
Mismanagement of Technology

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Abstract

This is a paper that investigates how major problems in corporations can occur if the Management of Technology is not properly administered. The purpose of this paper is to review large firms and people that relied on technology and who had serious failures caused by mismanagement. Such mismanagement had a variety of causes such as incompetence, poor ethics, abuse, and outright corruption. Over the years there have been individuals and firms who have been seriously sanctioned based on crimes such as fraud. This paper focuses on some of the most egregious cases that have occurred during the past four decades.

This manuscript documents a considerable number of major corporations that experienced such problems and suffered subsequent profound consequences. Two that are examined in detail are Volkswagen and Theranos. These two firms provide significant illustrations of how mismanagement of technology was a prime factor that caused catastrophic failure in their operations. Enough other big firms that are cited lead to the inference that mismanagement of technology was involved on a major scale.

Keywords: Mismanagement, A Ponzi scheme, The digital revolution, Corruption.

1. Background

Technology has been expanding exponentially over the past forty years. Even if a firm is not a technology firm per se, it has not been immune to the effect that the Digital Revolution, rapid growth of computers, software systems, the Internet, Web Sites and apps, cell phones, social media and other forms of newer technologies has had on all firms. Use of these technologies has been integrated into virtually all strategic actions that firms use daily to achieve success in their respective businesses. Mismanagement of technology in corporations needs to be examined, as it may well have played a key role in the failure of some of these firms. This paper looks at a number of failed major firms and individual entrepreneurs to determine if the mismanagement of technology may have been a factor in their demise.

A variety of companies that potentially failed due to their mismanagement of technologies cover a wide spectrum. A number will be mentioned in this study. The Literature Review primarily covers major firms that failed in the latter part of the 20th century. Then moving into the early part of the 21st Century, there are several major firms that will be discussed that appear to have failed partly due to

the mismanagement of technology. The major portion of the study will cover a new major factor that needs to be examined i.e., the increasing mismanagement of ethics and its interaction with technology in major corporations. Several firms that will be discussed include several of the major banks in the 2008-2011 financial crisis e.g., Moody's, Fannie Mae, Bear Stearns, Goldman Sachs, and AIG. The rest of the paper will deal in more detail with a variety of firms and individuals that also had mismanaged technology i.e., Volkswagen and Theranos. These will be looked at in some detail. The recent Bitcoin scandals using Blockchain technology are also of some note. One individual that is singled out for his mismanagement of technology is Bernie Madoff. His \$20 Billion Ponzi scheme was a particularly egregious example of how one individual defrauded thousands of investors of their hard-earned money.

2. Literature Review

In the years leading up to 2000, there were a respectable number of company failures due to the poor management of technology. These failures involved a variety of reasons that seem to come under the heading of mismanagement of technology. Some of these reasons were management's inability: (a) to recognize that the mismanagement of technology resulted in poorly designed products; (b) to determine that the technology was not mature enough "for prime time"; (c) to properly estimate the large costs that would be involved in the development, production and operations of products using the newer technology; and lastly (d) to recognize that in the firm's industry that there had been a paradigm shift to newer technology that was replacing a firm's older, established technology.

First, poorly designed products will be addressed. Personal computers (PCs) and cell phones began to appear on the market in the early 1980s. PCs immediately experienced a good deal of competition, as firms were anxious to take the lead in this new market. The market quickly became flooded with devices such as the Altair, Commodore 64, Kaypro II, the Apple II, the Tandy TRS-80, the Texas Instrument TI 99/4, the Atari 400, and the IBM PC Jr. With IBM mainframe dominance achieved in the 1960s, the computer industry was known as "IBM and the seven dwarfs"- the dwarfs being Burroughs, UNIVAC, NCR, Control Data, Honeywell, General Electric and RCA. However, in 1982 IBM was not really committed to their first PC- the PC Jr. Announced in November 1983, it sold only 270,000 units by 1985 and was discontinued in 1985 (Cringely, 2014). There were several factors cited for its failure. The biggest was that it was poorly engineered and designed. IBM also failed to market it properly and provided inadequate developer support. The weak backing of the PC Jr. by IBM management illustrates its mismanagement of the technology. The PC Jr. was a device that IBM produced without lofty expectations. To them the computer world was defined by massive mainframes. They considered the IBM PC Jr. to be just a toy. The lack of commitment to the PC Jr. was on full display in 1983 (Cortada, 2019). In contrast, the most popular home computers in the USA up to 1985 were: the TRS-80, various models of the Apple II, the Atari 400/800 (1979) and its follow-up models, the VIC-20, and the Commodore 64. Other poorly designed PCs that also did not do as well due to poor management of technology were the Altair and TI- 99 (Abbate, 1999).

The second factor manifested in the 1980s was that immature technology was sometimes rushed into production. Some firms became so obsessed with the potential of an unproven technology that they were willing to forge ahead with major strategic investments. A good example of this was virtual reality. Research into the viability of virtual reality (VR) systems goes back five decades. (Lum, Elliott,

and Aqlan, 2020). Several small firms jumped readily into virtual reality in the 1980s and 1990s and incorporated it into their business models. These included companies such as VPL Research. The idea of putting on special goggles and gloves and immersing oneself fully in a 3-D game or training session appealed to many who thought the technology was ready. However, the consumer public was far from being interested in engaging in VR. VR never took off commercially, even though some useful niche applications, such as providing surgeons with a way to practice difficult medical procedures were developed (Haskin, 2007).

A third factor was the inability to estimate the large costs associated with adopting the newer technologies. Iridium's idea to launch sixty-six satellites that could be linked in a network to route calls all around the world seemed to be the future of world-wide instant communications. Working with Motorola, Iridium strove to be the pioneer of instant worldwide telephone service. However, Iridium's managers grossly miscalculated the cost of the technology needed to bring such a complex satellite system into fruition (Collins, 2018). Most potential users did not wish to pay Iridium's estimated dollars per minute of call time. Another factor was that the users were unwilling to carry around a phone larger than a brick. Less than a year later, after losing nearly US \$1 billion in two disastrous quarters, the engineering marvel Iridium is in danger of becoming the "Ford Edsel of the sky" (Ibid).

The Apple Newton was another product that used the most modern technology. However, it was overpriced when it debuted in 1993. Pushing the state-of-the-art, the Newton promised many features that were too advanced for its time e.g. personal information management. However, the device was huge and expensive. It cost approximately \$700 for its first model and \$1,000 for a later, more advanced model (Muniz, 2005). Released in 1995 the smaller, cheaper PalmPilot became the device that the market much preferred. When Steve Jobs returned to Apple in 1997, he killed the Apple Newton (Isaacson, 2011).

A last factor affecting the management of technology was the industry paradigm shifts that occurred in technology. The Digital Revolution that occurred in the 1980s and 1990s is noteworthy. A major firm that completely missed the decline of analog technology and the rise of digital technology was Kodak (Lucas and Groh, 2009). A technology company that had dominated the photographic film market during most of the 20th century, Kodak used analog photographic chemicals and film. Kodak's management was so focused on the success of photography film that they missed the future major paradigm shift in technology. When the Digital Revolution occurred, Kodak decided that its future was with their venerable, analog processes (Kotter, 2012). Even though they had developed the world's first digital camera, Kodak's management was so focused on the success of photography film that they missed the onslaught of the digital revolution. They failed to keep innovating and filed for bankruptcy in 2012 (Ho and Chen, 2018).

Fujifilm, a competitor of Kodak, pursued a completely different strategy in the management of their technology (Shibata, Baba, Kodama, and Suzuki, 2018). While Kodak continued using their traditional analog "silver halide" technology, Fujifilm and other competitors took different paths. Fujifilm moved into the digital mainstream (Ibid). In this way Fujifilm, the closest challenger of Kodak learned to be bold and innovative to close the gap. They opened digital factories in the USA, daring to challenge the Kodak marketing empire in its backyard. In a major coup, it won the rights to sponsor the 1984 Los Angeles

Olympics (Kmia, 2022). Hewlett-Packard, Canon, and Sony also outmaneuvered Kodak. They launched digital products based on home storage with home printing capabilities. They also uncovered new demand for convenience, storage, and selectivity. Facebook was born, and prints became outdated. Most consumers stopped printing pictures; instead, they began to share them online (Ibid).

Another leader in its field that failed to adapt to the Digital Revolution was Motorola. In 1995 they were the best cell phone maker in America (Richtel, 2009). AT&T requested Motorola to furnish them with one million digital cell phones. Motorola responded that they would be happy to honor AT&T's request but insisted that they be analog cell phones (Nair, Ramalu, and Kumar, 2014). AT&T thanked Motorola but advised them that they needed the phones to be manufactured using the new digital technology. Instead, AT&T turned to a little telephone manufacturer in Finland and asked if they could provide the requisite number of digital cell phones. Nokia advised that they had to scale up their operations to provide such a large quantity of phones, but that they would do so at the right price. AT&T complied, and the order put Nokia on the map as a major digital cell phone provider (Vecchio, 2017).

3. Post 2000 Mismanagement of Technology

The Literature Review covered primarily Pre-2000 Mismanagement of Technology. The focus on this section will be on the trends that have occurred in the most recent twenty years. It will be noted that there were new major factors that now became evident and added significantly to the reasons previously mentioned in the mismanagement of technology. One new factor was the inability to maintain good ethics in firms as it pertained to the burgeoning changes in modern technology. With the advent of major deregulation in the 1980s, corruption in firms started to occur at an increased rate as the 21st Century approached. This was due in large measure to more cases involving bribery, commodities fraud, price fixing, tax evasion, and insider trading of stock (Ferguson, 2012). Ivan Boesky, Michael Milken, Charles Keating, and celebrities such as Martha Stewart went to jail for violations involving these practices.

A second major trend that arose in the early part of the 21st century was the sudden increase in the scale of corruption. Corruption began to reach new heights where it now was resulting in the demise of entire corporations. The most famous case that occurred in 2003 was the ENRON Corporation. Enron was an oil and gas company that engaged in huge fraud transactions. Chief Financial Officer Andrew Fastow used new accounting software to create a network of shell companies designed solely to do business with Enron, for the ostensible dual purposes of shielding Enron money and hiding its increasing debts. He also used broadband technology illegally to trade commodities. Enron was able to record non-existent profits from these ventures (McLean and Eklund, 2013). Both initiatives eventually failed. Other such fraud initiatives were employed by also manipulating ENRON's accounting software. This resulted in the firm's Chapter 11 bankruptcy in 2001 (Ibid). Due to this massive fraud, many of its employees lost their pensions and life savings, while investors lost over \$11 billion in shareholder value. CEO Ken Lay was sentenced to prison but died before entering jail. Both Andrew Fastow and his complicit wife also served prison sentences. Around the same time Bernie Ebbers, the CEO of WorldCom, engaged in similar unlawful activities. WorldCom collapsed in 2002 amid revelations of major accounting irregularities. This was one of the largest accounting scandals in the United States (Jeter, 2003). Ebbers was convicted of fraud and conspiracy and served 13 years of a 25-year sentence. Due to these and several other huge

fraud cases (i.e., Tyco International and Adelphia), Congress enacted the Sarbanes-Oxley Act in 2002. This act targeted the mismanagement of public companies, as well as their Board of Directors. It added criminal penalties for management misconduct, and required the Securities and Exchange Commission to create regulations to define how public corporations were to comply with the law (Arbetter etc., 2009).

The Financial Crisis of 2007- 2009 brought a new wave of major, unethical behavior, primarily in the banking and other financial sectors of the economy. The crisis was a systemic failure brought about by a variety of contributing factors such as: (a) the virtually unregulated growth in subprime mortgages; (b) the creation by the banks of new, damaging, high risk financial instruments such as Collateralized Mortgage Obligations (CMOs), Collateralized Debt Obligations (CDOs), and Credit Default Swaps (CDSs); (c) the failure of the Rating Agencies (Moody's, Standard and Poors, and Fitch) to properly rate bank high risk securities; (d) the lack of oversight by financial governmental agencies (e.g. SEC and the FED); (e) the growth a new financial entities that engaged in high risk securities i.e. Hedge Funds and Private Equity firms; and (f) a collapse in the housing market. (Foster and Magdoff, 2009).

Embedded in virtually all of these major factors were the unprecedented greed and ethical lapses demonstrated by poor management in: (a) the major US banks i.e. Goldman Sachs, Bear Stearns, Lehman Brothers, AIG, and Merrill Lynch; (b) the quasi- governmental banks such as Fannie Mae and Freddy Mac; and (c) large mortgage firms that had grown rich with sub-prime mortgages such as Country-Wide and Ameriquest. Information Technology (IT) was employed by the management of all these firms to fashion and market the financial instruments which were the neutron bombs of the crisis i.e., CMOs, CDOs, CDSs etc. (Ibid). The results were catastrophic for many major financial institutions: (a) Bear Stearns and Lehman Brothers went bankrupt; (b) Merrill Lynch had to be rescued by Bank of America; (c) Fannie Mae and Freddy Mac went into conservatorship and remained there through 2022; (d) Country-wide and Ameriquest went bankrupt; and (e) AIG had to be bailed by the government with a huge loan (Arbogast, 2022). Without major government interaction and capital infusions (TARP funds and Quantitative Easing), the fallout might have been catastrophic and brought on a major depression in the United States. Many of these new financial instruments had been sold to banks and investors all over the world. Thus, the global effect of the US fiscal crisis was also toxic to many countries, who also were beset by major setbacks (Ibid).

Beside the fiscal crisis, ethics violations also began to appear in many other business areas. The first of these was the largest Ponzi scheme in history by Bernie Madoff (Henriques, 2012). Madoff had gained prominence In the 1960s, when he founded Bernard L. Madoff Investment Securities LLC as a broker-dealer for penny stocks. His firm used innovative computer information technology to disseminate its quotes. Madoff continued to use this and other information technologies which then evolved in the 1970s into the National Association of Securities Dealers Automated Quotations Stock Market (NASDAQ). Later, Madoff would become its chair. With this platform and by engaging in several humanitarian initiatives, Madoff became a highly acclaimed financier. He then launched his now famous Ponzi scheme in the 1990s. Madoff told his investors that he was investing their funds in lucrative investments. In fact, he failed to do so (Ibid). Finally, in 2009 it all came to a head when Madoff pled guilty to a variety of criminal charges including perjury, money laundering, mail fraud and false SEC

filings. Earlier criminal complaints had revealed that Madoff had defrauded his clients of almost \$65 billion. Madoff was found guilty and subsequently received a maximum sentence of 150 years in federal prison. Madoff later died while incarcerated. Over 24,000 investors of Ponzi were seriously injured by his scheme. These investors only recovered less than a quarter of their total investments (Jordanoska, 2017). However, the consequences of Madoff's actions went well beyond his immediate transgressions. In the past few years there has been a surge in imitation Ponzi schemes. Fifty-seven Ponzi schemes were discovered in 2022 affecting a loss of \$5.3 billion in investor funds. This represented a seventy percent increase over the prior year when thirty-four schemes were discovered. The average size of a scheme in 2022 was \$94 million (Ponzitracker, 2023).

The last ten years also saw mismanagement of technology in a variety of other industries: construction, extraction (oil, gas, and mining), transportation and storage, and investments and finance (Beattie, 2022). In addition, the news media has uncovered a variety of serious problems in such industries as sports (e.g., FIFA), crypto currency (e.g., Bankman-Fried at Alameda Research/FTX Crypto), health technology and automotive. This paper now addresses these latter areas with two recent egregious cases.

The Volkswagen (VW) Case- The first is the VW Emissions Scandal Case. VW is a German Engineering automobile company. In 2007 they were struggling with diesel emissions standards. Their new diesel was producing emissions that exceeded US Environmental Protection Agency (EPA) standards. VW engineers were under pressure to solve this problem. Unable to find a fix, all they could suggest to management was a "Defeat Device" that could be installed in diesel cars. This device had a binary switch so that: (a) When the diesel was tested inside, the car would operate in the dyno mode- with less power, but complying with low EPA Nitrous Oxide emissions; and (b) on the road software would switch the car into a normal operating mode with up to thirty five times the emissions of the dyno mode, well over EPA standards. This device was approved by management and installed with the full knowledge of the new CEO (Martin Winterkorn). The vehicle was produced and sold in the US between 2008 and 2015 (Arbogast, 2022).

In 2015 Hemanth Kappanna was a junior engineer working in a small team for General Motors (GM) in West Virginia. His job was automobile emissions testing. Kappanna did not do his testing in the normal laboratories, but outside. He concluded that the outside emissions from the Volkswagen diesel were dirtier than those being cited by VW. When asked to testify by GM at an emissions forum in California, the EPA was present. The EPA reacted rapidly upon realizing that they had been duped. When VW was confronted with these revelations, the 'blame game' ensued. CEO Winterkorn said it was a misunderstanding between the C-level suite and middle management. Middle management blamed the engineers. As VW had been previously caught manipulating emissions testing in the early 1970s, the EPA moved decisively. VW was forced to recall eleven million cars and pledged \$6.7 billion dollars for repairs. However, that was not enough to satisfy this gross mismanagement of VW's technology. In January 2017 VW pled guilty to criminal charges of defrauding the U.S. government and obstructing a federal investigation. In addition to a \$15.3 billion settlement with U.S. regulators, VW agreed to pay \$2.8 billion in criminal fines and also \$1.5 billion in civil penalties. This was the largest settlement in the history of an automobile-related consumer class action case in the United States. The other fall-out that

ensued was that: CEO Winterkorn was fired along with a number of key other executives; (b) the company lost 46% of its shareholder value, about 42.5 billion dollars; (c) investors suffered major losses as the VW stock price declined significantly; and perhaps worst of all; (d) the pollution in the US from 2008-2015 had put people's health at risk (Ibid).

The Theranos Case- Elizabeth Holmes was a student at Stanford University in the early 2000s. For a summer internship, she worked abroad in blood laboratories. There she was appalled at the amount of blood being drawn from patients for disease testing. Drawn to nanotechnology labs at Stanford, she set out to find a simpler way to do the tests. Dropping out of Stanford, she directed her energies to organizing Theranos, a private Health Technology company in the mid-2000s. She did this with the assistance of a chemical-engineering professor at Stanford, who was her science and technical advisor.

Holmes maintained that Theranos could use a single finger-prick of blood to accurately predict diseases. A device developed in-house to do this was named 'Edison.' Holmes was also good at raising capital. Those who invested in Theranos included several technology CEOs, two Secretaries of Defense (General James Mattis and former Sec Def William Perry); and two former Secretaries of State (Sec State) Henry Kissinger and George Shultz. Theranos raised more than \$700 million from venture capitalists and private investors. This resulted in a \$10 billion firm valuation by 2014. (Arbogast, 2022). Also investing heavily in Theranos was Walgreens. Theranos Wellness Centers in Walgreen's stores started to appear around the country in 2014 (Ibid). Unfortunately, Holmes had duped everyone by claiming that her Edison machine was predicting the results being furnished to Walgreen's and other customers. In fact, Edison was incapable of providing accurate results. The Edison test results were "erratic and different" compared to Siemens. Some results were used to erroneously advise patients that they had HIV and Hepatitis (Ibid).

This was known by Holmes and her executives (e.g., COO Sunny Balwani). Instead of being transparent, Theranos lied to everyone including users and investors. In fact, they were secretly diluting the finger-prick blood samples and using German Siemens machines to provide their results (Carreyrou, 2018). Also aware of this deception was Theranos' Lab Director Adam Rosendorff and several others in the lab (Assistants Adam Schulz and Erica Cheung). Rosendorff was appalled and went to Holmes on this breach of ethics. He was met with hostility and rejection. Unable to convince Holmes and Balwani to stop this charade, Rosendorff retreated, but knew something had to be done. Getting past Theranos' strict policies and guidelines was a huge challenge. Theranos' tactics were: (a) all employees were required to sign non-disclosure agreements (NDAs); (b) security cameras had been mounted everywhere and security personnel (ex-military) roamed the halls; (c) personnel could not go between labs; (d) the windows were tinted "to prevent spying"; (e) employee emails were closely monitored; and (f) any employee who indicated any dissatisfaction was intimidated and threatened with huge lawsuits. Totally stifled by these restrictions, Rosendorff decided to resign and quietly disappeared in 2014. However, soon after he felt obliged to do something. He wrote to John Carreyrou at the Wall Street Journal about the situation at Theranos (Ibid). Carreyrou would later testify that this was the first inkling of knowledge that he had about the potential fraud going on at Theranos and it put him on a trail of discovery (Carreyrou, 2020).

Two Lab workers also tried to alert higher-ups of the issues. Tyler Schulz was the grandson of former

Sec State George Schulz. He went to his grandfather to advise him of his concerns. When the elder Schulz called Holmes, he was assured that Tyler was ignorant of the big picture and that everything was ethically sound. Schulz believed Holmes. Tyler was threatened with lawsuits and elected to resign. A second concerned lab worker was Erika Chung. When she received harsh treatment (e.g., potential major lawsuits), she was so frightened that she prepared to leave the country and travel to Hong Kong. However, before leaving, Erika contacted Carreyrou with more details of Theranos' nefarious operations and emailed Theranos' accrediting agency, the Center for Medicare and Medicaid Service (CMS). On Oct 16th, 2015, Carreyrou published an article with circumstantial evidence that Theranos had defrauded their investors and the CMS. The CMS reacted quickly and investigated the Theranos operation. They found that Theranos had unreliable devices, sloppy lab practices, had cheated on proficiency testing and misled inspectors during prior visits. A subsequent CMS lab investigation found forty-five deficiencies which Theranos was unable to correct. Thereafter, the CMS permanently shut down the Theranos labs in 2016 (Arbogast, 2022).

On June 14, 2018, Elizabeth Holmes, and "Sunny" Balwani (Theranos COO) were accused on sixteen combined charges of fraud. This included: (a) Holmes had incorrectly maintained that Theranos could use a single finger-prick of blood to predict diseases; (b) Holmes had engaged in unethical actions against her employees; (c) Theranos had lied to investors and users by providing results from Siemens and representing that they were from the Edison machine; and (d) they had interfered with potential inspections and audits by government agencies. Subsequently, Walgreens, Walmart and other prominent political figures filed a class-action lawsuit (March 2020). Despite Covid delays in the trials, both were finally found guilty on all counts of fraud. Balwani received a prison term of 12 years and 9 months while Holmes received 11 years. Pregnancy delayed her incarceration, but she was finally sent to jail in May 2023.

Lessons learned from these two cases included: (a) Don't fake it, until you make it; other Silicon Valley firms have also used this strategy to acquire capital for technology based initiatives, often failing to produce the promised outcome (Ibid); (b) A failure is not a loss, but rather a lesson that you can grow from; if Holmes and Winterkorn had been willing to accept failure early, they could have potentially prevented the downfall of their companies; (c) one should accept responsibility and avoid blaming others; taking responsibility enables both the leadership and employees to own their actions and the consequences.

4. Conclusions

This paper has documented many high-profile mis-managed companies over the past forty years. It documented that a great many of the failures were caused by the firm's inability to manage technology properly. In the period before 2000, there were issues in: (a) applying incorrect technologies that resulted in poorly designed products; (b) recognizing that the technology they were trying to push the envelope on was not mature enough "for prime time"; (c) estimating the large costs involved in the development, production and operations of products using the newer technologies; and lastly (d) recognizing that in a specific industry, there had been a paradigm shift in technology.

In the 2000s another major factor that added to the failure of major firms was the lure of misusing newer technologies that crossed the traditional ethical boundaries. ENRON's new accounting software

created “paper entities” designed to hide fraud. In the Great Banking Crisis in 2008-2010, there were new financial assets created using software systems. These assets were sold in great quantities in the United States and around the world. The “neutron bombs” were known as Collateralized Mortgage Obligations (CMOs), Collateralized Debt Obligations (CDOs), and Credit Default Swaps (CDSs). While many bankers escaped being responsible for these bad assets, the country paid a high price in having to bail out many of the banks and other major firms (e.g., GM) with TARP money and Quantitative Easing infusions. Software was also used by Bernie Madoff’s in his massive Ponzi scheme and by other Ponzi imitators that followed suit. The on-going investigations into crypto currency using newer technologies such as Blockchain are further evidence that many recent scandals are intertwined with technology. The VW and Theranos cases gave two stark examples of how the technologies in health care and the automotive business were at the root of gross mismanagement of technology.

5. Recommendations

Future research should focus on educating business leaders on the risks in managing technology. Changes in technology are accelerating today, as witnessed by the new challenges being posed by major advances in Artificial Intelligence, Blockchain and the Internet-of-Things. In the past corporate leaders could rely on subordinates to monitor technology advances and advise management on its proper use in their industry. Sarbanes-Oxley and other legislation have put top management on notice that CEOs can no longer lay the blame for such failures on subordinates. Leaders will be held accountable and as such, need to be educated better on the technologies vital to their firm’s strategic future.

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