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EMERGING TECH RESEARCH

The Postdigital Era

Setting the stage for the next era of technology innovation

PitchBook is a Morningstar company providing the most comprehensive, most accurate, and hard-to-find data for professionals doing business in the private markets.

Key takeaways

- The exponential growth currents of the past decade that drove mass adoption of digital goods and services are reaching maturity in many markets.
- As the next cycle of digital innovation and economic growth begins, several emerging technologies are poised to experience rapid growth as they transform society.
- The growth of next-generation technologies will be shaped by the current state of tech infrastructure as well as the present political and socioeconomic backdrop, which is profoundly different from how it was at the start of the prior cycle.

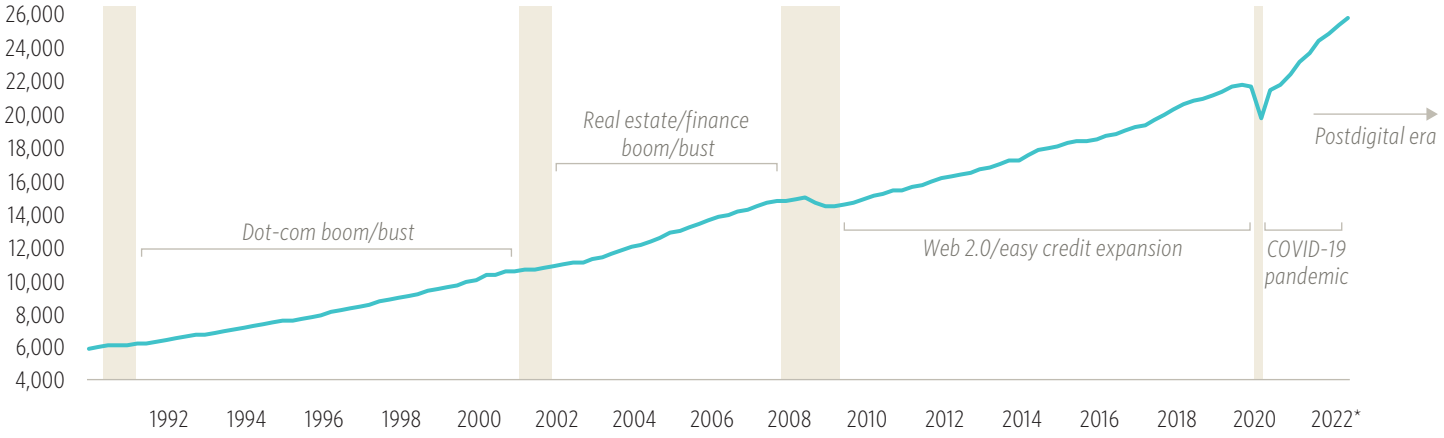
Cycles of innovation

As the global economy struggles to reach a post-COVID-19 normalcy, a new economic cycle appears to be getting underway. The past decade's supercycle of digital technology adoption is peaking, and the moonshot bets that gave rise to today's tech behemoths no longer have the same disruptive energy they once had. The great growth stories of the past decade, including those of smartphone adoption, streaming video, social media, and software as a service (SaaS), have matured, and the digital era is giving way to the next cycle of innovation. Within this "postdigital" environment (which is still very digital), several emerging frontier technologies are poised to have transformational economic and societal impacts over the next decade. As in prior cycles, how these technologies grow will be shaped by the world in which they exist and the present technologies upon which they are built.

The Great Recession ushered in an era of cheap money that fueled tech innovation and drove widespread scaling and adoption of digital technologies. The economic backdrop was shaped by accommodating federal and monetary policies that kept interest rates low and ensured a liquid lending market despite economic uncertainty. The sociopolitical backdrop was relatively benign and only starting to show signs of the strains and pressures caused in part by mass social connectivity that would ramp up toward the end of the decade. The postdigital cycle begins in a starkly different manner: Regulators are struggling to contain inflation and rising interest rates, and a vastly more robust and powerful technology infrastructure is being met with skepticism and caution by governments and consumers amid heightened levels of economic protectionism and sociopolitical polarization.

The last three major economic cycles ushered in significant growth opportunities for new technologies. While the dot-com boom is mostly remembered for the bust that resulted from the failure of startups to create sustainable business models, it nonetheless catalyzed the first major wave of internet adoption. Similarly, the banking and real-estate boom of the 2000s was powered by the emergence of tech-enabled financial derivative products, the impacts of which were so poorly understood by banks, investors, and regulators that they caused the Great Recession. The subsequent Web 2.0 cycle saw internet businesses achieve the promises of scale and profitability hinted at during the dot-com boom. This era gave rise to new business models, including SaaS, social media, streaming service, e-commerce, and gig economy platforms, while also ushering in new frontier tech, such as artificial intelligence (AI) and crypto. The winding down of the Web 2.0 cycle has not resulted from a failure of tech but from a combination of shifting consumer behaviors, changes in monetary policies, and the structural realities of a global economy strained by supply chain logjams. The complex forces unleashed by the pandemic have stoked inflation, driven up interest rates, and put the economy on notice for recession. For technology, the COVID-19 pandemic served as an unexpected late-cycle accelerant that flooded the economy with easy money and drove demand for digital goods and e-commerce.

GDP ($B) during recent economic cycles



Source: U.S. Bureau of Economic Analysis | Geography: US
*As of November 30, 2022

The Web 2.0 explosion

While the Web 2.0 cycle will surely be remembered for the extraordinary and unprecedented way in which it ended, it should also be recognized for the explosive adoption of digital technologies and the hyperconnected world that it created. When the Great Recession ended in 2009, fewer than 10% of Americans had smartphones, and the phones mostly operated on 3G networks. Today, more than 85% of Americans have smartphones, and they mostly operate on 5G networks.[1] In 2009, there were roughly 4,400 Blockbuster locations,[2] and it took more than half an hour to download a movie to a desktop computer. Today, there are no Blockbusters (apart from one novelty operation in Oregon), and you can download a movie to a mobile phone in less than a minute. In 2009, roughly half of Americans still had newspapers delivered to their homes, and there were less than a billion social media accounts. Today, less than a quarter of Americans have newspapers delivered to their homes, and there are more than 13 billion social media accounts.[3,4]

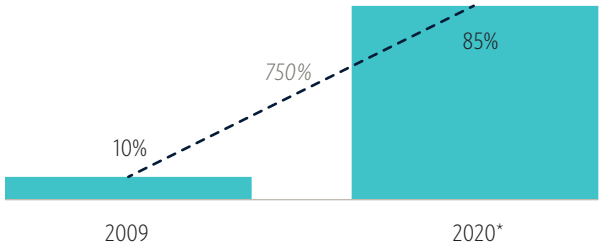
These once-explosive growth trends are starting to slow as adoption and penetration levels max out. Smartphone and streaming video service adoption has neared a peak, and first-generation social media platforms are embroiled in controversy as they face threats from new contenders such as TikTok and government regulators looking to rein in disinformation. As these once-powerful drivers of growth fade, they nonetheless serve as the foundation upon which the next generation of technology is being built.

The digital era will leave behind a tech-savvy population of people constantly on their phones with radically more powerful technology infrastructure at their disposal. Since 2009, annual cloud infrastructure sales have grown more than 23,000%, from $1 billion in 2009 to $237 billion in 2022. Sales of SaaS applications have grown nearly 2,000%, from $8 billion to $167 billion.[5] This growth has required the expansion of the tech

1: "The Infinite Dial 2020," Edison Research, March 19, 2020.
2: "Holy Popcorn! Blockbuster to Close Up to 960 Locations," Yahoo Money, Zac Bissonnette, September 15, 2009.
3: "Newspapers Fact Sheet," Pew Research Center, Michael Barthel and Kirsten Worden, June 29, 2021.
4: "The Rise of Social Media," Our World in Data, Esteban Ortiz-Ospina, September 18, 2019.
5: "Global SaaS Market to Hit US$9B in 2010," ZDNET, Tyler Thia, December 15, 2010.

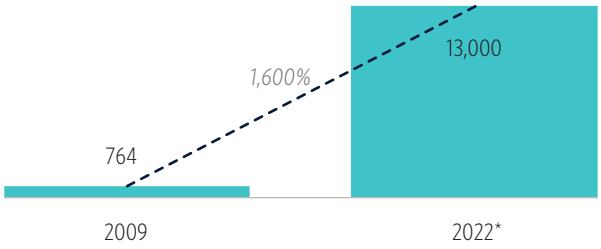
workforce, from around 13 million in 2009 to around 27 million currently,[6,7] and an explosion in open-source software on platforms such as GitHub, which has more than 90 million user accounts today relative to 100,000 in 2009.[8,9] This digital ecosystem, which is generating incomprehensible quantities of data, is run by exponentially more powerful hardware. In 2009, the strongest computer chips had 1 billion transistors; today, they have 100 billion.[10]

Percentage of US population (ages 12 and older) that owns a smartphone



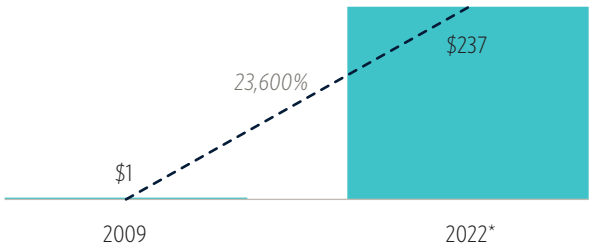
Source: Edison Research | Geography: US
*As of March 19, 2020

Monthly active users on social media platforms (in millions)



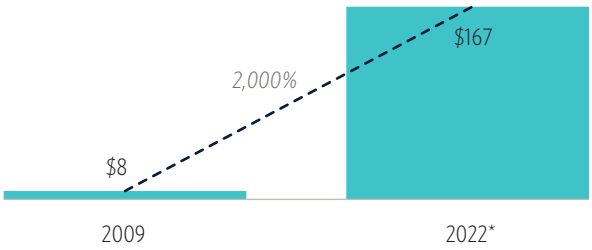
Sources: Our World in Data and Statusbrew | Geography: Global
*As of November 24, 2022

Cloud computing sales ($B)



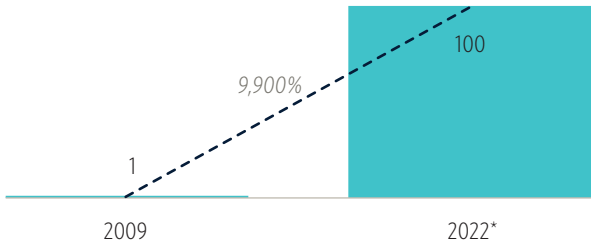
Sources: Gartner and PitchBook | Geography: Global
*As of December 6, 2022

SaaS sales ($B)



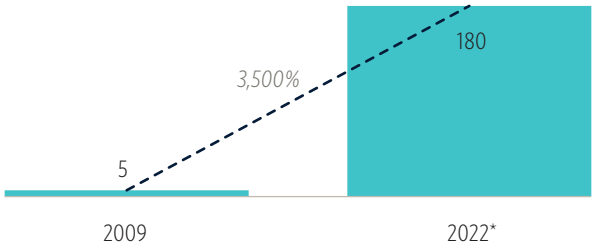
Sources: Gartner and PitchBook | Geography: Global
*As of December 6, 2022

Highest number of transistors on a computer chip (in billions)



Sources: Niklas Rosenberg and SiliconANGLE | Geography: Global
*As of December 6, 2022

Average home internet speed (Mbps)



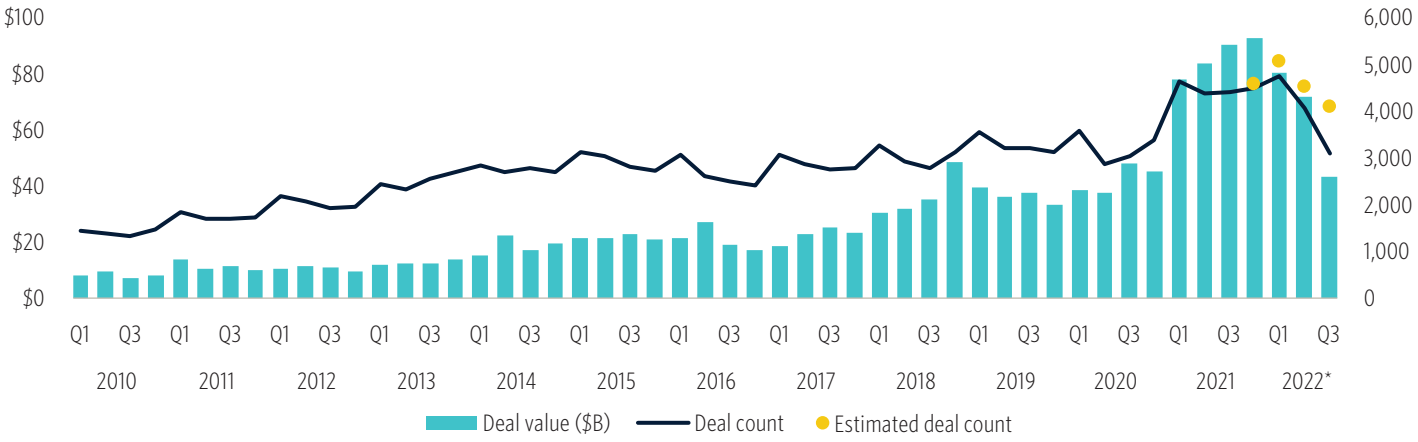
Sources: Business Insider and Speedtest.net | Geography: US
*As of October 2022

6: "Global Software Developer Population to Increase to 20M by 2015 – Strong Growth Seen in Asia," Evans Data Corporation, Ashley Hagewood, September 28, 2011.
7: "Developer Nation Pulse Report: Q3 2021," Developer Nation, n.d., accessed December 5, 2022.
8: "How GitHub Democratized Coding, Built a $2 Billion Business, and Found a New Home at Microsoft," Nira, Hiten Shah, n.d., accessed December 6, 2022.
9: "Octoverse 2022: The State of Open Source Software," GitHub, n.d., accessed December 6, 2022.
10: "Intel Unveils Details of 100B-Transistor AI Chip and Alder Lake Hybrid Processor," SiliconANGLE, Maria Deutscher, August 19, 2021.

Politics, economics, and financing

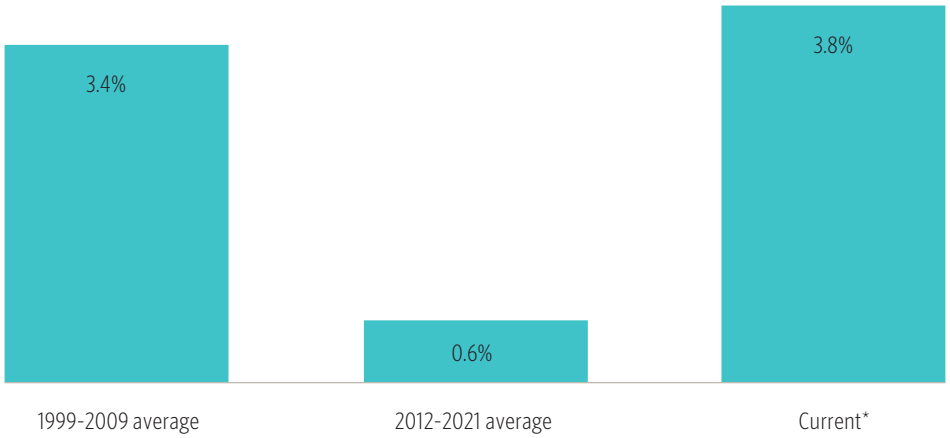
In addition to technology, the postdigital era will encounter a reshaped funding environment, with higher levels of capital availability and a larger and more robust funding ecosystem. While the low interest rates and accommodating federal policies of the Web 2.0 era were intended to lessen the blow of the Great Recession, they also served to establish new channels of capital deployment in search of higher yields in emerging and riskier corners of the market, which often included technology startups. The VC industry was a clear beneficiary of this trend, with nontraditional entrants, such as corporates, pension funds, and governments, driving the soaring fund formation and investment in the latter half of the decade. While inflation, high interest rates, and tighter fiscal and monetary policies have reduced the supply of cheap money in the market (a common feature in the beginning of cycles), the private financial markets are positioned to play a relatively larger role in future cycles of economic growth.

VC deal activity by quarter



Source: PitchBook-NVCA Venture Monitor | Geography: US
*As of September 30, 2022

Federal-funds rate



Source: Federal Reserve Bank of St. Louis | Geography: US
*As of December 2022

The upcoming cycle is also notable for its lack of looming transformational regulation. After the dot-com boom, regulators focused their energies on accounting practices to improve the transparency of publicly traded companies. The subsequent Sarbanes-Oxley Act mandated new accounting practices that have reshaped corporate accounting ever since. Following the Great Recession, lawmakers were unified in their effort to pass sweeping rules that would tamp down on banking malfeasance. The resulting Dodd-Frank Act had a chilling effect on dealmaking and encouraged fintech innovation by making it harder for incumbent banks to compete in areas of emerging growth. Both of these regulation packages have played a role in fostering the growth of the startup ecosystem by encouraging companies to stay private longer and avoid the high costs associated with going public.

In contrast, heavy-handed legislation seems unlikely in today's polarized political atmosphere. Current regulatory efforts are relatively narrow in focus, targeting, for example, the crypto industry, which represents a relatively small and nonsystemic area of the economy. While legal efforts focused on antitrust and big tech may result in large fines and/or breakups, they are unlikely to dramatically alter the regulatory playing field. The political environment is also notably different. The period following the Great Recession was dominated by liberal economic thinking that encouraged globalization. Conversely, the postdigital cycle will be shaped by nationalistic forces, which will incentivize the reshoring of manufacturing capabilities, the localization of supply chains, and the limiting of exports of technological intellectual property and investment capital.

Economic cycles tend to start with a whimper before ending with a bang, and many technologies poised to solve tomorrow's problems are sitting quietly on the sidelines waiting to grow and scale. These include electric vehicles, which currently represent less than 5% of cars on the road.[11] As this increases to 50%, it will generate exponential growth opportunities for original equipment manufacturers, data management services, and providers of charging grid infrastructure while dramatically reshaping the oil & gas industry. Similarly, virtual reality headset adoption is also minimal. What will be the knock-on effects as today's younger generations spend more time in Metaverse environments? Growth opportunities also abound in healthcare, a vastly complex and unwieldy ecosystem that will be further contorted by value-based care initiatives, digital and home-care services, mRNA biotechnology, and remote therapeutics. And while the crypto ecosystem remains battered by blows from the FTX implosion, the promise of supplanting megacentralized Web 2.0 platforms with autonomous decentralized goods and services provides a compelling narrative. Other technologies of the next decade will include carbon removal systems, cultivated proteins, generative AI, and gene editing, each of which offers a unique set of moonshot bets that will help shape the world of tomorrow.

PitchBook's Emerging Technology Research team closely follows key trends in developing technologies. Read more about them in our 2023 Industry and Technology Outlook here.

11: PitchBook estimate based on car sales data from Experian and US News & World Report.