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9B21M004

MICROSOFT: FOCUSING ON THE HEALTHCARE VERTICAL[[1]](#endnote-1)

Arpita Agnihotri and Saurabh Bhattacharya wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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As Microsoft Corporation (Microsoft) successfully turned around under the leadership of Satya Nadella,[[2]](#endnote-2) the focus of the company shifted toward industry verticals for business technology solutions and away from the company’s traditional horizontal clientele.[[3]](#endnote-3) In particular, Nadella focused on the healthcare vertical with regard to sales of Microsoft’s cloud computing, artificial intelligence (AI) (see Exhibit 1), and other technological services.[[4]](#endnote-4) By January 2020, healthcare was the most important vertical for Microsoft, and this prompted Nadella to consider healthcare to be a strategic partner.[[5]](#endnote-5) However, several challenges remained. For instance, doctors and consumers were unwilling to share data or to trust reports generated by machine learning, an aspect of AI.[[6]](#endnote-6) Due to security concerns, healthcare providers were unwilling to transfer sensitive patient data to the cloud. Moreover, although Microsoft invested in healthcare start-ups, it did so only in relation to data analytics companies. Unlike its competitors, such as Apple Inc. (Apple) and Google, LLC (Google), Microsoft was less aggressive in terms of acquiring start-ups.[[7]](#endnote-7) Would Microsoft be better off if Nadella had chosen not to focus on specific verticals but rather to offer standardized solutions to its horizontal clients? Should he concentrate on both standardized and customized cloud computing solutions?

**BACKGROUND**

In 2014, Satya Nadella became Microsoft’s chief executive officer (CEO), replacing Steve Ballmer. In 2017, the company began to prioritize six verticals: education, financial services, government, health, manufacturing, and retail.[[8]](#endnote-8) Microsoft clients such as **Starbucks Corporation, Chevron Corporation, Walmart Inc., Walgreens Company,** Bayerische Motoren Werke (BMV) AG**, Volkswagen, and Toyota Material Handling Group**usedMicrosoft’s Azure cloud computing platform, including the Internet of Things (IoT) and AI-enabled services, to accelerate their digital transformations.[[9]](#endnote-9) Peter Lee, who worked under two Microsoft CEOs (Ballmer and Nadella) and headed the healthcare vertical, stated that the most significant difference between Nadella and Ballmer was the way in which they thought about Microsoft as a company.[[10]](#endnote-10) Commenting on Nadella, Lee said,

He’s thought really differently about Microsoft’s business. He’s caused Microsoft to address vertical markets with more depth and expertise, pushed all of us to really focus on the future of the cloud, and [made] dozens of those profound changes that have put Microsoft in a position of being part of defining the future of digital.[[11]](#endnote-11)

Like those of other major technology companies, the percentage of Microsoft’s revenue from the cloud computing market was rising (see Exhibit 2).

Until 2017, Microsoft was principally a horizontal company, developing products for general purposes.[[12]](#endnote-12) In terms of its focus on verticals, Microsoft looked for ways to address specific problems in retail, manufacturing, healthcare, and the automotive industry. Lee said, “When Satya became our CEO, he thought [of] the future of transformation and evolution in tech intensity and thought [the company] would need to get deeper, violate the horizontal nature of Microsoft and get a little more vertical, and thinking about how Microsoft evolves to go deep.”[[13]](#endnote-13)

By January 2020,healthcare had become one of Microsoft’s highest priority verticals.[[14]](#endnote-14) The company’s product and research teams worked with their customers to develop cloud-based AI platforms. Their aim was to integrate information across healthcare providers, pharmacies, and payers “in ways that create personalized, community-based care networks.”[[15]](#endnote-15) Moreover, Microsoft’s corporate mission was to “empower every person and every organization on the planet to achieve more.”[[16]](#endnote-16)

Due to Microsoft’s intention to focus on the healthcare vertical, the company hired senior executives from the healthcare industry. Emma Walmsley, former CEO of GlaxoSmithKline plc, joined Microsoft’s board in 2019. Microsoft also hired former Samsung Electronics America executive David Rhew as its chief medical officer and vice president of healthcare, as well as Greg Moore, formerly of Google, as the corporate vice president of health technology.[[17]](#endnote-17) By 2018, Microsoft’s healthcare division was a multi-billion-dollar vertical with 1,100 employees and 168,000 clients.[[18]](#endnote-18) Between 2013 and 2017, Microsoft filed for 73 healthcare-related patents in the fields of AI and telehealth[[19]](#endnote-19) (see Exhibit 3).

**HEALTHCARE: THE CHALLENGES OF CLOUD COMPUTING**

In 2018, the global medical cloud storage industry was worth $10.1 billion,[[20]](#endnote-20) with its growth potential estimated to be 11 per cent per year.[[21]](#endnote-21) According to industry analysts, however, customizing cloud computing to meet a client’s needs was costly when compared with standardization.[[22]](#endnote-22) Dwight Davis, a technology consultant, stated,

Custom solutions, tailored to the precise needs of an application or user, can boost efficiency, productivity, and ease-of-use, but come at a premium price. Standard solutions provide economies of scale, greater compatibility, and lower prices, but the “one-size-fits-all” approach doesn’t always live up to the promise in its name.[[23]](#endnote-23)

Although Microsoft did not offer customized cloud computing services in the healthcare field until January 2020, transferring data to public clouds such as Microsoft Azure was expensive if not closely supervised.[[24]](#endnote-24) Yet, in doing so, companies were able to save money with regard to the costs of system maintenance and management, which they would have incurred if they used internal servers.[[25]](#endnote-25)

As robust secrecy and data privacy were essential in relation to healthcare data, a service provider’s reputation was a significant concern.[[26]](#endnote-26) Health systems were also reluctant to upload sensitive patient data to the cloud.[[27]](#endnote-27) Consequently, in 2017, less than half (40 per cent) of all United States (US) companies committed more than 10 per cent of their workloads to the cloud. However, 80 per cent planned to allocate more than 10 per cent of their data to the cloud by 2020.[[28]](#endnote-28) These intentions related to several significant challenges associated with the cloud (see Exhibit 4).

Microsoft Azure provided a comprehensive set of cloud services that offered developers, information technology (IT) professionals, and enterprises the flexibility to develop, deploy, and manage applications on any platform or device.[[29]](#endnote-29) Azure not only offered a secure environment for storing patient data, but also helped clients to analyze large patient datasets in order to predict and diagnose diseases using machine learning, AI, and other advanced cloud computing tools.[[30]](#endnote-30) For example, Microsoft offered to run healthcare chatbots on the Azure platform. Azure’s health products and services, such as AI and machine learning, provided healthcare practitioners with the opportunity to develop applications for any scenario and then to host them on the Azure platform.[[31]](#endnote-31)

By November 2019, Microsoft had partnered with US healthcare notables such as **Novartis International AG**, **UCLA Health**,and **Providence St. Joseph Health (Providence).**[[32]](#endnote-32)Through its new healthcare team, which was led by Lee, Microsoft sought to attract more health data to the cloud as well as to process such data in a meaningful way.[[33]](#endnote-33) This initiative resulted in Microsoft’s release of new tools, including Healthcare Bot, which was powered by AI, and the Azure application programming interface (API). The API used fast healthcare interoperability resource (FHIR) standards to allow for the secure transfer of data.[[34]](#endnote-34) Microsoft referred to the signing of cloud computing contracts with players such as Providence as a multi-year strategic alliance.[[35]](#endnote-35) Through that alliance, Providence’s 51-hospital system shifted its data to the Azure cloud, where its 119,000 doctors obtained access to Microsoft Office productivity software and collaboration tools.[[36]](#endnote-36) As Microsoft developed new tools for the healthcare industry, Nadella suggested that “machine learning tools could change the way health is given.”[[37]](#endnote-37)

However, the customization of cloud computing with regard to industry verticals was associated with a number of challenges. Customization decreased cloud computing interoperability, and it also resulted in the reduced utilization of assets.[[38]](#endnote-38) Clients were likely to benefit more from interoperability, as standardized solutions offered clients more control over data and enabled them to easily switch cloud computing platforms.[[39]](#endnote-39) Competitors such as Amazon Web Services offered a standardized version of cloud computing services, S3 standard. It had 99.9 per cent durability and a lower cost, although the retrieval of data took several hours.[[40]](#endnote-40) In terms of defining the specific attributes of standardized cloud computing solutions, 30 organizations worldwide were involved in the definitional process.[[41]](#endnote-41) Moreover, several emerging data analytics companies, such as Densify, saved money their clients would have spent on customized cloud computing solutions. They did this by conducting in-depth analyses and determining whether clients required customized or standardized cloud computing solutions.[[42]](#endnote-42)

**HEALTHCARE: THE CHALLENGES OF AI**

Gartner, Inc., a research and advisory company, estimated that the global AI-driven market had the potential to reach $3.9 trillion by 2022, when 90 per cent of US hospitals would be driven by AI.[[43]](#endnote-43) Due to its precision and accuracy, AI was likely to reduce the cost of healthcare in addition to improving healthcare management.[[44]](#endnote-44) AI had a broad spectrum ofapplications in the healthcare field, ranging from medical hardware in emergency rooms (such as surgery robots) to assistive patient care (such as tools for monitoring or assisting in recovery) and several related alternatives.[[45]](#endnote-45) Microsoft’s Healthcare Bot, for example, helped organizations to create AI-powered compliant virtual assistants and chatbots for several healthcare-related purposes.[[46]](#endnote-46)

As part of a precision medical solution, Microsoft wanted to use patients’ genetic and lifestyle histories to predict healthcare solutions. In 2018, in a project in partnership with the biotech start-up Adaptive Biotechnologies, known as the Antigen Map, Microsoft decided to sequence the T-cell repertoires of 25,000 patients.[[47]](#endnote-47) Microsoft’s machine learning technologies translated the T-cell receptor (TCR) sequences into the antigens they recognized. Information concerning the antigens targeted by the T-cells provided the basis for diagnosing cancers, infections, and autoimmune diseases.[[48]](#endnote-48) Microsoft sought partners in the healthcare industry willing to share such data.[[49]](#endnote-49)

In Project Premonition, Microsoft estimated the bacteria and viruses found in sequenced environmental samples using both machine learning and an extensive database of reference genomes.[[50]](#endnote-50) The technique tested for all known sequenced pathogens, and it detected related viruses and bacteria that could potentially spread disease. In 2016, to trace the life cycle of the Zika virus (carried by mosquitoes), Microsoft collaborated with Harris County Public Health in Houston to test technology related to robotics, genomics, and related fields.[[51]](#endnote-51) Microsoft found that robot field biologists could be trained to identify and selectively capture carrier mosquitoes with a high degree of accuracy (> 90 per cent). The genomic analyses performed by Microsoft were able to detect microorganisms and viruses in mosquitoes as well as to identify the types of animals on which they fed.[[52]](#endnote-52)

As healthcare records in the US were highly regulated, Microsoft’s principal challenge involved gaining access to patient data.[[53]](#endnote-53) Such data were required to design, develop, and further validate a safe and effective AI-enabled solution for clinical applications.[[54]](#endnote-54) Microsoft partnered with clients such as Providence to retrofit Azure with new technology, including natural language processing and machine learning tools.[[55]](#endnote-55) For several hospitals, however, the process was further complicated by the fact that patient data did not exist in an entirely digital form.[[56]](#endnote-56)

In addition to patient data, Microsoft also needed to understand the process of disease diagnosis in order for its AI to be able to perform that process. However, doctors were not ready to share such critical details.[[57]](#endnote-57) There were also issues concerning reliability, known as “black box difficulty.” Stakeholders were skeptical because it proved challenging to understand the technical workings of AI. For example, how does a system reach conclusions? Could those conclusions be used as the basis for patient treatment?[[58]](#endnote-58) Moreover, patients were unwilling to accept diagnoses and treatments from machine-learning-based AI (see Exhibit 5). They believed that machines could not offer customized solutions to the diseases affecting every unique patient.[[59]](#endnote-59) Industry experts also argued that machine learning could lead to the loss of diagnostic skills in doctors, while only a few experts believed that such technology would increase diagnostic accuracy.[[60]](#endnote-60)

**MICROSOFT’S INTERNET OF MEDICAL THINGS (IoMT)**

In 2018, the global Internet of Medical Things (IoMT) market was valued at **$44.5 billion,** and it was expected to reach **$254.2 billion** in 2026.[[61]](#endnote-61) The market consisted of medical devices such as the electrocardiogram (ECG) as well as smart wearable devices such as smartwatches and sensor-laden smart shirts. In fact, smart wearable devices represented **27 per cent** of the IoMT market in 2018.[[62]](#endnote-62)

Microsoft Azure’s IoMT solution helped healthcare organizations to reduce the time required to market their solutions by quickly connecting data from medical devices to other sources of health records. This connectivity was offered in a standard data format.[[63]](#endnote-63) The Azure API for FHIR helped healthcare organizations to improve their data interoperability. For example, health records could “connect to collaboration tools, pharmacy systems, fitness devices and others far more seamlessly. Data and insights from this more connected system can then be served up when and where they’re needed most.”[[64]](#endnote-64)

**INVESTMENT IN START-UPS**

Digital start-ups in the healthcare field were booming.[[65]](#endnote-65) Start-ups operated in several areas, including medical devices, genomics, electronic health records, and IoMT.[[66]](#endnote-66) Microsoft also invested in digital healthcare start-ups as part of its accelerator or incubator programs. Examples included Microsoft ScaleUp and Microsoft AI Factory. These programs worked actively with early-stage digital health start-ups,[[67]](#endnote-67) whereas Microsoft’s venture arm, M12, participated in late-stage funding, such as a start-up’s pre-IPO (initial public offering) round.[[68]](#endnote-68) However, most of Microsoft’s investment in digital start-ups focused on data management, analytics, and genomics companies.[[69]](#endnote-69) For instance, Innovaccer Inc. (Innovaccer) was one of the start-ups in which Microsoft participated in late-stage funding through M12. Innovaccer offered revolutionary technology streams rich in analytics, and it also provided custom insights and dashboards for real-time decisions by healthcare practitioners.[[70]](#endnote-70) Other leading tech companies invested in digital start-ups and acquired them—for example, Senosis Health, acquired by Google,[[71]](#endnote-71) as well as Gliimpse and Beddit, acquired by Apple.[[72]](#endnote-72) In 2012, Microsoft launched a healthcare joint venture with General Electric (GE) known as Caradigm.[[73]](#endnote-73) In 2016, however, Microsoft sold its stake to GE but continued work with Caradigm as a partner.[[74]](#endnote-74) By 2017, Microsoft had divested itself of several such healthcare assets.[[75]](#endnote-75)

**MICROSOFT’S PARTNERSHIPS WITH HEALTHCARE PLAYERS**

In 2019, Microsoft allied with Walgreens Boots Alliance (WBA), a global leader in retail and wholesale pharmacies. After three years of negotiations, WBA considered trust to be the key reason why it chose Microsoft as a strategic partner.[[76]](#endnote-76) Nadella said,“They went through a pretty rigorous process of really finding the right partner who can bring both world-class technology, but also that trust, in order to be able to help them build this ecosystem.”[[77]](#endnote-77) Further explaining the collaboration, Nadella commented, “They needed to find a partner who on the technology side has the capability to do that ecosystem orchestration and is trusted.”[[78]](#endnote-78) Microsoft and WBA were expected to participate in joint research and development (R&D) activities. Aside from such activities, WBA would continue to avail itself of the IT infrastructure provided by Microsoft Azure. Further, using Microsoft 365, including Office and Windows, would render that IT infrastructure accessible to more than 380,000 employees of WBA.[[79]](#endnote-79) As part of its R&D process, WBA used HoloLens, a mixed-reality technology developed by Altoura, Microsoft’s partner, to develop three-dimensional (3D) store models. The 3D model had the potential to teach WBA employees “how to restock products, determine if an onion or banana is past its prime, help customers redeem grocery coupons, and deal with unfamiliar service situations.”[[80]](#endnote-80) Steven Lamontagne, vice president of physical design and formats at WBA, said, “By using a 3D model for the store, a team member gets to see what the future is going to be like after their store’s remodelled, and they’re immediately within that new physical environment.”[[81]](#endnote-81)

**THE ROAD AHEAD**

In January 2020, Microsoft announced the launch of AI for Health, a five-year, $40-million program aimed at helping healthcare organizations to leverage AI and machine learning in order to boost global patient health.[[82]](#endnote-82) AI for Health was a philanthropic initiative that brought researchers, not-for-profit organizations, and healthcare organizations together to accelerate medical research and target health inequities.[[83]](#endnote-83) As Microsoft was leveraging its technological advancements to accomplish its healthcare mission, it faced several challenges. Given that enterprises were not shifting the majority of their data to the cloud,[[84]](#endnote-84) Nadella had to decide whether the company’s focus on verticals remained the best approach. What would Microsoft’s cloud computing strategy be if he continued to focus on vertical markets? How could the challenges associated with AI in the healthcare field be overcome? Finally, what role would Microsoft’s client partners play under the preferred strategy?

**EXHIBIT 1: KEY TERMS**

|  |  |
| --- | --- |
| **Cloud Computing** | “[The] on-demand delivery of IT resources over the Internet with pay-as-you-go pricing. Instead of buying, owning, and maintaining physical data centers and servers, you can access technology services, such as computing power, storage, and databases, on an as-needed basis from a cloud provider.”i Microsoft Azure and Amazon Web Services are examples of cloud service providers. |
| **Artificial Intelligence (AI)** | “[The] ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.”ii Organizations make investments in AI to achieve one of the following objectives:   1. Build systems that think exactly like humans do (“strong AI”) 2. Just get systems to work without figuring out how human reasoning works (“weak AI”) 3. Use human reasoning as a model but not necessarily the end goal.ii |
| **Application Programming Interface (API)** | “[A] set of definitions and protocols for building and integrating application software. API stands for application programming interface.  APIs let your product or service communicate with other products and services without having to know how they’re implemented. This can simplify app development, saving time and money.”iii |
| **Machine Learning** | “[The] science of getting computers to learn and act like humans do, and improve their learning over time in autonomous fashion, by feeding them data and information in the form of observations and real-world interactions.”iv |
| **Internet of Things** | “[The] concept of basically connecting any device with an on and off switch to the Internet (and/or to each other). This includes everything from cellphones, coffee makers, washing machines, headphones, lamps, wearable devices and almost anything else you can think of.”v |
| **Precision Medicine** | “[An] emerging approach for disease treatment and prevention that takes into account individual variability in genes, environment, and lifestyle for each person.”vi |
| **Natural Language Processing** | “[A] form of AI that extracts meaning from human language to make decisions based on the information.”vii |

Source: “What is Cloud Computing?,” Amazon Web Services, March 22, 2013, accessed June 20, 2020, <https://aws.amazon.com/what-is-cloud-computing/>; ii “The Key Definitions of Artificial Intelligence (AI) that Explain Its Importance,” *Forbes*, February 14, 2018, accessed June 20, 2020, www.forbes.com/sites/bernardmarr/2018/02/14/the-key-definitions-of-artificial-intelligence-ai-that-explain-its-importance/#3dbfcc2c4f5d; iii “What is an API?,” Red Hat: Integration, October 5, 2017, accessed June 20, 2020, www.redhat.com/en/topics/api/what-are-application-programming-interfaces; iv Daniel Faggella, “What is Machine Learning?” EMERJ, February 26, 2020, accessed June 20, 2020, <https://emerj.com/ai-glossary-terms/what-is-machine-learning/>; v Jacob Morgan, “A Simple Explanation of 'The Internet Of Things',” *Forbes*, May 13, 2014, accessed June 20, 2020, www.forbes.com/sites/jacobmorgan/2014/05/13/simple-explanation-internet-things-that-anyone-can-understand/#52ffd8891d09; vi “What is Precision Medicine?,” Genetics Home Reference, April 28, 2015, accessed June 20, 2020, <https://ghr.nlm.nih.gov/primer/precisionmedicine/definition>; vii Bernard Marr, “5 Amazing Examples of Natural Language Processing (NLP) in Practice,” *Forbes*, June 3, 2019, accessed June 20, 2020, www.forbes.com/sites/bernardmarr/2019/06/03/5-amazing-examples-of-natural-language-processing-nlp-in-practice/#6c25971b1b30.

**EXHIBIT 2: DISTRIBUTION OF CLOUD COMPUTING MARKET REVENUES WORLDWIDE BY COMPANY (%) (2015–2019)**

Note: Microsoft Corporation (Microsoft), Amazon.com, Inc. (Amazon), International Business Machines Corporation (IBM), Salesforce.com, Inc. (Salesforce), Google LLC (Google), Oracle Corporation (Oracle).

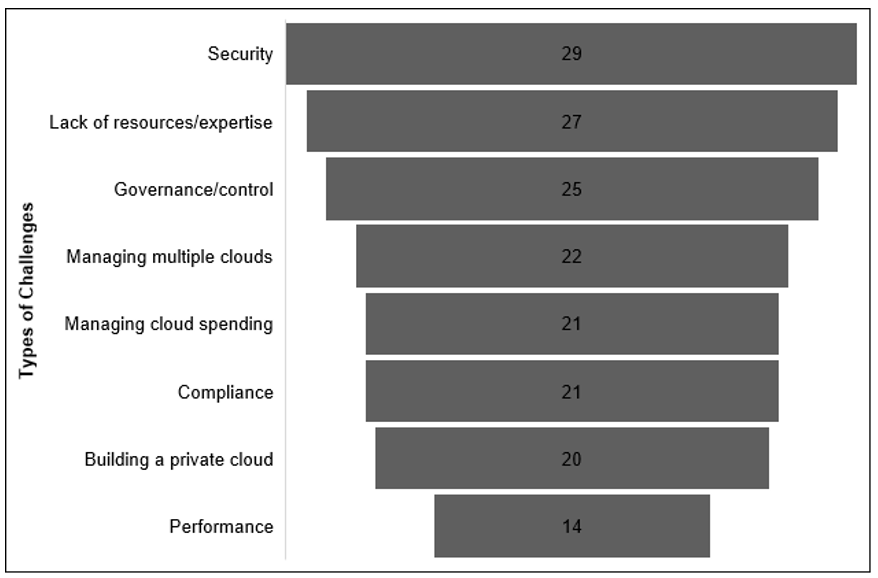
Source: Adapted from Arne Holst, “Distribution of Cloud Computing Market Revenues Worldwide from 2015 to June 2019, by Vendor,” Statista, March 2, 2020, accessed June 20, 2020, www.statista.com/statistics/540511/worldwide-cloud-computing-revenue-share-by-vendor/.

EXHIBIT 3: PATENT APPLICATIONS BY ALPHABET, APPLE, and MICROSOFT

Note: Alphabet Inc. (Alphabet), Microsoft Corporation (Microsoft), Apple Inc. (Apple).

Source: Ernst & Young, “When the Human Body Is the Biggest Data Platform, Who Will Capture Value? Pulse of the Industry 2018,” 18, March 13, 2018, accessed June 20, 2020, https://invivo.pharmaintelligence.informa.com/-/media/supporting-documents/in-vivo/2018/ey\_lifesciences40\_brochure.pdf?la=en&hash=A8E6BA22F1474AEDCB641BC1CE087FCB8D4FAC96.

**EXHIBIT 4: SIGNIFICANT CLOUD CHALLENGES (%)**



Source: Adapted from Connectria, “Overcoming the Top Three Challenges of the Azure Public Cloud,” 4, 2018, accessed June 20, 2020, www.connectria.com/wp-content/uploads/2018/11/WP\_Azure\_120518FNL.pdf.

**EXHIBIT 5: SHARE OF US ADULTS WILLING TO SHARE HEALTH DATA WITH TECH COMPANIES (%) (2019)**

Note: Lyft Inc. (Lyft), Uber Technologies Inc. (Uber), Facebook Inc. (Facebook), Samsung Electronics Co Ltd. (Samsung), Apple Inc. (Apple), Amazon.com Inc. (Amazon), Microsoft Corporation (Microsoft), Alphabet Inc. (Google).

Source: Adapted from Conor Stewart, “Share of U.S. Adults Willing to Share Health Data with Tech Companies as of 2019,” Statista, May 12, 2020, accessed June 20, 2020, www.statista.com/statistics/1102292/share-of-us-adults-willingness-to-share-data-with-tech-companies/.

ENDNOTES

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