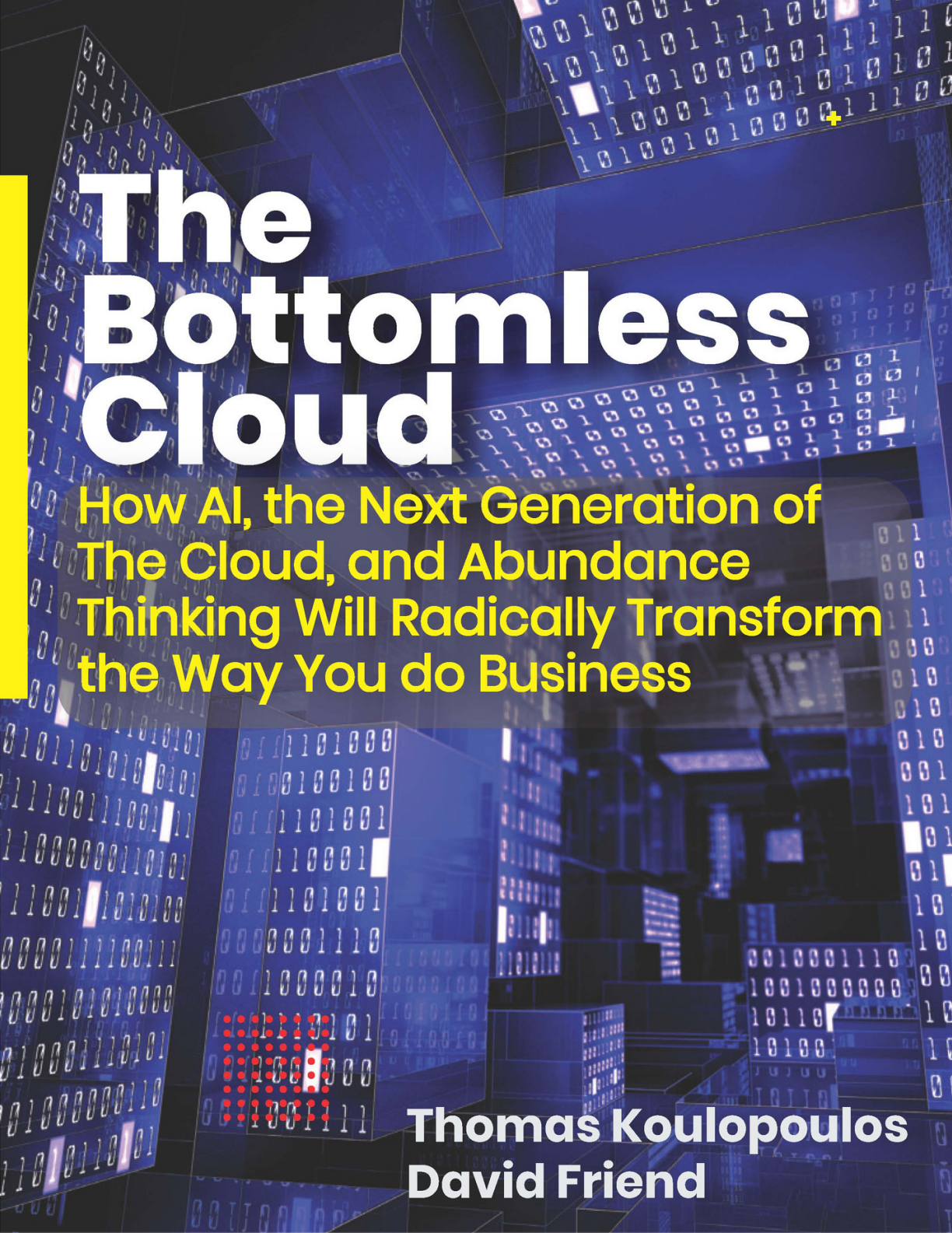
The Bottomless Cloud
How AI, the Next Generation of The Cloud, and Abundance Thinking Will Radically Transform the Way You do Business
Thomas Koulopoulos
David Friend

"We consistently fail to grasp how many ideas remain to be discovered ...

The difficulty is the same one we have with compounding.

Possibilities do not add up.

They multiply."

- Paul Romer,
Nobel Prize Winning Economist

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The Real Revolution

Power utilities were a cornerstone of the industrial age—not just by cutting the cost of power by 80%, but by radically accelerating innovation and new business models, allowing businesses to focus on what they were best at: their products and services.

At the turn of the twentieth century, more than 98 percent of all factories were powered by water wheels or reciprocating steam engines[1]. The other two percent were just starting to experiment with a radically new form of power—electricity.

These new factories were role models for the future, creating a sea change in the economics of manufacturing. They could outperform and out-produce their peers. However, electric power was dangerous, complicated, and unreliable. It required the retooling of factories and dedicated resources, staff, facilities, time, and money. In addition, companies had to build enough capacity to power their operations at peak loads even though they typically needed far less power in the normal course of operations.

As the industrial revolution began to scale rapidly at the end of the 19th Century, the need for power increased dramatically - by some estimates ten-fold from 1880 to 1910[2]. At around the same time, the first power plants capable of delivering AC power over large distances began to emerge as both Edison and Westinghouse built centralized electric utilities.

Soon the idea of moving electric power from an onsite function to one managed by a utility became a mandate, not only because it cut the overall cost of power consumption to less than 20% of what it had been[3], but also because it spurred a flurry of innovation and new business models by allowing businesses to focus on what they were best at; their products and services. Many of the cornerstone industries of the early 1900s, such as automotive and home appliances, would have been impossible to scale up without the advent of inexpensive and easily distributed power brought on by the economies of scale in the electric utility industry.

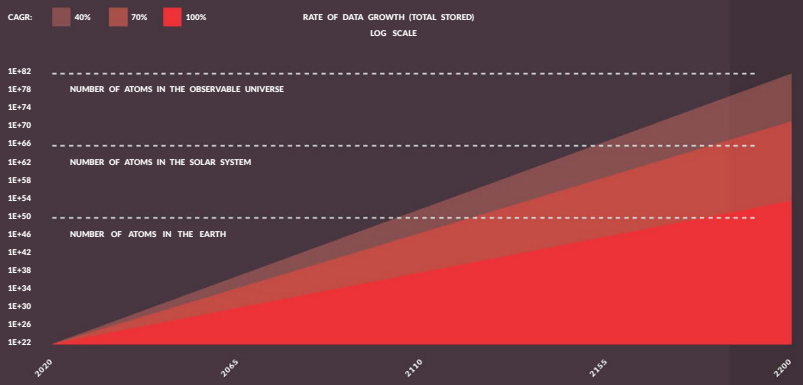
Just as electricity powered the industrial revolution one hundred years ago, data is powering today's most valuable companies—companies like Google, Facebook, and Amazon. Even companies that make durable goods, like Tesla, could not exist without an enormous quantity of data. And just as electric power generation migrated to centralized power plants, the storage of data is moving from on-premises storage to large centralized-clouds run by companies with storage expertise.

How much data?

It's been projected that the world's data centers (where all of the data that's used in the cloud is stored) are already using 25 percent more energy yearly than all of the UK and have a carbon footprint equal to that of the entire aviation industry[26]. In Japan alone, if its data centers continue to grow at their present rate, by 2030 they will consume all of Japan's energy output[27].

Some of the greatest contributors to the data of the next 50 years will be from industries that are incipient today. For example, it's projected that by 2035, vehicles in the USA alone will produce over 100 zettabytes of data yearly.

That's more than 100 times all digital global storage in 2017. More astonishingly, however, is the fact that if we continue on our current trajectory, we would simply run out of space to store data. By 2020 it's estimated that the world will produce forty-four zettabytes (that's a 44 followed by twenty-one zeros) of data yearly. By 2025 that will have exploded to one hundred eighty zettabytes per year[6]. That means the amount of data we produce is doubling every two years and accelerating (see the chart below). At that rate, within the next 200 years we will exceed the capacity available if we had the ability to store one bit of data on every atom in the solar system.



The different colors and increasing data storage projections reflect three rates of growth in data storage: 40%, 70%, and 100% CAGR. Even with the most conservative estimates we will exceed the capacity to store one bit on every atom that makes up the Earth by the year 2200.

Today it seems incomprehensible that a utility such as electricity, which is so simple to use, so prevalent in our lives, and so fundamental to our businesses, was once so radically disruptive; yet, most disruptive technologies follow a similar adoption curve. As reliance on them begins to escalate, they rapidly go from a curiosity to a mad rush of incompatible approaches.

For example, before utilities and the creation of the electric grid, each company had its own standards for power generation and distribution.

This was the advent of what we'll call Electrification 1.0, in which the first providers of electric power attempted to bundle power generation and delivery as an aside to what their core businesses were. The result was countless standards for the dynamos, motors, wiring, voltages, amperages, and machinery. Soon the costs incurred by trying to resolve these problems started to approach, and eventually exceeded, the savings of internal economies of scale. In fact, many factories began to sell power to local shopkeepers and municipalities, in an attempt to shore up an eroding financial proposition.

Ultimately, the reliance on electrification was so widespread, the threat of incompatibility such a stifling factor for innovation, and the risk of obsolete investment so great that broad-based standards emerged and industry segmentation occurred.

By 1890, the generation of electricity had begun to coalesce around two competing standards: Thomas Edison's DC current, and George Westinghouse's AC current. The battle raged until the 1920s when AC eventually won out, but DC power persisted in pockets throughout most of the 20th century.

Today, as Internet giants Microsoft, Google, and Amazon battle for shares of the world's data, using their own proprietary platforms, we are again faced with incompatible emerging standards.

The first generation of players that pave the road for these new technologies are often only bridges that transition us from the old to the new.

How Giants Fall

Long before the proliferation of privately-owned solar panels, electric companies were forced to separate the power generation from the power distribution. While the distribution is largely a regulated monopoly (it's impractical to string two or more sets of power lines into every home and office so that users can choose), generation has become highly competitive. The big central power plants of the last 100 years are giving way to smaller generation facilities that use new technologies to lower costs, such as solar, wind, hydro, geothermal, etc. This is similar to what happened in the steel industry. During the 1960s, US Steel was the largest steel company in the world. Their big soot-belching plants in places like Pittsburgh dominated the market. Then Nucor came along with their new electric arc furnaces and built mini-mills that were closer to their customers and sources of supply. US Steel, with their enormous entrenched infrastructure, lost ground year after year. Burdened with the cost of maintaining their old infrastructure, they couldn't afford to compete with Nucor and they didn't want to adopt Nucor's business model to only further erode their business. Today, US Steel has been delisted from the S&P and Nucor is the largest steel company in the US[4].

In data storage, we're seeing new companies with new technologies attack giant market leaders whose technology is now over a decade old. With the Internet owned by many competing players, it's difficult for any one or a handful of companies to control access and distribution, and it's relatively easy for customers to move data from one Cloud to another, especially considering the adoption of de facto standards, like the Amazon S3 API.

Are you looking at all of your Cloud options, or just the ones offered by the first generation of Cloud vendors?

In the early days of electrification, companies like GE and Westinghouse not only produced the equipment for power generation, but also transformers, motors, light bulbs, radios, and home appliances that consumed electricity. The adoption of standards unleashed an enormous wave of innovation as new companies emerged that specialized in doing parts of what Westinghouse and GE were doing. Sylvania produced light bulbs, RCA produced radios, Otis produced elevators, and so forth. While GE and Westinghouse continued to make all of these products for the next 100 years, they lost their grip on many of the markets that were emerging on the back of cheap, standardized, and ubiquitous electric power.

Similarly, as Microsoft, Google, Amazon, and a few others compete to be all things cloud, new companies are emerging that specialize in specific pieces of the Cloud. For example, Limelight and Fastly provide content distribution networks. Packet and Linode offer compute-in-the-Cloud, Wasabi offers storage, and File Catalyst offers file transfer acceleration.

While all three of the major Cloud providers have offerings in each of these categories, the "specialist" companies are thriving as customers adopt a multi-Cloud "best of breed" approach, piecing together the exact components that best serve their individualized needs.

The story of how electrification evolved applies to computing and data storage just as much as it does to nearly every disruptive technology that quickly creates value in unforeseen ways—creating distinct competitive advantage for its providers and its users.

As with electrification, the rush to use a new technology creates a chaotic and immature, though very lucrative, marketplace that scales quickly. But the first generation of players that pave the road for these new technologies are often only the bridges that transition us from the old to the new. They make the required investments to prove the initial value of the technology, but whether its data storage or electricity, they are not always the same companies that deliver on the longer-term promise.

For example, less than thirty years ago you would send a fax by going to your local FedEx office to use ZapMail—a proprietary precursor to commodity faxing. FedEx was effectively using proprietary methods to ride the wave of instant communication, which had enormous value to companies. But these proprietary first generation approaches typically crumble under their own weight as the technology evolves. For example, it's estimated that FedEx lost upwards of $300 Million on ZapMail as the fax market standardized and finally took off [5].

The Cloud Utility

That seems to be where we are with data storage in the Cloud; the first generation of Cloud-based storage is growing at an astonishing rate, nearly doubling year over year. After fifty years of on-premises investment in data storage, businesses have outgrown their ability to economically store all of their data on their own.

As with the evolution of electrification, companies built proprietary approaches for data storage. But these did not scale well outside of the organization and its closest partners. Inevitably, this stifled innovation, as data interoperability became the key impediment to doing business outside of any one proprietary set of data storage standards. For example, two thirds of companies claim that data storage costs are their number one data center challenge.

Companies such as Amazon, Microsoft, and Google were among the most affected by their own increasing demands for storage. Much like our early 20th century factories and electricity providers (i.e. Westinghouse and GE), they made the logical step of using their deep expertise in storage to defray the cost of their own data centers by providing storage as a service to their customers.

... each piece of data increases in value with each new piece of data captured.