR-based reporting will call for significant investment of resources but, if successful, would yield several benefits, including a dramatic improvement in the quality of healthcare (thanks to additional data from patients, such as the lifestyle factors or the degree of adherence to a medication regimen). It would also help in compensating healthcare providers based on the quality and the economic value of healthcare delivered.

However, at present, there still exist EHRs that do not track the contractual terms of pay for performance agreements or quantify the responsibility that a provider should bear for a certain healthcare delivery or outcome. Will 2018 be the year that this changes ubiquitously?

3 Remote healthcare for greater reach

A senior executive at the Healthcare Information and Management Systems Society (HIMSS) says that 98 percent of the patient outcomes are derived from events outside the doctor's office. This makes a very strong case for healthcare practitioners to be able to advise patients even when they are somewhere else. A typical scenario is that of a doctor who remotely monitors a heart patient's condition in real-time based on sensor data and takes pre-emptive action as soon as he spots an early warning indicator.

Analysts predict that by 2019, US$75 billion will be spent worldwide on IT (including hardware, software, telecom, and services) related to remote delivery of healthcare through means such as videoconferencing, mobile, email, etc. Telehealth will take more than 80 percent share in this revenue followed by mHealth.

How did the participants in the survey perceive remote healthcare delivery, which they included among the three most impactful trends for their business? When probed, they came up with two distinct interpretations – one, that hospital-like care would be delivered to the community with the help of video consultations and by enabling doctors and clinicians with access to data even when they were away from the hospital, and two, that doctors at specialty hospitals would offer expert advice remotely to other healthcare professionals rather than directly to patients.

Unfortunately, other research, namely a 2017 survey of 2,000 American adults on their interactions with healthcare providers, suggests that these scenarios may be further away because 80 percent of the people still use traditional channels of communication. But 2018 might well see the beginning of the practice of remote healthcare delivery.

AI, a significant miss

A surprising finding of our survey was that only 22 percent of the healthcare respondents included "sustained digital engagement, for example, using AI for automated conversations with patients" in their list of top trends. This is at variance with the expert opinion that the use of AI in healthcare is one of the digital technology trends to watch out for this year. Also note that several digital health initiatives that were funded last year were AI-based.

One of the important sub-trends under AI is the maturing of empathetic health interfaces – such as chatbots or smart virtual assistants – engaged in helping patients suffering from conditions such as stroke, depression, or advanced age. An example of such an interface is Mabu, an AI and Internet of voice-enabled platform from Catalia Health, which educates patients, enables health providers to share data, and helps patients to adhere to their medical regimen.

In 2017, empathetic interfaces were already counseling patients afflicted with a range of medical conditions from cancer and heart disease to addiction, depression, and stroke. This year, these interfaces are expected to venture further into rehabilitation of the depressive and the elderly.

Interestingly, as the next section reveals, AI is among the most deployed technologies in the organizations in our survey; perhaps it is being used for purposes other than digital patient engagement, and was therefore not included in the list of top trends.

DIGITAL TECHNOLOGIES THAT HEALTHCARE COMPANIES USE – CYBER SECURITY, BIG DATA ANALYTICS, AND AI

Healthcare organizations utilize about six digital technologies on average. The most deployed technologies in the industry are cyber security, big data analytics, and AI, in use at 77, 72, and 59 percent of the organizations, respectively.

Which of the following digital technologies does your organization currently utilize?

Cyber security	**77%**
Big data analytics	**72%**
AI (machine learning, deep learning, natural language processing, natural language generation, and visual recognition)	**59%**
Enterprise cloud	**53%**
3D printing	**43%**
Business process management solutions	**43%**
Internet of Things	**43%**
Enterprise service management solutions	**37%**
ERP and enterprise application implementation/modernization	**31%**
APIs	**30%**
Dev-ops and agile	**27%**
Mainframe modernization	**20%**
Blockchain	**19%**

For the healthcare companies in the survey, the most important purpose of implementing cyber security and analytics technologies was to improve existing business operations. In the case of AI, however, organizations were looking to solve new business problems (57 percent), and then, improve existing operations (53 percent). A substantial number of respondents (47 percent) also said they were using AI to create new opportunities.

When the following areas of digital technologies and solutions were implemented within your organization, was it to improve existing business operations, solve new kinds of business problems, or create new opportunities?

	Improve existing business operations	Solve new business problems	Create new opportunities	None of these
3D printing	68%	40%	40%	-
AI (machine learning, deep learning, natural language processing, natural language generation, and visual recognition)	53%	57%	47%	-
APIs	69%	46%	29%	3%
Big data analytics	66%	47%	40%	-
Blockchain	64%	41%	36%	-
Business process management solutions	66%	56%	28%	-
Cyber security	72%	53%	25%	-
Dev-ops and agile	58%	52%	35%	-
Enterprise cloud	64%	52%	44%	-
Enterprise service management solutions	69%	45%	38%	-
ERP and enterprise application implementation/modernization	67%	44%	56%	-
Internet of Things	51%	47%	49%	-
Mainframe modernization	87%	57%	35%	-

WHERE HEALTHCARE COMPANIES ARE INVESTING – EHR AND BIG DATA

Healthcare organizations plan to invest in digital technologies in the coming 12 months. Where is the healthcare industry putting this money? Are companies investing in disruptive technologies to bring totally new possibilities to life or only in tried and tested solutions that keep the business running?

More importantly, are the investments aligned with the trends deemed most significant in the next three years? To understand this, the survey asked the respondents whether they were investigating or investing in the top three trends they had named as having the most impact on their organization in the next three years. Here are the findings.

Digital technology investments were quite in sync with the major digital technology trends for the next three years. Most respondents, who believe a trend will have a positive impact, said they were investing in improving and modernizing EHR systems (68 percent) and also in big data and analytics to track patient behavior, learn risk patterns, and predict onset of unfavorable health conditions (61 percent). Note that these two were at the top of the list of important trends for the next three years. The third trend, namely, delivering hospital-like care remotely was being invested in by 38 percent of the respondents. While this number might seem somewhat low, 50 percent of the respondents claimed they were investing in telemedicine, which is also a part of remote healthcare delivery.

Healthcare organizations are also showing interest in investing in the trends of the future. For instance, half of the respondents in the survey said they were investing in nanosensor body implants.

Is your organization investing in or investigating any of the top trends?

	Investing in this trend	Planning on investing in this trend	Investigating this trend	Not investing in, planning on investing in or investigating this trend
Improving and modernizing EHR systems	68%	22%	10%	-
Big data and analytics to track patient behavior, learn risk patterns, and predict onset of unfavorable health conditions	61%	24%	13%	1%
Investment in technology for patient education	58%	19%	23%	-
Investment in nanosensors	50%	39%	11%	-
Investment in telemedicine	50%	35%	15%	-
Investment in technology for compliance management	47%	32%	21%	-
Sustained digital engagement (using AI for automated conversations with patients)	45%	45%	9%	-
Investment in technology for operations cost reduction	43%	34%	20%	3%
Hospital-like care delivered remotely outside of the hospital	38%	54%	8%	-
Participation in the platform economy to collaborate and innovate for better care management or allow patients to select health plans more intelligently	38%	46%	17%	-

Healthcare respondents who believe that at least one trend will have a positive impact answered the question, "Which of the following technologies or solutions will your organization use in order to realize the promise of all of these trends?" by naming the same technologies that they were using the most, that is, big data analytics (75 percent), AI (75 percent), and cyber security (60 percent).

But overall, how equipped are they to implement these trends? When the survey asked the respondents if they had what it took to implement their top trend, majority said they possibly needed to improve their skills (92 percent) and their technologies further (85 percent).

IN CONCLUSION

After a heady 2017 when digital health initiatives received record funding, it will be interesting to see what lies ahead for healthcare in 2018 and beyond. According to the survey participants, it is big data analytics in the cause of predictive and preventive care, upgrades for the EHR, and the delivery of hospital-type care outside the hospital. The industry is already making the right technology investments to take advantage of these trends but, of its own admission, needs to do more to build up its technological resources as well as its skill sets.

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