



IBM Watson: From healthcare canary to a failed prodigy

A case study in the "AI age" for business schools for decades

In the business world, it's really important to stay updated with the latest trends. One such big trend is the 'AI Race,' where tech companies are trying to be the best in the AI market. AI and ML are the most recognized technologies right now. In 2022, global AI software revenue surged to about \$62.5B, a remarkable 21.3% increase from the previous year.

To keep up with the trend many major tech companies like IBM, Salesforce, SAP, and Oracle are spending a lot on AI software for businesses:



Amazon

The top cloud computing company is **investing money into AI** - both to enhance its own business and to provide AI tools to external developers



Microsoft

The creator of the successful PC-era platform excels in cloud computing and AI. They have made their "deep learning" AI tech open-source to draw in developers



Google

The largest user of AI tech- in-house for tasks like search and self-driving cars, has made its ML AI, **TensorFlow, open-source**, gaining popularity among young developers



IBM

IBM, known as Big Blue, has **extensive connections** in the corporate sector and a wealth of **industry knowledge** to utilize AI tech



Salesforce

A trailblazer in cloud computing- recently launched its **AI platform** called **Einstein**. The current plan is to leverage AI into sales and customer service apps



Baidu

"China's Google" is **investing heavily in AI** in a drive led by Andrew Ng, a deep-learning star formerly at Google

A glimpse into IBM Watson

Flashback to 2015, IBM made several changes designed to more effectively align its key capabilities and resources to its strategic imperatives. One of these was Watson Health Cloud - an open platform- IBM's first business unit designed around a single industry involving a team of consultants, medical practitioners, clinicians, developers and researchers working with an extensive ecosystem of partners and clients to advance the quality and effectiveness of individual health with advanced data analytics and insights and help doctors diagnose and anticipate disease.

Watson Health was designed to recommend treatments that are tailored to individuals; and could have assisted researchers to predict and prevent the next generation of diseases.



IBM Watson, software capable of combing through **600,000 pieces** of medical evidence, **2M pages** of text from **42 medical journals** and **clinical trials** in the area of oncology research, and **1.5M patient records** to provide on-the-spot treatment recommendations to health care providers

According to IBM, **more than 90%** of the nurses who have worked with Watson followed the guidance the system gave to them.

But then something went wrong!

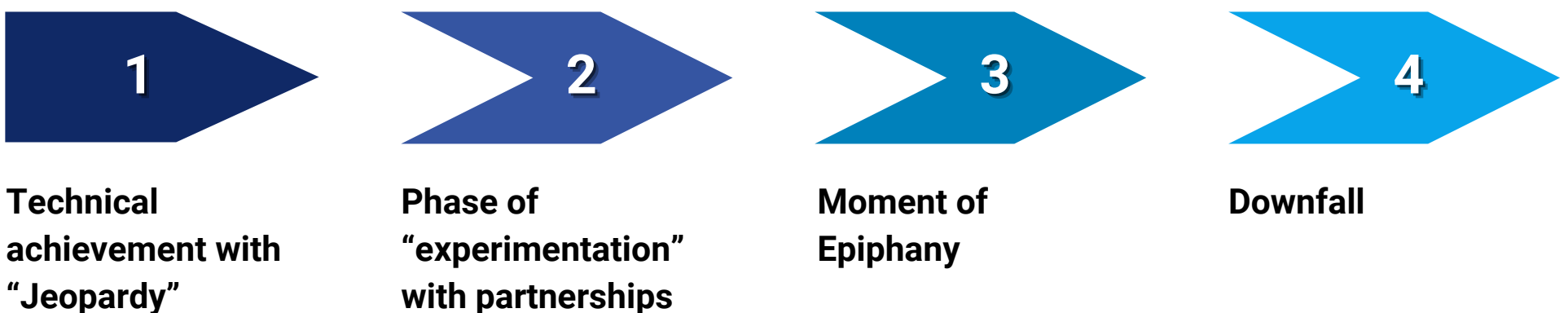
The rise and fall of IBM Watson: The most visible attempt to use AI

The tale began with the inception of Watson in 2006 when Mr. Ferrucci, the principal investigator, initially proposed the idea to his superiors at IBM's research labs. He envisioned creating a computer capable of playing a question-answer game, believing that it could advance the field of AI known as NLP, where scientists program computers to understand and analyze human language. Another research goal was to enhance techniques for automated question answering.

Over time, a team of more than two dozen scientists gathered to build Watson. It became a massive supercomputer that occupied an entire room, with thousands of processors running millions of lines of code. Its storage contained digital versions of reference materials, Wikipedia articles, and electronic books. This computing intelligence consumed 85,000 watts of electricity, while the human brain, in contrast, operates on the equivalent of just 20 watts

And that's how the journey began.

The story of Watson Health at IBM had 4 stages:



1. Technical achievement with "Jeopardy"

A decade ago, IBM's public confidence was unmistakable. IBM's Watson Health made a comparable and successful bet with its chess-playing Deep Blue computer, which defeated the world chess champion Garry Kasparov in 1997

2011

Inception

IBM Watson was first launched in 2011, when it competed on the television game show Jeopardy! and won against two former champions- Brad Rutter and Ken Jennings, winning the first place prize of \$1M

IBM initially saw Watson as the beginning of a tech revolution, especially in fields like healthcare, finance, law, and academia. They poured significant funds into promoting Watson as a versatile digital assistant, even calling it "the future of knowing." Watson's friendly encounters with celebrities and its appearance on "60 Minutes" made it the face of AI.

IBM believed that Watson would not only revolutionize industries but also rejuvenate the company, much like the mainframe computer did in the past, ensuring long-term growth and profitability.

Undoubtedly, there was a demand for Watson. However, IBM lacked substantial offerings to meet that demand- It had little to sell!

2. Years of “Experimentation” with partnerships

Since its launch, Watson Health revolutionized treatment, and started paving its the way for a new era of treatment. It has dropped \$4B on acquisitions and grown from having no dedicated staff to more than 6,000

IBM executives set out to explore ways to transform its moon shot- Watson, into a thriving business. One idea that repeatedly surfaced was to focus on healthcare.

Healthcare stands as the largest industry in the country, and global spending in this field continues to grow. It's a sector abundant in data, which is backbone of modern AI systems. Moreover, the societal benefits of healthcare innovation were also promising improved health and longer lives.

IBM began with cancer, looking for hospitals with lots of data. They wanted Watson to help sort and understand this data to make treatments better.

2012

Partnership with MD Anderson Cancer Center

Partnered with the aim to create a bedside diagnostic tool that would read patients' EHR, volumes of cancer-related scientific literature and then make treatment recommendations

2015

Acquisition of patient engagement platform

Acquired Phytel and integrated its patient engagement tool to analyze insights that nurses and other healthcare providers can use for patient care and monitoring



2015

Partnership with Apple and others to deploy big data

Watson Health unit deepened its partnership with Apple's HealthKit and ResearchKit data collection platforms, and added 5 partners, including Columbia Medical Center and Teva to deploy big data for the improvement of patient care and drug discovery



teva



2015

Expansion of IBM Health Cloud

Introduced IBM Watson Health Cloud for Life Sciences Compliance and the IBM Watson Care Manager

2012

Acquisition of Explorys

Acquired Explorys, that has built one of the largest clinical data sets in the world, representing more than 50M lives to strengthen IBM's healthcare analytics and cloud computing



2015

Partnered with UNC cancer center

UNC Lineberger, one of more than a dozen leading cancer centers partnered with IBM's Watson to accelerate DNA analysis and inform personalized treatment options for patients



2016

Acquisition of Merge Healthcare

IBM acquired Merge Healthcare in \$1B deal to view current and historical images, along with EHR, genomic tests, mobile health data and more to get a consolidated view of patients



2016

Collaboration with genome center

IBM Watson Health and the New York Genome Center collaborated to analyze genomic cancer tumor data that will be integrated into patient medical records and, ultimately, used to guide treatment strategies



2016

Acquisition of Truven Health Analytics

IBM to acquire Truven Health Analytics for \$2.6B to integrate its technology, methodologies and health claims data into the Watson Health Cloud over time, bolstering Watson Health



2016

Acquisition of Weather Company

Completed the acquisition of the Weather Company to serve as the foundation of the Watson IoT cloud platform



2016

Partnership with Veterans Affairs

Partnered to treat as many as 10,000 veterans with cancer; the technology was intended to be provided for free to the VA for two years to analyze genomic data, pinpoint potential cancer-causing mutations and identify potential treatments

2016

Collaboration with German doctors

Collaborated with doctors in Germany attempting to solve some complex medical cases at the University Hospital in Marburg



2016

Partnership with UPMC

Partnershiped with UPMC to improve supply chain performance, with Medtronic on the development of a new diabetes app, with the American Diabetes Association and with Thomas Jefferson University Hospitals to improve the patient experience, among others



- Through a partnership with IBM Watson, UPMC has created an independent supply chain management company, Pensiamo- to reduce supply chain costs



2016

Partnership with Siemens Healthineers

Underwent a 5 yr strategic alliance to jointly develop population health management tools to help provider organizations improve value-based care for chronic patients



2016

Collaboration with healthcare imaging providers and vendors

Announced the formation of a collaborative of 15 healthcare imaging providers and vendors to work to extract insights from previously 'invisible' unstructured imaging data and combine that with a broad variety of data from other sources.

2016

Collaboration with Best Doctors

Collaborated to make Watson available as health benefit to help employees fighting cancer



2016

Partnership extension with Teva

Extended partnership to work on chronic disease management- first on respiratory and CNS disorders


3. Moment of Epiphany

Hospitals had varying degrees of reliance on Watson for Oncology. Some with fewer specialists relied heavily on its recommendations, while others used it more in the background, like a research assistant whose main role is finding existing information

2017

MD Anderson expired its contract with Watson

4 years and \$62M later, MD Anderson let its contract with IBM expire before anyone used Watson on actual patients as it was unable to tap patients data, decipher doctors' notes and patient histories



When IBM partnered with UNC, it started getting known as Watson for Genomics. They wanted Watson to go through lots of medical papers and help with diagnoses in hopes of getting a new diagnostic tool. However, the difficulties soon became apparent considering the complexity, messiness and gaps in the genetic data at the cancer center. IBM eventually stopped Watson for Genomics.



Later, IBM also set aside another cancer product, Watson for Oncology, which they had developed in collaboration with Memorial Sloan Kettering Cancer Center. It turned out to be not useful or flexible enough to be a successful product and had many quality assurance gaps.



This project with the MD Anderson Cancer Center in Houston known as the "Oncology Expert Advisor," was terminated due to numerous challenges. When MD Anderson shifted to a new EHR system, Watson couldn't access patient data. Additionally, Watson had difficulties interpreting doctors' notes and patient histories, leading to physician frustration as they wrestled with the technology rather than focusing on patient care.



4. Downfall

IBM's missteps with Watson started when they focused on large and challenging projects with an immature technology and promised more than it could have delivered

2022

IBM's Watson Health sold for parts

IBM first explored a sale of the division in early 2021, with Morgan Stanley leading the process - at the time that the unit was generating roughly \$1B in annual revenue, but was unprofitable

IBM in 2022 sold Watson Health assets to investment firm Francisco Partners; The companies did not disclose financial terms of the deal, but according to Axio, IBM was seeking a price in the \$1B range

- The assets acquired by Francisco Partners include extensive and diverse data sets and products, including Health Insights, MarketScan, Clinical Development, Social Program Management, Micromedex and imaging software offerings
- Under new investment firm ownership, Watson Health reborned as Merative. It aims to offer its health data services to clients including health plans and employers, life sciences firms, imaging companies, government entities, etc.

What went WRONG?

According to IBM, the sale of Watson Health business will allow them to focus more on its platform-based hybrid cloud and AI strategy. However, in contrast, Oracle made a substantial \$28.3B acquisition by picking up the electronic medical records company Cerner, one of their biggest acquisitions to date. This move reflects the increasing involvement of major software and technology giants in the healthcare industry, including Microsoft's \$19.7B bid for Nuance and two private equity firms acquiring Athenahealth, a competitor of Cerner, in a \$17B deal.

Even after spending roughly \$4B in acquisitions to prop up the initiative and leveraging marketing resources of a major tech company, why Watson Health did not meet the expectations it had set for itself in terms of revolutionizing healthcare? According to Paddy Padmanabhan, founder and CEO of Damo Consulting, “Selling off the data assets essentially means an end to the Watson Health experiment. IBM had several missteps early on, especially in cancer care applications, that created significant setbacks for the business that they could not recover from”.

What were the **MISSTEPS** that led to IBM Watson's downfall? Where did it miss the mark?

- **MD Anderson's over-the-top promotion and hype:** IBM's salesforce oversold the economic benefits and capabilities of Watson, creating a gap in perception between the AI in the lab and the AI in the field. IBM's early emphasis on big and difficult initiatives, intended to generate both acclaim and sizable revenue, led to inflated expectations for Watson's capabilities. The company's \$4B investment in health data acquisitions and its \$62M partnership with MD Anderson were part of this ambitious push. However, the reality did not live up to the hype, and Watson's failure to meet expectations was a significant factor in its downfall
- **Attempts to encompass the entirety of cancer treatment:** In its rush to increase revenue, IBM released a product without fully considering the challenges of implementing it in global hospitals. As a result, frontline doctors and healthcare researchers discovered the system's limitations. While it showed promise in some areas, it remained under-developed. One of the main challenges with Watson's Oncology Expert Advisor was its evolving focus. It initially targeted leukemia but later shifted to lung cancer. Unlike other AI oncology platforms, Watson aimed to provide evidence-based treatment recommendations for various cancer types. However, this approach posed implementation challenges and limitations. For instance, it took about six years for data engineers and doctors to train Watson for just seven types of cancer, indicating that the system was still in its early stages with many loopholes
- **High cost of implementation and treatment:** Hospitals were charged a per-patient fee for Watson enabled by AI. The cost depended on the number of products a hospital buys, ranging from \$200 to \$1,000 per patient. In addition to these fees, there may be consulting expenses and costs associated with connecting Watson to the EMR. In the case of MD Anderson, the project's total cost exceeded \$62M. This figure includes payments to external firms for planning, project management, and development for the Oncology Expert Advisor product, as well as an initial MD Anderson and IBM contract worth \$2.4M and \$39M in contract renewal fees

- **Concern around biasness of diagnostic information:** The primary source of diagnostic information for Watson came from a team of experts at Memorial Sloan Kettering. While this hospital is highly regarded for cancer treatment worldwide, some have raised concerns that Watson's results may be biased, as they largely drew from a wealthier subset of patients. The concept of AI bias has become a growing concern, particularly in light of data disparities affecting certain populations, such as the LGBT community and minorities
- **Inadequate quality assurance and data interoperability:** One of the major initial challenges faced by the cancer hospital was adapting the machine to handle the idiosyncrasies of medical records, including the acronyms, human errors, shorthand phrases, and different styles of writing. For instance, during IBM Watson's collaboration with MD Anderson Cancer Center the issue revolved around the inconsistent data points found in medical records. Some experts found it challenging and burdensome to input data, especially when the benefit of Watson's recommendations aligned with the physician's decisions
- **Low integration with EMR:** IBM Watson acknowledged that the system faces challenges and requires improved integration with the EMR, as well as more data from real patients to identify patterns and propose innovative treatments. For instance, in the case of MD Anderson, the Oncology Expert Advisor was initially trained on MD Anderson's old EHR system, which was changed during the course of the project. The IBM product no longer worked with MD Anderson's new EHR system, and since its data has not yet been integrated into the new system, some of its information has become outdated
- **High data reliance on acquisitions:** Watson Health was a business built primarily around acquisitions such as Truven and Merge Healthcare which was about large data sets. The goal was to utilize IBM's AI tools to extract advanced insights, but it seems that IBM was unable to fully realize this vision. These very data assets are now being sold to Francisco Partners

In response to these challenges, some experts recommended using Watson for more specific and credible demonstrations, focusing on achievable goals, such as predicting drug reactions rather than cancer treatments.

Some LESSONS that can be learnt

Rather than symbolizing technological excellence, Watson emerged as a cautionary tale about the risks of excessive technological hype and overconfidence in AI. IBM characterizes Watson as a learning experience for the company, which has included wrong turns and setbacks—common challenges when attempting to bring groundbreaking technology into the commercial sphere.

The progress of AI in the everyday economy will be more gradual evolution than a sudden and dramatic transformation.

Some lessons that can be learnt from its pitfalls are:

- **Manage expectations and learn from errors:** Set realistic expectations, acknowledge shortcomings, and continuously improve based on the lessons learned from past mistakes. This lesson underscores the value of transparency, adaptability, and a commitment to refine AI technologies to better serve the intended purposes. Also, companies should avoid making exaggerated promises about their technology capabilities. Overhyping and underdelivering can damage the company's reputation and trust with customers and investors
- **Assess the challenges:** It's crucial to have a realistic understanding of the challenges involved in implementing new technology. Identifying potential roadblocks and difficulties in advance can lead to more accurate expectations
- **Oversee the actual capabilities:** Companies should have a clear understanding of their technology's true capabilities. This means not only knowing what the technology can do in a controlled environment but also how it performs in real-world situations
- **Address bias concerns:** To avoid bias in AI systems, it is essential to ensure that data sources are diverse and representative of different populations. This helps prevent favoring one group over others and mitigates concerns about fairness
- **Back-up with scientific papers and critical review:** To establish trust and credibility, it's crucial that companies should be open to third-party evaluations and independent studies to assess the performance and effectiveness of their AI solutions. Demonstrating the actual value and benefits of the technology, supported by the publication of scientific papers, is essential for earning trust
- **Invest in workforce development:** To advance AI projects successfully, it's important to nurture top talent by providing training and opportunities for growth

By adhering to these principles, companies can better manage expectations, maintain credibility, and be critical before venturing into AI in healthcare.

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