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IBM at the Crossroads

January 1, 2015. It is New Year's Day and Virginia Rometty, IBM's chief executive officer (CEO), looks at IBM's performance and knows the company faces challenges. In October 2014, IBM announced a tenth consecutive quarter of flat or declining sales, and she broke with prior CEO commitments to earn more than $20 a share every year.[1] IBM has a history of reacting to change slowly, but eventually reinventing itself. Under her predecessor, Sam Palmisano (2002–2011), IBM underwent significant changes. Palmisano redefined IBM by deemphasizing hardware to increase the impact of consulting and software. In 2002, IBM acquired PricewaterhouseCoopers Consulting for $3.5 billion and Rational Software for $2.1 billion to remake IBM around three complementary areas of Systems and Financing, Software, and Services (see **Exhibit 1**). Rometty was part of those changes and, since becoming CEO, she has divested unprofitable businesses, such as selling its server unit to Lenovo for $2.1 billion in 2014, and paying Global Foundries $1.5 billion to take IBM's money-losing chip business in 2014.[2] Still, a clear move by IBM into new profitable areas has remained elusive. Further, increased competition in cloud computing services from Amazon and Google put pressure on software and services sales and revenues (see **Exhibit 2**).

As she celebrates her third-year anniversary as CEO, Rometty becomes increasingly aware that time is the one thing she is running out of to change IBM. Once again in its over 100-year history, IBM is at the crossroads. It is time for further changes at IBM so it can adapt to disruptive cloud computing and data analytics technologies. Alternatively, will the current strategy of offering customers integrated technology solutions enable growing revenues from cloud computing and data analytics? As Virginia Rometty is getting ready for the new year, she ponders: What needs to be done to avoid her becoming known as the CEO that oversaw IBM's decline or being dismissed early in her tenure?

Brief History of IBM

IBM's ("Big Blue's") history dates back to long before electronic computers, reflecting several technological discontinuities (see **Exhibit 3**). It originated as the Tabulating Machine Company in 1896, and it specialized in the development of punch-card data-processing equipment. Thomas J. Watson, Sr. became general manager of the company in 1914 and in 1924 changed its name to International Business Machines Corporation, or IBM. During the next 20 years, IBM grew rapidly. Despite the Great Depression of the 1930s, IBM continued to manufacture new products, and after passage of the Social

Security Act of 1935, IBM secured a major government contract to maintain employment data for 26 million people. This was described as "the biggest accounting operation of all time,"[3] and it opened the door for a variety of other government contracts. After the United States entered World War II, all IBM facilities were placed at the disposal of the federal government and IBM's product line expanded to include bombsights, rifles, and engine parts.[4]

In the 1950s, IBM became a chief contractor for developing computers for the U.S. Air Force's automated defense systems, a product that generated tremendous profits. More importantly, the company gained access to cutting-edge research on digital computers being done under military auspices. However, IBM failed to dominate the emerging industry by letting RAND Corporation take over the job of programming the new computers. According to one project participant, Robert P. Crago, "we couldn't imagine where we could absorb two thousand programmers at IBM when this job would be over some day, which shows how well we were understanding the future at that time."[5]

IBM was the largest of the eight major computer companies through most of the 1960s. (Others were UNIVAC, Burroughs, NCR, Control Data Corporation, General Electric, RCA, and Honeywell.) People in the industry talked about "IBM and the seven dwarfs," as IBM dominated its competitors with a 70 percent market share. In the 1970s, a number of mergers and acquisitions resulted in an increasingly concentrated market, with IBM still firmly in the lead. Many companies chose to focus on niche areas in order to avoid competing directly with IBM. The IBM mainframe, IBM System/360, that earned the company its dominant position was still part of IBM's product line through 1978, though IBM continued to produce mainframes.

The Decline of Mainframe Computing

Up through the 1970s, IBM relied on a vertically integrated strategy, building most key components of its systems itself, including processors, operating systems, peripherals, and databases. IBM preferred to do things in-house, and the prevailing attitude was that no one could do it better. The company was able to capture high margins capitalizing on its reputation for technical prowess, reliability, and outstanding service, even when the technology was not cutting-edge. IBM's strategy was virtually flawless, routinely out-competing its rivals. In 1976, however, IBM faced a life-threatening discontinuity that was not the result of a traditional competitor's action. It started in a California garage far from IBM's New York headquarters, where college dropouts Steve Jobs and Steve Wozniak put together the Apple personal computer kit. On April Fools' Day of the same year, they founded what was then known as Apple Computer, Inc.

Once among its greatest assets, IBM's size and industry dominance caused it to underestimate the power and speed of the computer revolution that was taking place. Instead, IBM's disdain toward Apple and other emerging competitors gave the new companies five unchallenged years during which to perfect their new technology. IBM did not introduce its own version of the PC until 1981, and though it set the (open) standard for the industry, IBM's delayed response meant that it had already forfeited the opportunity to dominate this new market. To add insult to injury, IBM then chose to outsource the operating system and microprocessors for its new machines from Microsoft and Intel, respectively, creating the Wintel standard in the PC industry. IBM bought the operating system from Microsoft's Bill Gates in a deal where he retained the rights, making him one of the wealthiest people on the planet. In another misjudgement, IBM sold its 20 percent equity stake in Intel in the mid-1980s.

Meanwhile, IBM held on tight to other activities in the computing value chain, only to find that its vertically integrated business model had no advantage in the evolving computer industry. PCs could be sold in a variety of retail outlets, eliminating the need for a highly trained sales force. Data-processing centers were no longer essential as PCs had their own memory and processing systems inside. There was also no need for IBM to maintain these machines because businesses increasingly internalized the service function and hired their own computer technicians.

As the computer value chain disintegrated, different companies took the lead in specific segments. Intel was the leader in microprocessors, Microsoft in operational systems, Novell in networking, HP in printers, Seagate in disk drives, and Oracle in databases. Even in personal computers, cost-efficient competitors like Compaq and Dell easily outpaced IBM. Many dedicated software developers and vendors also popped up. Thus, in 1992, IBM's CEO John Akers began to split IBM into business units (e.g., for processors, storage, software, services, printers, and so on) in order to compete more effectively with these focused niche players.

The growth of local area networking capabilities and the subsequent decline of mainframe sales led to the inevitable outcome: On January 19, 1993, IBM announced the largest single-year corporate loss in U.S. history ($8.1 bn). The "big iron" business divisions had not recognized the need for the company to adapt. As a result, 250,000 workers departed, and a decade of radical transformation followed. Louis Gerstner was the first non-IBMer to take over as CEO and he inherited the daunting task of saving Big Blue.

The Louis Gerstner Era (1993–2002) or "When the Elephant Learned to Dance"

When Louis V. Gerstner, Jr., became chairman and chief executive in 1993, it was not clear whether IBM would survive. Gerstner was not a lifetime IBMer. Even worse, he had no particular understanding of the computer-technology industry. He came with a background in consumer products, financial services, and consulting. The IBM board had decided that IBM needed a leader, a strategist, and a manager—and Gerstner fit the bill.

Louis Gerstner received a bachelor's degree in engineering from Dartmouth College in 1963 and an MBA from Harvard Business School in 1965. He worked as a McKinsey consultant and later became president of American Express and then CEO of NJR Nabisco. He was not the obvious choice for the fallen icon of American technology. Nevertheless, he brought to the table a strong vision and a passion for change. As soon as he took the reins at IBM, he began traveling to meet customers to get a sense of the market. His verdict was bold: "We were going to build this company from the customer back, not from the company out."[6]

One major decision Gerstner made was to reverse Akers's plan to split IBM into 13 "Baby Blues." In theory, dividing the company into multiple strategic business units addressed IBM's fundamental trouble—that as an integrated company, IBM was not flexible. Gerstner, however, liked the concept of "integrated solutions," recalling his days as an IBM customer. IBM could provide one-stop shopping and service to tackle tough business problems without forcing its customers to deal with different vendors. He heard similar sentiments from customers. Within three months, Gerstner decided to keep the company together, saying: "I knew it was a big risk, but I never doubted that it was the right thing to do at IBM".[7]

Under Gerstner, IBM's new strategy evolved quite rapidly. In late 1995, the firm formed a new division to make sure the entire company was focused on the emerging business opportunities the rapid adoption of the Internet would bring. Then, beginning in 1997, IBM started a massive advertising and marketing campaign to push "e-business," a term coined by IBM. Many observed that the notion of e-business served as a wake-up call to Wall Street about the upcoming shift in business models.[8] While experts and competitors were slow to comprehend the full value of e-business, IBM's corporate customers loved the new focus. The dot-com boom in 1999 was an opportunity for Gerstner to say that he regarded the Internet start-ups as "fireflies before the storm," suggesting that there was much more to come which was uncommon at the time. Gerstner's success as CEO demonstrated the dynamism of the IT industry, and the fact that even if one misses a turn of the innovation cycle, there is still hope to survive and get back in the game. Gerstner's turnaround was a huge success; under his tenure, IBM's market cap grew from $29 billion in 1993 to $133 billion in 2002. Louis Gerstner summarized the success transformation of IBM in his business memoir: "Who Says Elephants Can't Dance?: Inside IBM's Historic Turnaround."

The Sam Palmisano Era (2003–2011)

On January 1, 2003, Samuel "Sam" J. Palmisano took the helm at IBM and he pushed the e-business strategy begun under Gerstner even farther. However, Palmisano had a very different leadership style that ranged from body language to conversation style. He was tall, beefy, and relaxed, looking every inch the former college football lineman he was, and he spoke to people with trademark informality.[9] Palmisano was also a life-long IBMer, having joined the company as a 22-year-old salesman in 1973. Since then, he had held a series of leadership positions, including Senior Vice President for the Enterprise Systems and Personal Systems groups. He had played an instrumental role in creating and leading IBM's Global Services (rising to Senior Vice President) and building the largest IT services organization in the industry. He also served as Senior Managing Director of Operations for IBM Japan, and he became IBM's President and Chief Operating Officer in 2000.

Upon becoming CEO in 2002, Sam Palmisano organized IBM around three complementary areas of hardware, software, and services. Essentially, IBM consultants could visit a company and outline an integrated solution to meet a customer's IT needs that would also sell IBM hardware and software. As part of this strategy, IBM only kept high margin hardware. For example, in 2004, IBM divested its PC business to Lenovo.[10] When revenue flattened in 2005 (see **Exhibit 4**), Palmisano pushed the shift to services even faster. "Software had to play a bigger role," Palmisano explained. In software, IBM built expertise mainly with acquisitions of small companies in fields like security, data management, and web commerce. From 2003 until 2007, IBM spent $11.8 billion on 54 acquisitions—36 software and 18 services companies—in order to facilitate the transformation process.[11] Additionally, IBM encouraged universities and other technology companies to promote education for an emerging field that within IBM was called "service science."[12]

Palmisano's strategy represented an aggressive effort to increase profit margins in response to intense price competition in hardware and software. Under his leadership, IBM transformed itself from a multinational company with worldwide operations to a more seamless global enterprise with centers of expertise, each of which was a hub in a global service network. The corresponding change in IBM's corporate mindset was illustrated by employees' responses to a 2003 survey regarding the company's future values. Three strategic thrusts emerged: "Dedication to every client's success," "Innovation

that matters—for our company and for the world," and "Trust and personal responsibility in all relationships." Under Palmisano, IBM was consistently profitable and its stock market valuation passed Microsoft in 2011.[13] It was another example of IBM responding to rapid technological change and the challenges of globalization.

The Virginia Rometty Era (since 2012)

Virginia "Ginni" Rometty followed Sam Palmisano as CEO of IBM on January 1, 2012 and as Chair of the Board of Directors on October 1, 2012.[14] Rometty began her career at IBM in 1981 as a systems engineer and she progressed through multiple leadership positions, including Senior Vice President of IBM Global Business Services where she oversaw the successful integration of PricewaterhouseCoopers Consulting. Rometty is IBM's first female CEO, and in 2014 was ranked number 10 on Forbes list of powerful women.[15] Upon her appointment, Palmisano downplayed the selection of a woman by stating, "Ginni got it because she deserved it."[16]

Having played a part in creating IBM's strategy under Palmisano, Rometty initially avoided changing IBM's strategy stating: "What you'll see is an unfolding of the strategy we have in place."[17] However, simply continuing what had worked in the past was what led to previous problems at IBM. When leadership shifted a struggle for a new direction began. Since Rometty has taken over the position, IBM has focused on what it calls "strategic imperatives": cloud computing, data analytics, mobile, social, and security efforts. These imperatives have led to double-digit revenue growth for the company.[18]

Yet, high growth alone has not been enough. For example, in 2014, IBM's cloud computing revenues grew roughly 60 percent to $7 billion, but this only represented 7.5 percent of IBM's total revenues.[19] IBM has also pushed into data analytics with predictions that this area of investment will bring in $10 billion in revenues—granted, it may take 10 years.[20]

Rometty increasingly sees IBM's future as tied to three disruptive technologies.[21] IBM believes that the following three environmental forces will have a more radical impact on the business environment than any other technology revolution has had before:

1. *Cloud Computing:* A model for enabling convenient, on-demand network access to a shared computing resources such as networks, servers, storage, applications, and services. If you use Google Drive, Dropbox, or Microsoft 365, for example, you are taking advantage of cloud computing. In the future, most businesses will rent computer services rather than owning hardware and software as well as running their own networks.
2. *Big Data and Analytics:* How to acquire, process, store, manage, analyze, and visualize data arriving at high volume, velocity, and variety. Prime applications are in finance, medicine, law, and many other professional fields relying on deep domain expertise within fast-moving environments.

Systems of Engagement: Provide decentralized technologies which encourage peer-to-peer interactions, often on cloud-based platforms. One application, for example, is leveraging social media such as Facebook or Twitter on a secure and mobile platform to engage one-to-one with each customer, rather than using a one-size-fits-all approach.

Rometty believes that both current and future IBM customers all face these major challenges. Thus, her strategic intent is to transform IBM in order to help transform its customers—she views these dis-

ruptions as the biggest ones ever experienced in the technology and services industry. She also views them as major business opportunities that IBM hopes to leverage via heavy investment. To ensure that customers are prepared for their own transformations, IBM has trained each of its more than 100,000 consultants in all three areas of potential growth.

IBM's Cloud Computing Initiative

The introduction of personal computers shifted computing power from mainframes to local machines and now applications running on the cloud are shifting processing power back to servers. Cloud computing is a web-based form of information technology (IT), defined as "a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that [could] be rapidly provisioned and released with minimal management effort or service provider interaction."[22] (See **Exhibit 5** for a full definition and further explanation of cloud computing.) It was made possible by cheap and powerful processors combined with high-bandwidth availability across networks. The cloud has changed the distribution of value across the entire IT industry. Traditional "big fish" in the IT industry sold hardware (e.g., Intel, Dell, IBM), operating systems (e.g., Microsoft), database engines (e.g., Oracle, IBM), office applications (e.g., Microsoft), or business applications such as enterprise resource planning (e.g., SAP, Oracle) or customer relationship management tools (e.g., SAP, Oracle, Microsoft). Now the cloud allows users to access all of these functions as an online service that blurs traditional distinctions among industry participants,[23] placing giant companies that used to be partners in hardware and software on a direct collision course. For example, Dell bought Perot Systems to move upstream into value-added IT services. Winners and losers will be determined by their capabilities, understanding of where value was created, and approach for capturing it.

The two primary approaches to capturing value involved either public or private clouds. The public cloud can be accessed by anyone, and this approach is largely dominated by Amazon. Companies that offered complementary technologies also emerged. Early examples included RightScale, CloudKick, and enStratus, which offered tools to manage public cloud infrastructures. However, Google, Microsoft, and other firms could also enter the market to leverage their infrastructures, brand names, and scale and cost capabilities. For example, telecom companies like AT&T controlled bandwidth, which was a key cost driver in cloud technologies. The private cloud segment required firms to make significant investments in and reconfigure their own data centers. Any firm with a preinstalled base would therefore be cautious in implementing changes, and private cloud providers faced resistance to adopting proprietary systems.

IBM made its first foray into the cloud in 2007. The "Blue Cloud" was a combination of software and hardware components through which IBM sought to provide customized, cloud-based services for each of its client organizations, a so-called "private cloud." Some analysts viewed IBM's efforts critically, claiming that Blue Cloud was just "Web computing by another name."[24] IBM responded that Blue Cloud was never intended as a full-fledged cloud service; rather, it was an initiative crafted by IBM to experiment with the emerging technology.

In 2008, IBM started offering integrated Cloud Computing Centers. Their purpose was to enable IBM's clients to transition to virtualized data centers and to provide them the freedom to innovate in a controlled and secure computing environment. According to IBM, the Cloud Centers could deliver standardized services through IT automation, resulting in reduced system and application manage-

ment costs. They were targeted at clients in emerging markets, to facilitate growth as well as to acquaint them with the benefits of the new delivery model. The first Cloud Center opened in February 2008 in Wuxi, China. After that, IBM built centers in Vietnam, Japan, Brazil, India, Korea, Ireland, Poland, and South Africa, and has since continued to expand the program.[25]

In 2008, IBM started to extend its consulting and technology services to the cloud, building on knowledge gained from its earlier Blue Cloud project. IBM envisioned helping its customers in three main ways. First, IBM would communicate the message of the cloud to help its customers understand its full potential. Second, it would help them assess the cost of their own cloud initiative and plan accordingly. Third, IBM would be in a position to provide expertise in the installation, configuration, and usage of a "private" cloud in its customers' data centers. In 2008, IBM also formed an alliance with Google to capitalize on each other's strengths, such as IBM's reputation helping to drive sales of Google Apps, Google's cloud offering, while IBM offered an integrated solution to provide infrastructure for customers around the globe.

At the same time, IBM moved even further into the cloud revolution by developing a certification program covering the resiliency of cloud-based applications or services delivered by its partners. Companies hoping to gain IBM's seal of approval had to work with IBM's cloud consulting practice, making IBM a "reference point" in the cloud market.[26] The idea behind the certification program was to help create some standards around security and interoperability in the rapidly emerging world of cloud computing. Generally, the program seemed to have attained its goal, as smaller companies were utilizing it as a signal of expertise in the cloud arena.

Since 2013, IBM has pursued both private and public cloud efforts. IBM continued to offer highly successful private clouds for its clients to run behind their firewalls.[27] At the same time, IBM uses application vendors to address specific business processes that would align with IBM's offerings. The intent was to form an ecosystem of partners where different vendors address specific business needs to provide integrated business solutions that IBM could offer to clients. IBM also had its sights on the public sphere, creating a public cloud facility in Raleigh, North Carolina where clients could integrate their private clouds with public infrastructure.

IBM's Big Data and Analytics Initiative

Another effect of cloud computing was that firms had more information than ever before. For example, it is estimated that Walmart collects more than 2.5 petabytes of data every hour.[28] As a result, IBM, SAS, and other firms are lining up to help customers use the data they amass. Data analytics, also called Big Data, examines the growing amount of data firms collect to identify patterns or other relevant information so managers can make better decisions. The questions presented to clients are: 1) Why collect and store terabytes of data if you do not analyze it, and 2) What is the use of traditional analysis if you have to wait days for the results? The advantage of data analytics is that answering these questions often requires expensive new hardware and software for data mining, predictive analytics, forecasting, optimization, and other uses. These functions relate to business intelligence to help understand what is happening, or more forward looking analysis to identify trends and their implications. The business implications of data analytics can be compelling. For example, Netflix analysed its subscriber data to develop its hit show "House of Cards".[29] With appropriate data analytics platforms, firms can boost sales by making relevant recommendations to customers, increase efficiency of operations, and reduce fraud.

In 2009, IBM initiated a massive advertising campaign to promote the idea of building a "smarter" planet to follow its cloud strategy. According to IBM, the world was already "instrumented" (transistors, mobile phones, RFID tags, and sensors were the dominant building blocks of the digital age) and interconnected (2 billion people on the Internet, immense information exchanges, and smart interacting devices). The next step was to make our planet "intelligent." What IBM meant with the slogan "smarter planet" was that we could use integrated technology to tackle most of today's pressing environmental and social issues—in other words, make the world smart enough to be sustainable. For example, in working with Carnegie Mellon University, IBM anticipated it could save it 20 percent annually on utilities or nearly $2 million.[30] IBM cites a number of examples that illustrate the urgent need for a smarter planet: inefficiencies in firm operations; the need to acquire, retain, and grow customers; manage risk; and other areas with information on the improvements IBM could make.[31] To spread awareness, IBM embraced social media, including pages on YouTube[32], Facebook[33] and Twitter.[34] However, since 2009, IBM's sales have become less international and more focused on North and South America (see **Exhibit 6**). This is problematic, as there is more economic activity outside North America and IBM has lost roughly 25 percent of its market share in Europe, while simply maintaining it in Asia.

Perhaps IBM's most visible effort in data analytics involved its artificial intelligent computer system called Watson. In 2011, Watson competed on the Jeopardy game show against former champions Brad Rutter and Ken Jennings. Watson won with Jennings commenting: "I, for one, welcome our new computer overlords".[35] Watson was not connected to the Internet during the game and stored information including the full text of Wikipedia to answer questions using automated reasoning.[36] Discussion of the week-long Jeopardy! competition exploded giving IBM free advertising and after one year contributed to increased collaboration (see **Exhibit 7**).

IBM's Watson reflects a new era of cognitive computing where computers are able to understand natural language and learn to be able to engage with humans, make decisions, and discover new connections.[37] However, not everyone is convinced of the usefulness of artificial intelligence (AI) and Elon Musk has warned that AI represents a threat to humanity.[38] The ethics of having a machine make decisions for people and the potential unpredictability of the connections and logic such machines used to make decisions raises ethical questions. However, progress on answering these questions is falling behind advances in computing power and capabilities.

IBM's Systems of Engagement Initiative

The systems of engagement initiative seeks to redirect the way people access and use information. Rather than access information in isolated chunks, a system of engagement strives toward a more collaborative and efficient versus . Improved communications that allow people to connect inexpensively in real time via mobile devices has made this transformation possible. While these capabilities raise concerns about information security, they also open opportunities. Within businesses, employing systems of engagement can enable coordinated efforts across time zones, so because the work never stops, product lead times never shorten. Such manner of engagement also enables faster decision making and provides the context for collaborative social systems. A system of engagement can use social media to attract and retain customers by improving customer service and developing deeper brand relationships. The challenge for organizations is redefining how they manage associated technology and data.

At IBM, systems of engagement leverage the cloud and data analytics to make information available at the right time and place to make a difference. The focus of IBM's jStart's consultants is on understanding the IT landscape and listening to clients in order to match business needs with IBM technologies.[39] Experts at IBM can help organizations make sense of IT infrastructure needs to integrate cloud, data analytics, and mobile together into a system that redefines internal and external relationships.[40] Most large companies have systems of record focused on past information and processes, and more effectively using and accessing that information requires linking existing systems with new systems of engagement. This challenge requires a robust IT infrastructure that IBM can provide to help organizations rapidly create value from IT investments. Finally, this approach is more consistent with firms having a hybrid or private cloud that provides increased security for organizational data.

Doubt Lingers

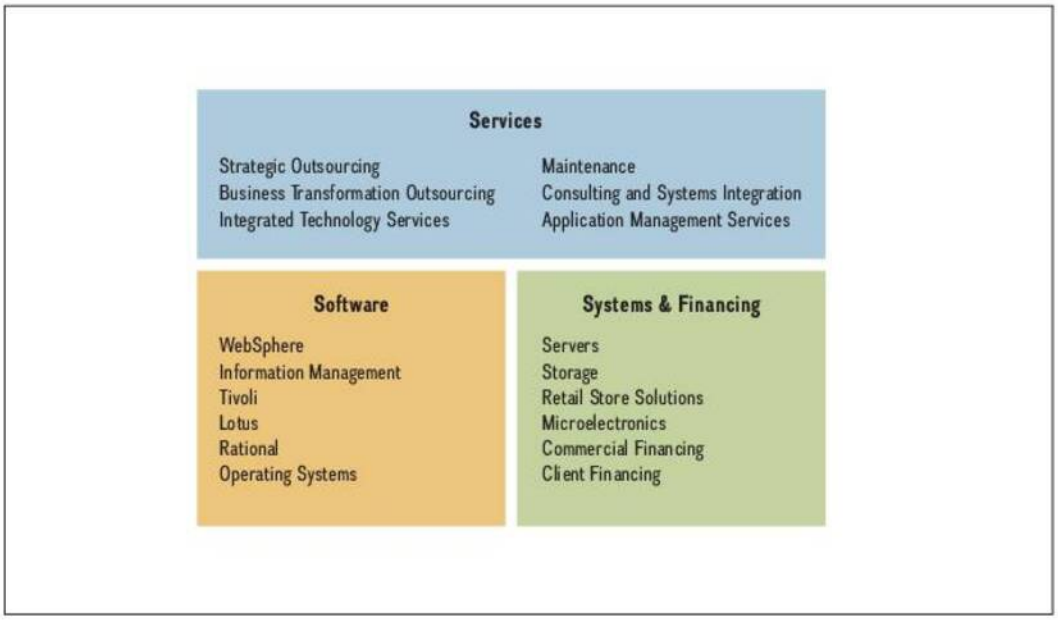
Since Sam Palmisano, IBM's strategy has been to leverage a portfolio to deliver integrated solutions to clients. Virginia Rometty helped to build and implement that strategy, but in the darkness even she begins to doubt it. Initial optimism of her leadership has fallen as improvements in IBM's performance at the start of her tenure in 2012 have begun to decline (see **Exhibit 8**). While profits have improved by moving into more profitable segments (see **Exhibit 9**) growth in those segments has not compensated for revenue declines in other areas, as competition and technology has continued to shift. The combined results have contributed to a falling stock price (see **Exhibit 10**) associated with executive turnover.

As 2014 turned into 2015, Rometty decided to invest $4 billion with the majority of the money focused on cloud computing and data analytics with the goal of her "strategic imperatives" representing 40 percent of IBM's revenues by 2018.[41] In essence, she doubled down on the current strategy. She believes new technology is disruptive, but not to the strategy of IBM helping customers with integrated spoliations. However, even with double-digit growth, her revenue targets are ambitious for businesses that only brought in 27 percent of revenues in 2014. To be successful, IBM needs to meet its double-digit growth projections for its strategic initiatives, but two clear obstacles lie in its path:

- **a focus on high margin products and software, which could backfire and alienate customers.** Meeting this challenge requires managing IBM's culture and demonstrating the benefits to customers. Will IBM consultants compensated by commission and executives worried about stock options be able to implement her strategy? Further, high profits in these areas will attract additional competition.
- **the growing challenge of continued dependence on its home market international sales.** For example, China has made it a priority to build its own IT industry; to do so, it is asking foreign companies to turnover source codes and to partner with domestic firms to produce both the hardware and software that run on machines.[42] Further, while IBM needs to expand international sales, a stronger dollar dilutes profits from overseas revenues. Can IBM navigate this more complex global environment?

These are the most obvious challenges, but certainly there are more. Will continuing the existing strategy meet current competitive demands, grow revenues, and enable Rometty to avoid being the CEO that failed IBM?

EXHIBIT 1 IBM's Offerings and Market Segments

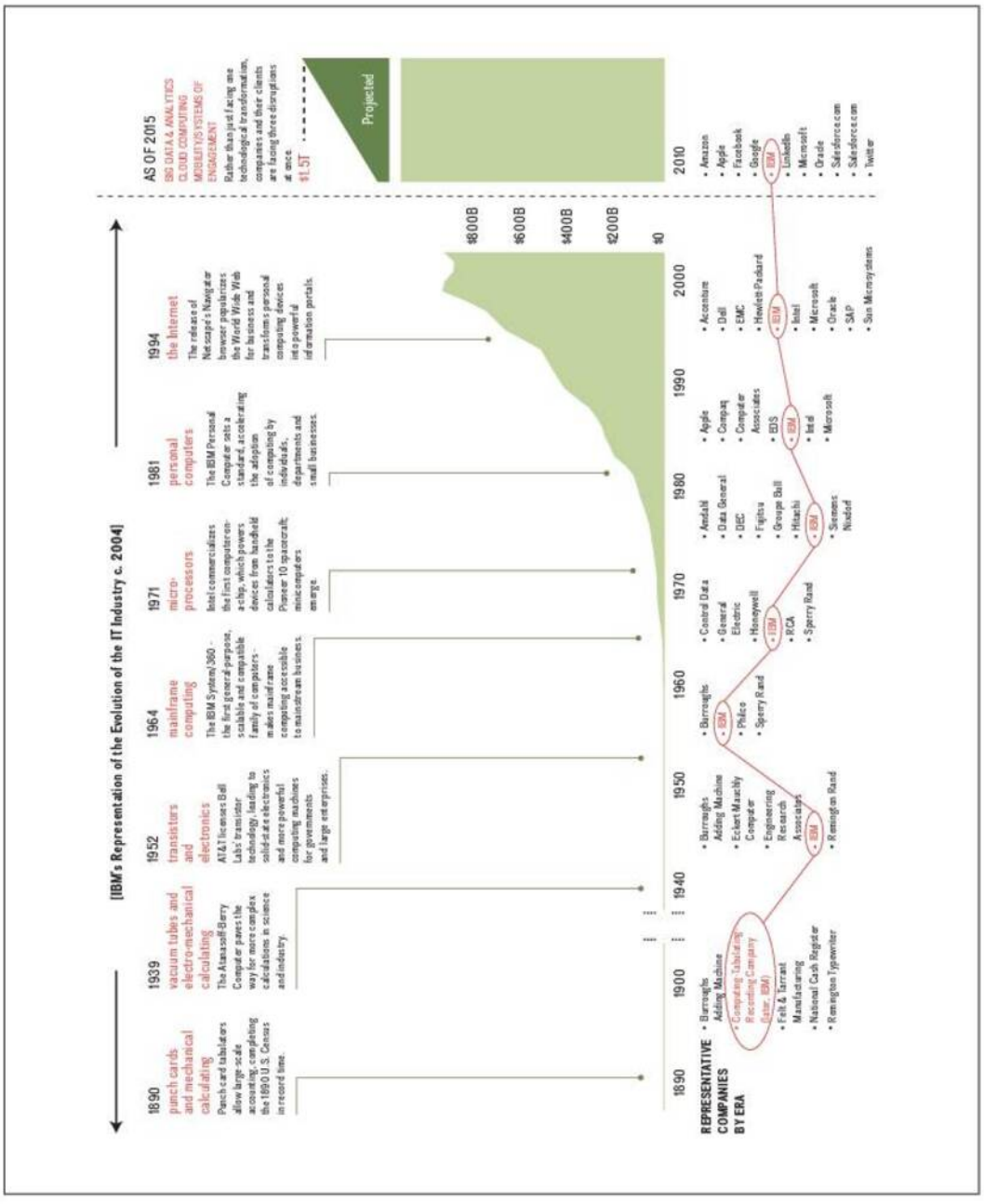


Source: IBM 2007 Annual Report.

EXHIBIT 2 Examples of Providers of Different Cloud Service Models

Service Model	Intended Users	Level of IT Stack	Examples of Providers
Infrastructure-as-a-Service (IaaS)	System administrators	Lowest. Closest to hardware.	Public Cloud: Amazon, Rackspace, GoGrid, Joyent Private Clouds: VMware, Enomaly
Platform-as-a-Service (PaaS)	Developers	Moderate. Developers care only about application code.	Google App Engine, Force.com, Engine Yard, Heroku
Software-as-a-Service (SaaS)	End-users	Highest. Users only access application.	Google Docs & Gmail (office apps), Microsoft Software Plus Services (office apps), Salesforce.com (CRM), NetSuite (ERP)

EXHIBIT 3 IBM Navigates Wave after Wave of Technological Change, 1890–2015



Source: IBM Prospectus (2004), "Understanding our company." Vertical axis shows total industry revenues. Red lines added to emphasize IBM's ongoing competitive standing. Research and depiction of last wave (2015) by author.

EXHIBIT 4 IBM Financial Data, 2004–2014 (numbers in $ millions except per-share amounts)

Fiscal Year	2010	2011	2012	2013	2014
Cash and short-term investments	11,651	11,922	11,129	11,066	8,476
Receivables (total)	28,225	29,561	30,578	31,836	31,832
Inventories (total)	2,450	2,595	2,287	2,310	2,103
Property, plant, and equipment (net total)	14,097	13,883	13,996	13,821	10,771
Depreciation, depletion, and amortization (accumulated)	26,193	26,241	26,506	26,654	28,263
Assets (total)	113,452	116,433	119,213	126,223	117,532
Accounts payable (trade)	7,804	8,517	7,952	7,461	6,864
Long-term debt	21,846	22,857	24,088	32,856	35,074
Liabilities (total)	90,280	96,197	100,229	103,294	105,518
Stockholders' equity (total)	23,046	20,138	18,860	22,792	11,868
Sales (net)	99,871	106,916	104,507	99,751	92,793
Cost of goods sold	48,472	51,320	48,987	45,981	41,353
Selling, general, and administrative expenses	27,822	29,832	29,671	29,703	28,607
Income taxes	4,890	5,148	5,298	3,041	4,234
Income before extraordinary items	14,833	15,855	16,604	16,483	15,751
Net income (loss)	14,833	15,855	16,604	16,483	12,022
Earnings per share (basic) excluding extraordinary items	11.69	13.25	14.53	15.06	15.68
Earnings per share (diluted) excluding extraordinary items	11.52	13.06	14.37	14.94	15.59

EXHIBIT 5 Working Definition of Cloud Computing

Note 1: Cloud computing is still an evolving paradigm. Its definitions, use cases, underlying technologies, issues, risks, and benefits will be refined in a spirited debate by the public and private sectors. These definitions, attributes, and characteristics will evolve and change over time.

Note 2: The cloud-computing industry represents a large ecosystem of many models, vendors, and market niches. This definition attempts to encompass all of the various cloud approaches.

Definition of Cloud Computing:

Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five **essential characteristics,** three **service models,** and four **deployment models.**

Essential Characteristics:

On-demand self-service. A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service's provider.

Broad network access. Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, laptops, and PDAs).

Resource pooling. The provider's computing resources are pooled to serve multiple consumers using a multitenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, network bandwidth, and virtual machines.

Rapid elasticity. Capabilities can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and can be rapidly released to quickly scale in. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time.

Measured service. Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.

Service Models:

Cloud Software-as-a-Service (SaaS). The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface such as a web browser (e.g., web-based e-mail). The consumer does not manage or control the underlying cloud infrastructure, including the network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.

Cloud Platform-as-a-Service (PaaS). The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure, including the network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations.

Cloud Infrastructure-as-a-Service (IaaS). The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications, and possibly limited control of select networking components (e.g., host firewalls).

(continued)

EXHIBIT 5 (continued)

Deployment Models:

Private cloud. The cloud infrastructure is operated solely for an organization. It may be managed by the organization or a third party and may exist on-premises or off-premises.

Community cloud. The cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be managed by the organizations or a third party and may exist on-premises or off-premises.

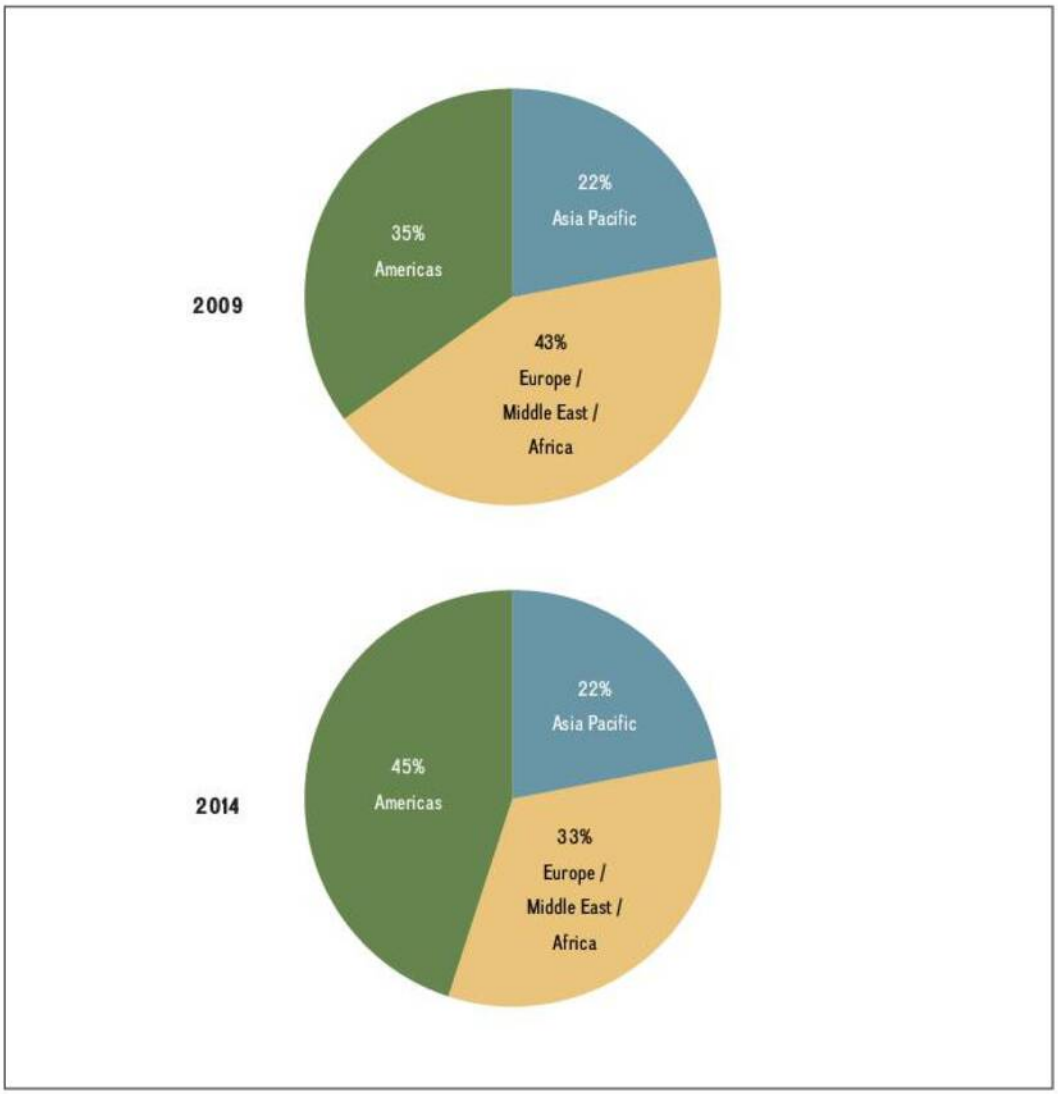
Public cloud. The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services

Hybrid cloud. The cloud infrastructure is a composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load-balancing between clouds).

Note: Cloud software takes full advantage of the cloud paradigm by being service-oriented with a focus on statelessness, low coupling, modularity, and semantic interoperability.

Source: National Institute of Standards and Technology, Information Technology (NIST), Laboratory Authors: Peter Mell and Tim Grance, Version 15, October 7, 2009, http://csrc.nist.gov/groups/SNS/cloud-computing/.

EXHIBIT 6 IBM Revenue by Geographic Region, 2009 and 2014

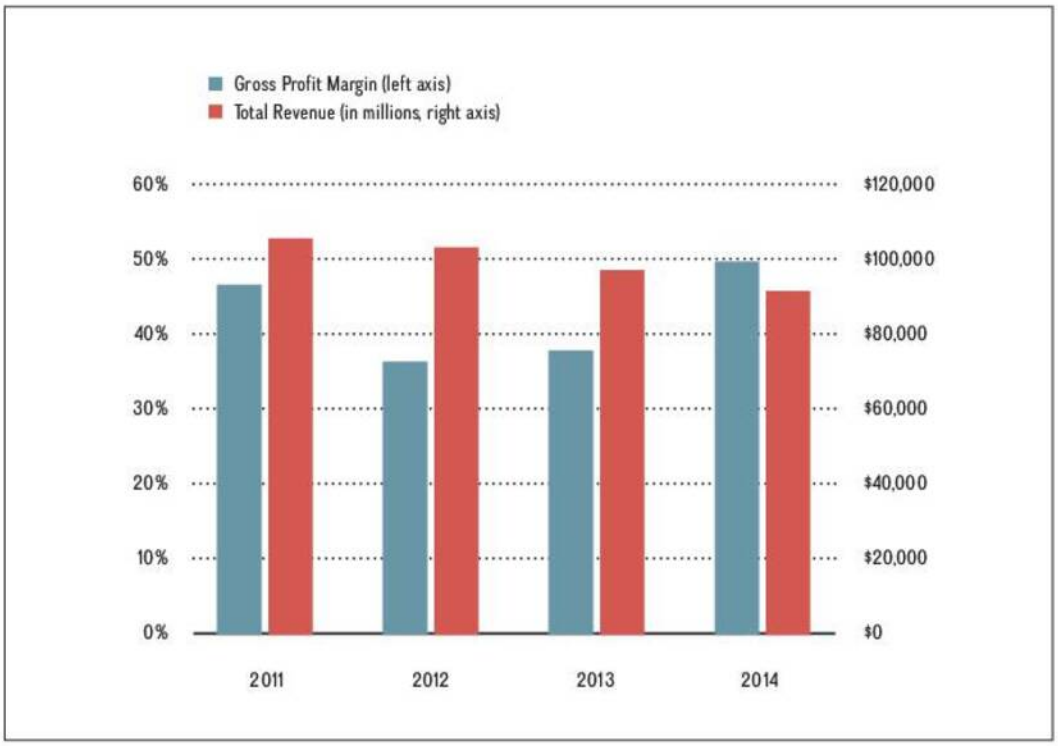


Source: Based on author's depiction of publicly available data.

EXHIBIT 7 Watson's impact one year after Jeopardy!

Source: Based on PowerPoint Presentation located at IBM, http://www-03.ibm.com/press/us/en/presskit/27297.wss

EXHIBIT 8 IBM Financial Performance, 2011–2014



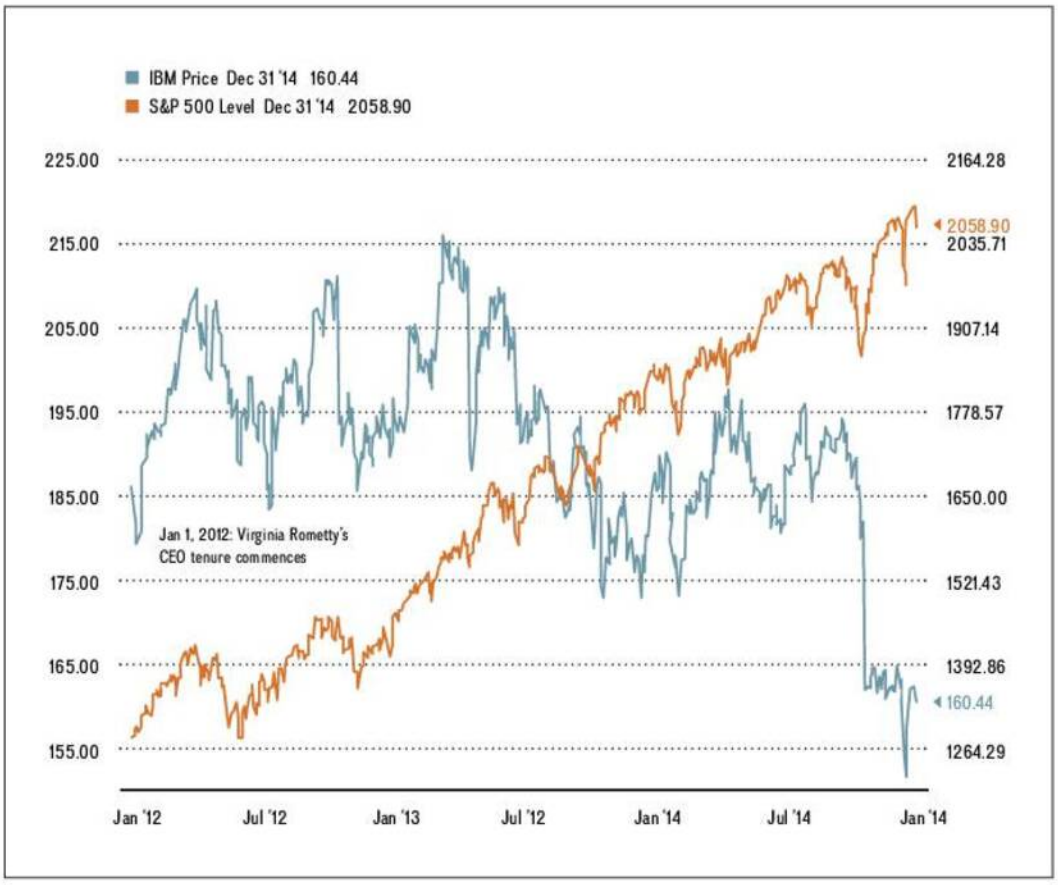
Source: Based on author's depiction of publicly available data.

EXHIBIT 9 IBM Financial Information by Segment 2013–2014 ($ millions)

Segment	2014	2013
Global Technology Services		
Revenue	$37,130	$38,551
Gross Margin	38.3%	38.1%
Global Business Services		
Revenue	$17,825	$18,396
Gross Margin	30.8%	30.9%
Software		
Revenue	$25,434	$25,932
Gross Margin	88.6%	88.8%
Systems and Technology		
Revenue	$9,996	$12,988
Gross Margin	39.5%	40.8%
Global Financing		
Revenue	$2,034	$2,022
Gross Margin	49.4%	45.6%
Other		
Revenue	$374	478
Gross Margin	(215.0)%	(195.6)%
Total		
Revenue	$92,793	$98,684
Gross Margin	50.0%	49.5%

Source: IBM 2014 Annual Report.

EXHIBIT 10 IBM Stock Performance vs. S&P 500, January 1, 2012–December 31, 2014



Source: Author's depiction of publicly available data using YCHARTS, http://ycharts.com/.

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